Results of a probabilistic model applied to the research carried out on the Turin Shroud

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ABSTRACT

A probabilistic model, capable to consider mutually excluding events, is been applied to 100 statements derived from the research done on the Turin Shroud.
The 3 different alternatives are here defined as: A "the Shroud is authentic"; F "it is a medieval fake"; N "it is neither A nor F".
Each statement is characterized by 7 subjective coefficients, 3 regarding the probability of each alternative A, F or N, 3 the uncertainty of the probabilities and 1 to express the scientific importance of the statement.
The 700 parameters have been elaborated by a "Mathcad 7" software to obtain the following result: the Turin Shroud is authentic with a probability of 100% and a corresponding uncertainty of 10^{-83}.
Making an analogy with the roulette game, it means that it is more probable to obtain in sequence the same number for 52 times than affirm that the Turin Shroud is not authentic.

LIST OF SYMBOLS:

- Acronyms: **TS**: Turin Shroud; **MTS**: Man of the Turin Shroud
- Notes: **[1]**
- Bibliographic references: **[1]**
- ***Italics:*** statement object of valuation.

1) INTRODUCTION

It was made up a probabilistic model [1] able to value the results of the research carried out on the Turin Shroud (TS) because of the difficulty the authors found to judge in a global and objective way the remarkable quantity of evidences or statements brought in favour or against a thesis of authenticity or of falsity. Still nowadays in fact the scholars keep on upholding diametrically opposed theses bringing in favour only a limited number of statements.
On the other hand from the numerous researches carried out on an international level, it didn't result a sole statement so complete and significant as to show the TS authenticity or falsity. In fact no evidence is such as to completely show the considered hypothesis, but perhaps the global analysis of all the clues can reach

(*) For merely academical purposes the individual contribution of the single authors is specified as follows: G. Fanti (40%) has developed the probabilistic model, moreover he has defined the 100 statements with E. Marinelli (60%) who granted their reliability providing the corresponding bibliographic references.

this purpose. "When the clues multiply, agree among each other and join toward a conclusion, rises a reasonable certainty[2].

It's paradoxically less difficult to admit at the origin of the imprint an extraordinary event happened inside Christ's sepulchre, than not to suppose, in the Middle Age, the work of a forger-artist with superhuman cleverness or the product of a forger-murder with a diabolic will to torture a man to death[3].

In this work the 100 statements retained the most significant, both in favour or against a particular thesis, are discussed and analyzed as to provide a database useful to any scholar who wants to carry out a probabilistic valuation on his own.

Maybe from the synthesis of all the valuations we propose it could come to light an answer to the question that for centuries has been asked to the scientists as for the authenticity of the object: in fact it's important to exactly understand what the TS is, because if it is authentic, it would be the nearest object to the fundamental event of the Christian faith: Christ's death and resurrection. The New Testament doesn't indicate that anyone testified what happened in Jesus' sepulchre, but if the TS is really Jesus' burial cloth, then it would be a testimony without precedent of the event on Easter morning [4].

2) ALTERNATIVES AND A PRIORI PROBABILITIES

The analysis begins synthesizing three possible, but among each other mutually excluding alternatives, the most plausible hypotheses regarding the TS origin. They are called **A, F, N** and are here described as follows:

1) Alternative **A**: the TS is *authentic*. It wrapped Jesus' body, a Hebrew male around thirty years of age, who lived in Palestine about 2000 years ago. The cloth has a Syriac-Palestinian origin and presents traces of ceremonies common in the ancient Palestine[1].

2) Alternative **F**: The TS is false, *medieval or post-medieval*: it could be a painting or the work of a so-called "ingenious forger murder" who succeeded in realizing in a such detailed and minute way all the particulars that would have allowed the attribution of the cloth to Jesus[2].

3) Alternative **N**: the TS *is not authentic*, but it is neither false, medieval nor post-medieval; therefore the alternatives "A" and "F" are not verified. In such alternative are therefore included all the other possibilities[3].

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[1] The cloth got stained with blood, since it wrapped the body of a crucified man, before the image formation. The blood traces belong to a man, strongly traumatized before his death, who suffered a scourging naked and who remained in the sheet until the third day after his death. The body suffered a Roman crucifixion typical of the I cent. A.D. without suppedaneum, wore on his head a helmet of thorns and on his shoulders the patibulum. He died of an infarct followed by haemopericardium. The TS, passing through the Negev, was showed in Edessa and Constantinople before being transferred to France and to Turin and it completely agrees with what described in the Gospels. The body image originated in a not yet completely known way (it could be originated through a source of energy developed during the resurrection, or because of various concomitant factors like the interaction among the contact of the body with the linen, the sweat, the blood, aromas like aloe and myrrh and maybe some effects caused by the resurrection).

[2] This thesis, confirmed by various scholars, was also confirmed by the radiocarbon dating (however various perplexities about the method followed for the radiodating remain). Among the techniques supposed for the realization of the image we have to remind the singeing (warmed metallic bas-relief), the technique of the dark room and the interaction of substances oxidizing the cellulose of the linen (like aloe for instance) with manikins (also through rubbing). In this hypothesis is also included that one that the work is false, post-medieval, cleverly substituted with that whose documentation is dated back to the XIII century A.D. In the probabilistic valuation one has to consider that the hypothetical forger should have had the ability and the means to realize the object.

[3] The alternative N includes for instance the hypothesis that the sheet wrapped Jesus' body, but the image was realized subsequently by a hypothetical forger; that the sheet wrapped the body of any man (but not Jesus) crucified according to the techniques used by the Romans in the I cent. A.D.; that it is false, of the early centuries A.D., work of a painter or of an "ingenious forger murder", or the result of a miracle or had another origin not natural (the cardinal Ballestrero said: "Why don't we want to consider among the possible causes also that of God's supernatural intervention?")[5].

One values first of all the *a priori probabilities* of the three alternatives A, F, N, supposing not to know anything regarding the evidences that will be discussed and valued in a second phase.
To the alternative A one assigns an "a priori" probability $P^I(A)$ and an absolute uncertainty i_A:

$$P^I(A) = 0{,}05; \quad i_A{}^I = 0{,}02$$

since one retains that it is statistically more likely that the TS is not the burial sheet of a particular person died in a particular historical period.
To the alternative F one assigns an "a priori" probability $P^I(F)$ and an absolute uncertainty i_F:

$$P^I(F) = 0{,}35; \quad i_F{}^I = 0{,}05$$

because one retains that statistically it is more likely than the alternative A, but the condition to be false and moreover of a particular historical period, makes it less likely than the alternative N to which one assigns an "a priori" probability $P^I(N)$ and an absolute uncertainty i_N:

$$P^I(N) = 0{,}60; \quad i_N{}^I = 0{,}05.$$

3) PROOFS SUBJECTED TO STATISTICAL ANALYSIS

For each proof the advised values of the statistic parameters are inserted in the following way: to the hypothesis A, F, N, one gives a numeric value that satisfies the condition A+F+N=1 and to the correspondent uncertainties i_A, i_F, i_N one assigns a per cent limited value[1].
The results of the analyses are subdivided in the following 8 points: a) Cloth; b) Microparticles; c) Blood; d) Corporeal image; e) Other images; f) Man; g) History; h) Analogies between the MTS and Christ from the Old and the New Testament. Many proofs should appear contemporaneously in different points of the subdivision, but to avoid possible correlations, such proofs were inserted only once in the point considered the most significant.

3a) CLOTH

1) *It has the characteristics of a Jewish* ***burial cloth*** *of the I cent. A.D.* The corpses were buried integral, with eyes and mouth closed, and with aloe and myrrh[6]. [a=.45, f=.05, n=.5, i_a=.1, i_f=.02, i_n =.1, p=1]
2) *It has not an European origin since the* ***dimensions*** *are expressed in Syrian cubits (8x2).* Such measure was used in the ancient Israel. With other systems we don't have entire measures (4,36x1,10 m)[7]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]
3) *The* ***"Z" twisting of the TS's yarn*** *is typical of the Syro-Palestinian area of Christ's time, opposite to the "S" one, more common in the ancient Egypt.* Even the interlacing of the cloth, hand spun, can be taken back to a rudimentary treadle loom; it presents jumps and beat mistakes[8][4]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]
4) *Supposing authentic the* ***Sudarium of Oviedo***[5]***,*** *from the strict correlation showed, it results that the TS is authentic too.* The linen threads of the Sudarium, with "Z" twisting, are analogous to those of the TS[12]

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[4] The "herring-bone" cloth has a Mesopotamic or Syriac origin and not Egyptian of orthogonal "cloth" kind[9]. In the laboratory of Oxford, during the radiodating, they found dark yellow cotton fibers of probable very ancient Egyptian origin[10].

[5] The Sudarium is a linen cloth that the tradition wants to have been used to cover Jesus' Face during the way from the Golgotha to the place of the burial. The analogies presented by the two clothes concur to show that the TS is not false. For instance on both clothes they found 9 identical varieties of pollens coming from Palestine and also other varieties that point out the different geographic way covered by the two clothes in the centuries. Moreover the bloodstains of the two clothes fit together as if they came in touch with the same face. Even the outline and the dimensions of the two faces, that can be taken from such imprints, are compatible. The blood on the two clothes is human, of AB group. The verified difference regards the ^{14}C radiodating, that for the TS resulted of 1260-1390 A.D. and for the Sudarium of about 680 A.D., maybe not only because of the different contamination suffered during the centuries, but also for the fact that the Sudarium wasn't exposed to the Chambéry fire (1532) and to the strong source of radiation to which the TS was probably subjected during the resurrection[11].

and superimposing studies with polarized light and computerized comparison identify 70 bloodstains fitting together between the TS's face and the Sudarium of Oviedo[13] [a=.98, f=.01, n=.01, i_a=.15, i_f=.005, i_n =.005, p=2]

5) *The MTS was an important man: the* ***precious weaving*** *in fact doesn't fit with the corpse of a common crucifix.* Such bodies generally ended in common graves or like meal for the birds of prey. The only two cases of evidences of crucified men are the TS and Jehohanan ben Hagqwl's bones [14]. [a=.80, f=.05, n=.15, i_a=.06, i_f=.02, i_n =.06, p=1]**.**

6) *The cloth comes from the Middle East because they found* ***traces of cotton*** *(Gossypium herbaceum).* Such cotton was spread in the Middle East at Christ time [15]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

7) *The cloth was produced in a Jewish environment because they didn't find traces of* ***fibers of animal origin.*** In a Jewish environment, the respect of the Mosaic Law prescribes to keep separated the wool from the linen (Dt 22,11)[16]. [a=.79, f=.01, n=.2, i_a=.1, i_f=.005, i_n =.1, p=1.3]

8) *The* ***^{14}C radiodating*** *of 1988 provides an age for the TS included between 1260 and 1390*[17]. Differently from some normatives[18] it was realized a detailed analysis of the accidental errors, but they didn't consider different systematic effects that according to many scholars rejuvenated the samples[6,7]. [a=.3, f=.4, n=.3, i_a=.3, i_f=.4, i_n =.3, p=0]**.**

3b) MICROPARTICLES

9) *The MTS* ***walked barefoot***. In the area of the heel they found a remarkable quantity of earthy material[31]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

10) *The MTS comes from Palestine: the samples of earthy material found in the feet area contain* ***aragonite*** *with strontium and iron*. Such material is infrequent, but very similar to samples taken in the Jerusalem caves[32]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

11) *The MTS* ***fell to the ground*** *without the possibility to protect himself with his hands.* There are fragments of earthy material also in correspondence of the tip of the nose and of the left knee**.** The hypothetical forger should have taken care of all the microscopic details that resulted probable. The microscope wasn't known in the Middle Ages[31]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

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[6] Systematic effects: a) the Chambéry fire in 1532 that according to D.A Kouznetsov and A. A Ivanov caused the carbossilation of the cellulose present in the linen also for the presence of silver cations (catalyst) [19]; b) the representativity of the sample containing possible medieval darns (the mass of the taken samples is about 39 mg/cm^3, almost double of the average, equivalent to 23 mg/cm^3) [20]; c) the presence of a layer of fungi and bacteria bioplastic covering[21]; d) the biofractionment of the carbon isotopes in the linen plant[19].

The ^{14}C radiodating of 1988 could be conditioned by the resurrection: the protonic and neutronic radiation, that would have caused the image, would have also varied the percentage of carbon and azote atoms in the linen[22].

[7] Other indications. The co-ordinator of the radiocarbon dating, M. Tite[23] subsequently explained to the dating not to retain that, on the basis of the result, one could define the TS a fake. The statistic test of Pearson, realized on the results of the dating, shows that one has the 95,7% of the probabilities that the date obtained doesn't correspond to that of the whole sheet[24]; the dating of the Manchester Museum's mummy n°1770 linen resulted younger than 1000 years with respect to the correspondent bones[25]. In the Tucson laboratory, in the analyzed sample they found a red silk thread (material that covered the TS) and blue fibrils (from the border) [26]. R. Hedges, from the Oxford laboratory, stated that it is possible an alteration of the ^{14}C content due to an explosion of radiation[27]. M. Tite declared that a neutronic radiation that comes into collision with the cloth could cause a production of ^{14}C from the azote[27]. It's sufficient a variation of 18% of the ^{14}C percentage to make resulting medieval an object of the I cent A.D.. If the valuation mistake is caused by the presence of recent contaminating material, 1 gram of Shroud cloth hypothetically of the I cent. A.D., to be rejuvenated to the 1300 should weigh 2,5 grams [28]. Gonella[29], affirms that the 1988 ^{14}C radiodating assures that the TS doesn't date back to Christ time: even if the uncertainty due to systematic effects, such as the instruments setting and the samples cleaning method, was of various centuries, one couldn't miscalculate of 1300 years.

In 1982 it was undertaken a secret test on a thread of the TS cloth: an extremity resulted dated back to 200 A.D., the other one to 1000 A.D.[30].

12) *It comes from Palestine because there are traces of "**natron**"*. Among the dust sample inspired they identified elements that one can take back to the 'natron'. 'Natron' was used in Palestine for the corpse dewatering[33]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

13) *It was identified the presence of **aloe and myrrh** in the cloth.* Such substances were used in Palestine at Christ time for the corpses burial[34]. The serrate aspect of the halos left on the TS that the water, used to put out the Chambéry fire, originate on a cloth previously imbued with aloe and myrrh[35]8. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

14) *From the analysis of the **pollens**, it results that it was showed in Palestine, Edessa and Constantinople.* Otherwise it was exposed to plants coming from those places. Of the 58 species of identified pollens [37] [38], 17 grow in Italy or in France, 38 grow in Palestine (among them the Ridolfia Segetum Moris, the Anemone Coronaria, the Phillyrea Angustifolia, the Pinus Halepensis and the Gundelia Tournefortii) and many of them are typical and frequent in Jerusalem and environs.[9] [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=3]

15) *The most **frequent pollen**, relative to the samples taken from the TS, is that of plants that grow in Palestine.* Such specie of pollen resulted equal to the fossil one abundant in the sediments of the Genezareth lake and of the Dead Sea[37] [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=1.2]

16) *Some **flowers** were put around the MTS's head at the moment of the burial and/or during **Easter ceremonies** in Palestine.* Among these flowers they found the Zygophyllum dumosum, that lives in the Dead Sea area, and the Capparis aegyptia, a kind of caper common in Israel[41]. In the Eastern, Orthodox and Coptic rites the flowers have an important role for the commemorations of Jesus' death. Through the superimposing technique in polarized light they identified the images of 28 (fresh cut) flowers coming from Palestine[42]. It was already classified the pollen of 25 of them[37]. A thirty among the analyzed pollens belongs to flowers that blossom in Palestine in spring and they found fragments of flowers (anthers and bracts) [39]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=1]

17) *The **wax** drops show that the TS could have been used like altar-cloth*[39]. The wax is not dated. It doesn't result that the TS was used like altar-cloth from the Middle Ages on. Candles could have maybe

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[8]According to someone[36] the presence of aloe and myrrh is excluded. But Baima Bollone had at his disposal pieces of thread, not only material of surface taken with adhesive tapes.

[9] On the basis of the classification of other 19 (therefore 77 in total) new kinds of pollens[39], it results that the TS passed through the Negev until the Libanon. Two species of pollens don't exist either in Europe, or in Palestine, but a specie (Atraphaxis spinosa) exists in Urfa (Edessa) and a specie (Epimedium pubigerum) exists in Istanbul (Costantinople). The Ixiolirion montanum lily grows in Turkey, Mesopotamia and Syria, but not in Europe. They found pollens of desert plants such as the Anabasis aphylla, the Suaeda aegyptiaca and the Tamarix nilotica. The Reaumuria hirtella and the Zygophyllum dumosum are typical pollens of plants from the Dead Sea. Pollens of Acacia albida refer to a plant of the Jordan Valley and those of Hyroscyamus aureus and of Onosma orientalis belong to plants that blossom in Jerusalem in April on the walls of the ancient citadel. Among the different species of pollens, 13 belong to alofite very characteristic or exclusive of Negev and of the Dead Sea area. The presence of such pollens is maybe caused by the Khamsin wind that blows from South East in spring and autumn: it could have taken in Jerusalem pollens from desert areas. From 1300 on the TS remained in Europe and if it dated back to the Middle Ages it would be difficult to explain the presence of such pollens. The Palestinian and Anatolic flora doesn't result to be changed in the last 2000 years.

They are clues or presumptive evidences more than evidences because the number of analyzed samples is limited[40]. One traced back to kinds of plants whose specie is difficult to distinguish on the basis of the pollens, but the clues are not negligible. The techniques used by Frei for the identification are not clearly known.

Being most frequent the pollens derived from entomophilous pollination (transport through insects) respect to the anemophilous one (transport through the wind), is to be excluded the contamination due to a transport with big distances through the wind. The pollens analysis is significant for the reconstruction of the TS path. The greatest percentage of pollens next to the Face respect to that one of the rest of the cloth, confirms the public exhibition (in Edessa) of the only Face. They also identified the specie of pollen "Oryza Sativa" relative to rice plants, typical of Vercelli: in 1553 Emanuele Filiberto in fact kept the TS in the Vercelli Cathedral. In the future the study of the pollens found on the TS could allow to determine the age of the cloth if it is possible to evaluate the fossilization degree of the pollens's cuticle.

caused the ancient burnings, also transferred in the Pray Manuscript of Budapest in 1192-95. [a=.89, f=.01, n=.1, i_a=.05, i_f=.005, i_n =.05, p=1]

3c) BLOOD

18) *The red covering of the linen threads* ***is blood***[34] [43] *identified of* ***human kind of AB group***[34][44]. This is confirmed by various specific analyses[10]**.** [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=3]

19) *The red covering contains* ***human male DNA***. They found a modest quantity of female DNA due to a contamination during the TS restoration, but the presence of male DNA is more remarkable[21] [47]**.** [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=1.3]

20) *The high quantity of* ***bilirubin*** *they found is sign of a person heavy traumatized before his death.* Indeed, the bright red of the bloodstains is caused by the presence of a high quantity of bilirubin[48]**.** [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.03, p=2]

21) *In numerous flows the* ***coagulation phases*** *of blood are evident.* One observes the clot formation and its retraction with crust and serous exudate formation[48]**.** [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.03, p=1.4]

22) *It wrapped a wounded man: around the bloodstains there are* ***halos of serum****, invisible with the naked eye.* Ultraviolet fluorescence photographs, unknown in the Middle Ages[48], confirm this**.** Therefore it is not likely the hypothesis that the MTS remained inside the sepulchre in state of coma[49]**.** From the thoracic wound, the serum too dropped besides the blood. It is possible to realize such halos only through contact with hematic clots. The blood, coagulated on the wounded skin, transferred on the cloth through fibrinoulisis, that during the first 36 hours causes a remelting of the blood[50]**.**[a=.69, f=.01, n=.3, i_a=.1, i_f=.005, i_n =.1, p=1.5]

23) *It wrapped a corpse: the stains of living and post-mortal blood are* ***perfectly transferred****.* They are due to a direct contact with the wounds of a human body. In the ultraviolet fluorescence photographs one can distinguish even the slightest signs of flagrum[48]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1.2]

24) *On the Face image the* ***blood perspiration*** *is evident*. The computerized image analysis shows a probable hematohydrosis on the whole Face[51]. [a=.9, f=.01, n=.09, i_a=.05, i_f=.005, i_n =.04, p=.7]

25) *The MTS shows the effects of a still and naked* ***scourging*** *by two executioners.* One can count in UV light the lacerated and contused wounds[11], 120 radially arranged strokes, caused by a Roman flagrum, with two different sources. Lesions on the gluteals don't lack. The scourging didn't happen during the transport of the cross[52].[a=.69, f=.01, n=.3, i_a=.1, i_f=.005, i_n =.1, p=1]

26) *It provides till now inedited details of Christ Passion: the at least 50 imprints in correspondence of the head, caused by sharp objects, correspond to the effects of a* ***helmet of thorns***. Therefore it was not the circle of thorns of the Western tradition. The helmet of thorns is conformable to the Eastern royal crowns. It was not usual in the Roman crucifixions to crown with thorns the head of the condemned[35]. [a=.99, f=.005, n=.005, i_a=.003, i_f=.002, i_n =.002, p=2]

27) *It is not a medieval painting: the imprints point out the* ***difference between arterial and venous blood*** *discovered in 1593*[35]**.** One can clearly distinguish hemorrhages of living blood from post-mortal

[10]Microspectroscopic research, cromatography and reaction to benzidine confirm that the covering is blood. Such covering completely melts in proteasis. A fragment immersed in a solution of idrazine reveals the presence of hemocromogen. The bilirubin is present in the analyzed fragments. The test with the green bromocresolous, carried out on a sample of serum halos, revealed the presence of blood albumins. Even the test of the proteolytic enzyms showed that colouring matters weren't added in the blood[43]. The neatness of the wounds and therefore the quick drying up of the blood show moreover that the crucifix was dehydrated. In correspondence of the feet area it was found a red corpuscle[45] and some human epidermic cells[46]**.**

[11] Each stroke provoked 6 contusions caused by as many leads (or little bones) set at the ends of the flagrum[52]**.** It was not a Jewish scourging because the Jewish didn't exceed the 39th stroke[53]**.** An hypothetical medieval forger couldn't know the Roman flagrum taxillatum, forgotten for centuries, to leave its imprints on the TS.

extravasations, hemorrhages of arterial, venous, mixed or hypostatic blood[54] [12]. [a=.495, f=.005, n=.5, i_a=.1, i_f=.003, i_n =.1, p=1]

28) *It wrapped a man who was hanged to a cross since the* ***hematic flows respect the law of gravity****, (discovered in 1666) and the* ***position*** *of the crucified Man*. For instance one considers the blood flow on the right forehead-temporal area that came out from an artery, it flew down long the hair frame, and the flows coming out of the wrists[35].[a=.69, f=.01, n=.3, i_a=.1, i_f=.005, i_n =.1, p=1]

29) *The body was* ***wrapped in the sheet not over two hours and a half*** *after the death.* Until little before the death the blood flew from the wounds. The blood came out after death from the holes in the feet and in the wrists during the unnailing and from the side wound also during the deposition[55]. [a=.99, f=.005, n=.005, i_a=.002, i_f=.001, i_n =.001, p=2]

30) *The* ***sheet "became empty"****.* The contact between body and sheet interrupted without altering the blood transfers remained extremely clear. An hypothesis to explain this phenomenon could be the crossing of the body become "mechanically transparent with respect to the sheet, during the resurrection" [56] [13]. [a=.99, f=.005, n=.005, i_a=.003, i_f=.002, i_n =.002, p=1]

31) *The blood transfer was obtained in the Middle Ages by a clever* ***forger-murder*** *who tortured until death a man to reproduce the same wounds caused by the executioners to Jesus*[57] [58] [14]. However it is not easy to reproduce in the least details all the signs of the Passion and certain particulars of the Roman crucifixion were unknown in the Middle Ages. It is not easy to wound at the side the dead victim and let coming out from it blood and serum separated. This affirmation doesn't explain how one obtained the body image. [a=.15, f=.7, n=.15, i_a=.07, i_f=.1, i_n =.07, p=.2]

3d) BODY IMAGE

32) *The image is impressed in a way still* ***today scientifically unexplainable*** *therefore even more so impossible to reproduce for a forger (even medieval)***.** The most sophisticated modern techniques don't allow realizing a similar image[15, 1616]. Moreover there aren't any areas of image saturation, all superficial, and the dorsal image is not influenced by the body weight[56]. [a=.79, f=.01, n=.2, i_a=.01, i_f=.01, i_n =.003, p=2]

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[12] For instance the reversed 3 on the forehead corresponds to a slow and continuous descent of venous blood due to a sharp object (a thorn) driven in the frontal vein and then taken off; the curious aspect of the reversed 3 is due to the corrugation, under the spasm of the pain, of the frontal muscle. The right bloodstain, at the root of the hair, is produced by a circular clot (due to a thorn) of arterious blood because it comes out with an intermittent jet[35].

[13] The points previously in contact with the skin would have laterally moved and the body image would have originated on the cloth as the sheet, going down, through the gravity would have met the outline of the body. Confirming such theory one can notice for instance the stains in the hair, that would have originated where the cloth, in a first moment, touched the cheeks and the blood flow in correspondence of the frontal view opposite the right elbow where one can observe that the segment ends with a circle stain completely out of the body imprint[56].

[14] According to someone the TS would have wrapped the body of a crusader killed like Jesus in the Holy Land[57], or it would have wrapped the body of the Templar Jacques de Molay[58]. But the Templars wore short hair.

[15] J. Jackson stated: "On the basis of the physic-chemical processes known up to today, we have reasons to say that the Shroud image can't exist, but it is real even if we can't explain how it originated"[59]. Two are the techniques of the image transferring on the cloth[56]: a) the one relative to the bloodstains originated before through direct contact with the body; b) the one relative to the body images that have no clean lines of demarcation and that are characterized by a colour that gradually fades next to the borders and that originated afterwards. It lacks traces of lateral body image, while there are lateral bloodstains. The resolution of the body image is of 5 mm and therefore a satisfying hypothesis of the image formation mechanism must permit to obtain a comparable resolution degree. The correlation on a great scale between anatomic distances and image lights and shades doesn't seem correct: this effect could imply that the correlation of the lights and shades varies in the image from area to area even if it is still difficult to understand its mechanism. One can suppose the coexistence of two image formation mechanisms: the direct contact and a mechanism of action at a distance; the first would explain the resolution of the image, the second the correlation with the distance.

[16] Even a mixture of olive oil with sweat and aloe warmed in an oven caused an image[31] . However according to S. Pellicori, who carried out this experiment, the substances used work like catalysts: the image would have been caused by the exposition to light.

33) *The image originated* ***after the sheet wrapped a corpse.*** Under the bloodstains the threads have no body image yellowing. While the image was originating, the blood shielded the underlying area. It is not possible to transfer first the blood with the serum and then to reproduce the image in the perfect corresponding position[60]. It agrees with the hypothesis of the resurrection. [a=.94, f=.01, n=.05, i_a=.02, i_f=.005, i_n =.02, p=2]

34) *It is not a painting because there is no* ***organic or inorganic pigment*** *on the TS.* The X rays fluorescence examination, that provides a quantitative analysis of the present atomic species, didn't point out any pigment[61]. [a=.595, f=.0005, n=.4, i_a=.1, i_f=.002, i_n =.1, p=1]

35) *It's an image that contains a* ***tridimensional*** *information unconceivable in the Middle Ages.* In 1902 one observed that the light and shade varies proportionally to the distance between cloth and body[62] [17] [a=.4, f=.2, n=.4, i_a=.1, i_f=.1, i_n =.15, p=1]

36) *The* ***Fourier transform*** *of the image reveals that it is not a painting.* In the common paintings one points out a directionality that is on the contrary absent in the TS[64]. One could have used particular techniques like the impression of the image through fingers dipped in the colour[28], but a medieval painter couldn't have wanted to evade controls through transformates discovered centuries later. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

37) *It is not a painting:* ***25 different kind of solvents,*** *among them water, don't reduce or sponge out the image.* The translucent yellow colour is not due to any added substance[43]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1.5]

38) *It is neither a painting nor a print because one can note the absence of* ***foreshortening,*** *an apparent* ***perspective*** *of the frontal and dorsal image,* and *the conception of the* ***space*** *is contrary.* The perspective was used only after the XV cent. [65]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

39) *It is not a painting:* ***there is no trace of liquids penetration*** *and the threads are not cemented among them*. On the backside of the cloth there is no image[60]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

40) *It is not a painting: the* ***colour tonality*** *is the same*. The light and shade effect is due to the different number of yellow fibers per unit area[60]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

41) *Experimental tests show that the* ***coordination system human eye-brain*** *is not able to recognize and produce a correlation degree with an intensity like that found on the TS*[63]. The image is recognizable at a distance of 2 m, but a painter would have had remarkable difficulties in realizing it in those conditions. The anatomic precision of the details is moreover historically documented only at the end of '400 [65]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

42) *The body image is the result of the* ***yellowing of the superficial linen fibrils*** *(2 or 5 out of the total 80-120) exposed to an energy source or to a chemical reaction.* The yellowing is due to the oxidation, dehydration and conjugation of the cellulose; only irradiated energy and some acids make the cellulose yellow. On the backside of the cloth there is no image[60]. [18, 19]. There are different theories that correlate

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[17] The tridimensional characteristic of the image can be correlated to the distance of two surfaces: the first is the body form, the second is the cloth that wraps the whole body. This would show that the cloth wrapped the body of a man[63]. Even the imprints coming from mineral or vegetable colours can result tridimensional, like for instance those coming from, after tens of years, the dehydration of leaves and flowers not completely dried[3].

[18] Many hypothesis about the body image formation were made: both **1) in favour of the authenticity**, and **2) to show that the TS is false**. Among the most accredited there are the hypotheses that attribute the image formation **1.1)** to an **energy source** maybe caused during the resurrection; such energy can be of protonic, neutronic, UV, IR kind or a combination of them; it is not excluded any form of energy till now unknown. In favour of the hypothesis of the energy source also protonic is the relatively high definition of the image details that can be obtained through such energy source acting from inside: in fact if the image is due to diffusion or irradiation it would be more out of focus[63]. The hypothesis of the luminous Man foresees that the body image was produced by an intense, but short light source (a flash lasted some hundredths of second) [66]. Already in 1930 it was supposed that the image could have been caused by a photoflashing phenomenon bound to the resurrection[67]. From the image characteristics, many researchers suppose that the radiant source was prevalently vertical. It's obvious that the scientist who states this thesis comes out, at least partially, of the science domination, since he supposes the existence of an at present scientifically unexplainable phenomenon, the

the body image formation to a "flash" of energy happened during the resurrection[20]. Other theories refer to the combined effects of the body contact with sweat, aloe, myrrh and light. [a=.6, f=.1, n=.3, i_a=.07, i_f=.05, i_n =.05, p=1]

43) *The body image was obtained through linen exposed in a "**darkened room**" using chemical agents available in the Middle Ages*[71]. The photograph of S. Pia (1898) revealed that the image is in 'negative'. The photographic technique wasn't known in the Middle Ages. The image is similar to a photograph,

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resurrection; on the other hand one retains useful to consider this possibility also from the scientific point of view to try to explain a phenomenon that, according to the present scientific knowledges, couldn't exist: the body image formation mechanism. Other hypotheses favourable to the authenticity base on the effects of the **1.2) "natural**" **chemical** reaction. Among them: **1.2a)** it is showed that the sun rays superficially expose a cloth wet with **Socotrine Aloe and Cummiphora Myrrh and sweat** helps such a process[68]. Since the TS was treated with aloe and myrrh, an analogous event could have happened. Such hypothesis doesn't exclude the concomitance of (1.1). Like alternative one can use another drug: the gall[69]. The so obtained image differs with that of the TS. Analyses with computerized techniques point out however the least chromatic resolution of so obtained images respect to that of TS[68]. The hypothesis **1.2b)** states that for the MTS it was happened a process analogous to that one that happens for the leaves in the **herbaria**[70]: the image would have originated through direct contact. However the hypothesis doesn't consider that the herbaria are uniformly pressed, while the ventral part of the MTS was very less pressed than the dorsal part, but the intensities of the ventral and dorsal image is similar; moreover one notices the image of the MTS even where there was no contact. As for the last statement, a researcher affirms[68] that the sheet, originally more rigid, because of the fibers deformation (amplified by humidity) would have gradually conformed to the body surface: the mechanism is not experimentally demonstrated and the doubts about the reachable resolution remain. The hypothesis **1.2c)** states that the image would have been caused by the emanation of **ammoniacal vapours**[62]. These however cannot be the cause of the image formation because their direction is not only orthogonal (also for the effects of the small convective currents) and wouldn't interest only the superficial fibrils.

Among the hypotheses that try to show that the TS is false there are those that state that the TS is **2.1) a painting**, it was realized through **2.2) a warmed bas-relief** or through **2.3) a rubbed bas-relief.** Such hypotheses are object of other statements discussed in this text.

[19] The different kinds of fibrils and materials present on the TS were described[48]: 1) very pale fibrils with very smooth surface in the support cloth and patches; 2) pale yellow fibrils with slightly corroded surface in the areas without image; 3) yellow fibrils with corroded surface on the body image; 4) brown fibrils with much corroded surface on the singed areas; 5) fibrils covered with orange-red not birefringent material consisting in blood in the blood imprints; 6) fibrils covered with golden yellow material consisting in serum on the borders of the blood imprints; 7) fibrils covered with red-brown birefringent particolate consisting in pure iron, accumulation due to the migration of iron from the cellulose during the Chambéry fire, that are on the borders of the water stains; 8) black particles of silver in the singed areas, due to the fusion of the case containing the TS during the fire.

[20] It was formulated the hypothesis that the radiant source maybe correlated to the mass of the human body, because the image intensity is independent from the body pressure and it is not equivalent to the intensity of the areas along the outline where the first contact should have happened[68]. The average pressure of the dorsal part is higher of two order of magnitudes (28 g/cm^2 against 0.35 g/cm^2). The distortions in the plane of the image (as well as the large ilia, the stretched fingers, arms and the displacement of the hair from the face) are consistent with the linen draping if one assumes an almost vertical map from the body to the sheet. Among the various theories are noteworthy the one that supposes that the body changed into a flash of light and therefore the whole body would have irradiated from its volume a light mostly with orthogonal direction[66] and the one that supposes an atomic radiation: the heavy hydrogen (deuterio) releases a proton and a neutron; the irradiation of the proton would originate the image, the one of the neutron would enrich the linen fibers of ^{14}C[22]. According to such theory, the protons would be moreover responsible for the oxidation that causes the corpse burning and therefore also the disappearance of the body inside the sheet. Supporting such theory there is the fact that in Hiroshima, after the burst of the atomic bomb, one could observe on the walls of the buildings and on the pavement of the streets images (with information of tridimensional kind) of persons hit by the atomic radiations: the intense flash would have projected the shadows of the human bodies, instantaneously burnt by the heat, imprinting them on the stone that preserved from the calcination in the areas where the images appear[8]. Only such an energy irradiation can explain the superficiality of the acid oxidizations of the linen fibrils; the rays, made parallel to the vertical axis, would have been attracted by the rocky masses, placed over and under the corpse, acting like ground[22]. Experiments to show such theory are still being carried out.

however the sensitive plate can't be level, but has to follow the shape of the body[63]. [a=.1, f=.8, n=.1, i_a=.4, i_f=.7, i_n =.4, p=.0]

44) *It wrapped a male corpse: it is double (frontal and dorsal part of the body) and the* ***distances*** *correspond to the body position*[63]. A double photographic exposure should have considered the distances and in such case there would be areas of photographic superimposition with different lights and shades. [a=.8, f=.01, n=.19, i_a=.11, i_f=.05, i_n =.9, p=1]

45) *The image was obtained through singeing with a* ***warmed metallic bas-relief***[72]21. The blood, that results placed on the cloth before the impression of the image, is not however burnt except next to the patches applied after the 1532 fire. Differently from the superficial image of the TS, the imprints obtained pass to the backside of the cloth[22]. [a=.1, f=.8, n=.1, i_a=.4, i_f=.7, i_n =.4, p=.0]

46) *The image was obtained* ***rubbing*** *a linen cloth with* ***aloe and myrrh or with iron oxide*** *on a bas-relief*[76]. It is to reject the hypothesis that the image originated through direct body-cloth contact because one can notice some tonalities of colour where the contact is extremely doubtful[63]. In the bas-relief hypothesis, the bloodstains should be however already impressed in the perfectly correspondent position. [a=.05, f=.9, n=.05, i_a=.02, i_f=.4, i_n =.02, p=.7]

47) *It's a painting because it was found the presence of ochre, birefringent iron similar to a pictorial pigment (****Venetian red),*** *mercury sulphide (****vermilion****) and proteins*[28]23, 24, 25. The quantity of the

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[21] To obtain a good result, the bas-relief should however be "very short, in millimetric scale" [63]. But it would be difficult to perfectly superimpose the hypothetical bas-relief to the bloodstains already impressed on the cloth and the heat would cook the blood. As a matter of fact the blood didn't burn except near the areas interested by the Chambéry fire. Even if some characteristics of the image are like a singeing, studies[63] show that it is at present impossible to obtain the chromatic resolution of the Shroud image through warmed statues or other similar techniques. Through thermic processes it is interested the whole thickness of 345 μm, while the only superficial fibrils of the cloth cause the image. The fibrils oxidization produces, over the 180-200 °C, through the pyrolisis of the cellulose carboidrates, the furfurals, that with the UV rays present orange coloured fluorescence: the TS has no such a fluorescence[73].

[22] The image obtained with a bas-relief tends to attenuate itself in the long run and interests all the fibrils while the TS image is only on the most superficial fibrils[74]. It is completely different from the one of the TS face even if at first glance one can see some likenesses. The histogram of the grey levels of the two images digitalized with 256 different levels is completely different: a) the image obtained with a bass-relief has grey values included between 60 and 256, but it is much contrasted with wide areas of white saturation (levels included between 245 and 256) and lacking of intermediate grey levels (levels included between 160 and 200); b) that one of the TS face has grey tonalities that vary in the same values field (between 60 and 256), but the white saturation is much less marked and the histogram is practically flat in correspondence of the intermediate grey levels (levels included between 160 and 200) [75].

[23] Heller and Adler[43] showed the presence of 3 kinds of iron in the TS: a) the chelato iron coming from the linen retting; b) the iron oxide Fe_2O_3 present in the singed blood areas and in the borders of the stains caused by the water used to put out the 1532 fire; c) the iron bound to the hemoglobin spread everywhere on the cloth but in great quantity in the bloodstains. The adhesive tapes were subsequently analyzed and no reaction to the mercury was found: it is therefore to exclude the presence of vermilion. According to Mc Crone, moreover accused to have declared false the Vinland Map and original a Rembrandt fake, the blood is red ochre and vermilion: he declares that the red ochre would be present in 20 analyzed tapes, the vermilion only in 11 tapes taken from the blood imprints[28]. Obviously during centuries of exhibition the cloth enriched of various foreign particles. During the fire, part of the blood could have produced iron oxide[43]. The proteins found by McCrone were evidenced with reagents like the black of starch that intensely colours also the pure cellulose[43].

[24] On the image area there are no pigments. R.A. Morris[61] found traces of iron oxide on the cloth, but such traces are not even sufficient to revive the colour of the interested area. Various painter made copies of the TS through direct superimposition and some traces of paint could be remained. However the elements found aren't absolutely in sufficient quantity as to realize a painting[43]. In case of pigments, all the fibrils would be stained and not only the most superficial. The absence of pictorial pigments is confirmed by radiography and IR thermography[48]. The image didn't suffer any alteration in consequence of the 1532 fire: on the contrary the organic pigments change in an evident way with the heat.

[25] According to somebody[77], the MTS is the portrait of Leonardo da Vinci and it doesn't exist any evidence that the TS is effectively the Sheet of Lirey. The presence of the TS in the Savoys' hands results documented since Leonardo was 1 year old, therefore it can't be his portrait. Leonardo was born in 1452 and in 1453 Marguerite de Charny gave the Sheet to

pigments found, however, is much limited and insufficient to justify the image. [a=.2, f=.55, n=.25, i_a=.1, i_f=.15, i_n =.1, p=.5]

3e) OTHER IMAGES

48) *The* ***writings on the sides of the face*** *attribute it to Jesus.* Through computerized analysis and microdensitometer different writings were found, among them: INNECEM, shortened form of INNECEM IBIS, "you will go to death"; NNAZAPE(N)NUΣ: "Nazarene"; IHΣOY: "Jesus" and IC: Iesus Chrestus". Moreover it would result the letters "IBE(R?)" that would confirm the dating to the time of the Emperor TIBERIUS[78]. [a=.99, f=.005, n=.005, i_a=.003, i_f=.002, i_n =.002, p=2]

49) *The coin, a* ***dilepton lituus,*** *placed on the right eyelid dates back the TS around 30 A.D.*. The coin was coined under Pontius Pilate in 29-30 A.D. (from the letters "IS": I=10, S=6; sixteenth year of the Emperor Tiberius) [79] [26]. [a=.8, f=.001, n=.199, i_a=.1, i_f=.0005, i_n =.1, p=1.5]

50) *To confirm the dating of the TS to the I century there is on the left eyebrow the image of a second coin, a* ***lepton simpulum,*** *coined by Pilate in 29 A.D.*. The coin results coined under Pontius Pilate in 29 A.D. (from the letters "LIS": L=year I=10, S=6; sixteenth of the Emperor Tiberius) [51]. [a=.8, f=.001, n=.199, i_a=.1, i_f=.0005, i_n =.1, p=.4]

3f) MAN

51) *The* ***imposing, sad serenity*** *of the face, that is in contrast with the numberless traumas suffered by the MTS, let us think that he is not a common man: he has closed eyes, but he has no sense of death.* A hypothetical forger would have had not few difficulties to reproduce it[3]. [a=.999, f=.0005, n=.0005, i_a=.0003, i_f=.0002, i_n =.002, p=2]

52*The MTS is a Jewish considering the* ***somatic features*** *of the face*. One notices the stretched nose, the closeness of the eyes to the nose, the fullness of the lower lip[16]. [a=.7, f=.01, n=.29, i_a=.1, i_f=.005, i_n =.1, p=1]

53) *The MTS suffered a roman* ***crucifixion*** *of the I cent. A.D. with details unknown in the Middle Ages*[81]. The body is scourged, the MTS transported the patibulum and suffered all the tortures bound to the crucifixion[27]; escoriations at the knees, tumefactions of the face are evident and both the wrists and the feet are transfixed by nails[28]. [a=.79, f=.01, n=.2, i_a=.1, i_f=.005, i_n =.1, p=1.5]

54) ***The absence of mutilations*** *excludes a crucifixion of Oriental kind*. It is therefore a Roman crucifixion[81]. [a=.49, f=.01, n=.5, i_a=.1, i_f=.005, i_n =.1, p=1]

55) *The MTS was buried according to the Jewish tradition of the I cent. A.D. with the* ***4 fingers*** *extended.* Pagan techniques of burial didn't foresee the stretching of the fingers (see mummies and Egyptian statues) [7]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

Anna di Lusignano, wife of the Duke Ludovico of Savoy, who kept it in Chambéry. The Pray Codex assures that the TS existed in 1192-1195.

[26]The Jewish custom to place little coins on the eyes, discussed by somebody[80], is confirmed by findings in Jerico, Jerusalem and En Boqeq of skeletons of Christ time with the coins in the orbital cavities[3]. A medieval forger couldn't have used coins of Christ time, rediscovered in the XX century. Such imprint has a misspelling in the letters UCAI (C instead of K of "TiberiOU KAIcaros"=Tiberious Cesar) and presents the stick inside out; subsequently they found two coins with the same misspellings.

[27]The wrists and feet wounds correspond to those of a man fixed to the cross with nails in the wrists and in the feet. The left wrist shows a bloodstain caused by a big sharp object (a nail). The two flows that distinctly depart from the left wrist show that the left arm, nailed through the wrist at the cross, moved having like a pin the nail, to facilitate the respiration of the crucifix. The right wrist is partially hidden by the left one, but the blood thread that flows long the forearm shows the presence of a serious wound. In correspondence of the right foot, complete imprint, one can notice in the middle a bloodstain, that can be correlated to the penetration of a sharp body with square section (a nail).

[28] The dimensions of the nail (square section with a side of 1 cm) kept in S. Croce in Gerusalemme in Rome correspond to those of the MTS wounds. Also the nail of Jehohanan, the crucifix found in Giv'at Ha-mivtar, has a square section with a side of 1 cm.

56) *Sharp bodies (nails) in the wrists pierced the MTS: the lacking of the thumbs on the image shows this*. The lesion of the median nerve takes to the contraction of the thumb[82]. [a=.699, f=.001, n=.3, i_a=.1, i_f=.0005, i_n =.1, p=1]

57) *The MTS is not Jesus:* ***he is 181±5 cm tall*** *while the average tallness of the people at Jesus time was 160 cm*[77]. Also the average tallness of the people in the Middle Ages was about 160 cm. If Jesus had been a giant, Judas wouldn't have had to identify him with the famous kiss. The measure of the MTS tallness is therefore discussed[83]. The cloth could also result a little stretched in consequence of the several exhibitions. [a=.2, f=.6, n=.2, i_a=.1, i_f=.15, i_n =.1, p=.4]

58) *The MTS is not Jesus because has* ***long hair*** *typical only of the "nazirei" at Christ time.* If Jesus had been a nazireo, he shouldn't have ever been in contact with corpses or drunk wine[84]. It is difficult to try to classify a particular man like Jesus within a certain class of people. It results that both Samson and Absalom, son of David, had long hair. The nazirei didn't wear beard and the prophets wore long hair[85]. [a=.25, f=.5, n=.25, i_a=.1, i_f=.15, i_n =.1, p=.5]

59) *The MTS transported on his shoulders a heavy object (****patibulum****)*. Unlike what reported by the Christian tradition, he wouldn't have transported the whole cross[52][29]. [a=.69, f=.01, n=.3, i_a=.1, i_f=.005, i_n =.1, p=1]

60) *The MTS was crucified without* ***suppedaneum.*** It lacks the footrest that is brought in the crucifixions in the second half of the first century. Of the left foot one can see only the heel because it was nailed superimposed to the right one[81]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

61) *The MTS has no putrefaction signs: it lacks traces of* ***ammoniacal gases*** *near the lips.* The putrefaction is fastened by great wounds and contusive focus. The contact of the body with the cloth is therefore happened for a period of time lower than 40 hours[35]. [a=.99, f=.005, n=.005, i_a=.003, i_f=.002, i_n =.002, p=1.5]

62) *The MTS is antecedent to the Middle Ages because the face was the* ***inspiring model for the Eastern and Western Christ's iconography***[86][30]. [a=.8, f=.01, n=.19, i_a=.1, i_f=.005, i_n =.1, p=1.2]

63) *It is extremely difficult for a forger to reproduce in the slightest details an excoriated and incised* ***face hit*** *by blunt instruments.* The right cheek-bone is tumefied; it has incisions on the left check-bone; a clot of blood on the left eyelid and two flows of blood come out of the nose; it has blood drops under the upper lip; the tip of the nose is contused and deviated; lacerated and contused wounds with palpebral ecchymoses are evident on the eyebrows[51]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1.2]

64) *It provides* ***new information*** *on the crucifixion: the nails driven in the wrists and not in the palm of the hand show the error made by the traditional iconography till today.* It is demonstrated that the nailing

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[29]It presents an ecchymosis, on the left shoulder-blade level, and a wound on the right shoulder that added to the wounds of the scourge; in such areas the wounds caused by the scourge appear enlarged by the pressure of the patibulum. The dimensions of the patibulum of Disma (the good robber), (a relic kept in S. Croce in Gerusalemme in Rome) with a side of 13 cm, correspond to those of the ecchymoses on the right shoulder and on the left shoulder-blade of the MTS. The shoulders are risen: this can be correlated to the transport of a transversal beam (patibulum). In the area of the ecchymoses, the wounds due to the flagrum don't seem to be lacerated by the rubbing with the wood: Mathew and Mark report that one let Jesus wear his dress.

[30] The TS has influenced the Christianity at the East of Europe: this is demonstrated by the profusion of Mandylion (Christ's face on a cloth) icons antecedent the medieval time, based on a common prototype, identifiable with the Shroud image. Over 100 points of congruence (elements of likeness: flowing hair divided on the forehead, a forelock on the forehead substitutes the particular blood flow, big symmetric eye-sockets, long beard, falling moustaches, etc.) show the superimposibility between the MTS Face and most of Christ's reproductions known in the Eastern and Western art[87]. The Christ's Face reproduction, since the VI century, presents asymmetrical characters improbably attributable to artists' imagination. Since the "icon writing" requires the exact reproduction of the subject, one can go back through them to the "original model" from which they originated, that presents different characters attributable to the TS. A fresco of the XII cent., at Gradac in Serbia reproduces a frieze with a face in the middle similar to the TS folded in eight parts. On a vase of the VI cent. found at Homs, the ancient Emesa in Syria, there is a face with clear Shroud inspiration.

in the palm of the hand wouldn't allow supporting the weight of a man[31]. The sharp object driven in the wrist is penetrated among the eight little bones of the carpus, in the Destot space[82]. [a=.69, f=.01, n=.3, i_a=.1, i_f=.005, i_n =.1, p=2]

65) *In the Middle Ages all the* ***anatomic knowledges*** *pointed out by the image weren't known*[65]. The density of information (or correlation with anatomic details of the human body) is extremely high[63]. [a=.599, f=.001, n=.4, i_a=.1, i_f=.0005, i_n =.1, p=1.2]

66) *It reproduces a particular death:* ***infarct followed by hemopericardium***. Other causes of death were supposed, but this one is retained the most reliable[53]32. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.3]

67) *The MTS* ***was not Roman***. The scourging was reserved to not Roman citizens except for crimes of great gravity[89]. [a=.49, f=.01, n=.5, i_a=.2, i_f=.005, i_n =.2, p=.7]

68) *The MTS was not Jewish and the TS can be took back to the work of a forger: the* ***arms are crossed on the pubis***. According to someone the Jewish rules impose that one stretches them to the dead man along the sides with the thumbs folded inside. The hands disposition is logic, as an act of respect, if one intends to realize an image to show to the public[88]. This assertion is questionable since it doesn't result that the Jewish rules prescribe this and at Qumran they found men buried in common graves (of low rank, like the servants) with the arms stretched; but men of sacerdotal rank had the hands crossed on the pubis. Moreover there are findings of priests from ancient Egypt with the hands crossed on the pubis[90]. [a=.35, f=.3, n=.35, i_a=.1, i_f=.15, i_n =.1, p=.5]

69) *The body corresponds to that one of* ***a thirty-year-old man*** *and not to that of an old man.* According to some authors the image can't belong to Jesus because it doesn't seem to belong to a thirty-year-old man: eidomatic techniques show the contrary[51]. Moreover results of forensic medicine confirm that the musculature can't belong to an old man. [a=.8, f=.1, n=.1, i_a=.07, i_f=.05, i_n =.05, p=1]

70) *The dorsal image of the MTS doesn't appear enlarged and* ***deformed for the weight*** *of the body.* It is very similar to the frontal one. This detail is in disfavour of the hypothesis of image formation through chemical process at contact and favourable according to someone[88] to the hypothesis of the existence of a statue (or bas-relief) inside the sheet. On the contrary this detail is not against the hypothesis of image formation due to an energy source bound to the resurrection. [a=.4, f=.3, n=.3, i_a=.1, i_f=.15, i_n =.1, p=1]

3g) HISTORY

71) *The TS is authentic if it was* ***kept and venerated as a relic*** *certainly from the Middle Ages till today and likely since two thousand years.* The fact that it was kept a cloth considered impure for the Jewish people since it wrapped the body of a corpse, let us think that whoever decided to keep it didn't consider it impure, maybe because it wrapped the body of the resurrected[91]. [a=.8, f=.1, n=.1, i_a=.07, i_f=.05, i_n =.05, p=1]

72) *The rests of* ***Jehohanan*** *ben Hagqwl (the crucified found near Jerusalem) dated back to Christ time, confirm that the crucifixion techniques pointed out on the MTS are those used at the beginning of the I cent. A.D. .* It is common the piercing of wrists and feet with nails and the lacking of a suppedaneum. Such crucifixion techniques were modified in the course of the I cent. A.D[81]. [a=.59, f=.01, n=.4, i_a=.1, i_f=.005, i_n =.1, p=1]

73) *From the presence of blood on the body, one deduces that the* ***MTS wasn't washed****: in fact it is a honorific burial of the Jewish culture, that set with the end of Jerusalem in 70 A.D.*[7]. According to someone[88] it is false because the MTS wasn't washed and smeared with aromas, but it results that also during Saturdays burial operations were allowed; this is true but not in the case of the Jewish Easter

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[31]According to some skeptics[88] the nailing in the wrists was not necessary because the crucifix was sat on a peg (cornu): however it is to demonstrate that for Jesus it was used such a technique of crucifixion and that this excluded the wrists nailing.

[32] Such a cause of death can be deduced by the study of the side wound signs (a wound of 45x15 mm and a dense bloodstain of 15x6 cm) where one can notice clots of blood separated from a serum halo typical of a man died with a remarkable accumulation of blood in the thoracic area happened before the wound with the lance. Moreover the hemopericardium causes an immediate rigor mortis, the "statuesque stiffness", noticeable on the MTS[53].

Saturday. According to the Jewish culture of that time the victims of violent death, the men executed for religious crimes, the exiles from the Jewish community or the men killed by not Jewish people didn't receive the ritual purification: Jesus is included in all these categories[16]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=1]

74) *The TS was **showed in Edessa** before 944 A.D.*. In 525 A.D. one discovered in Edessa, today Urfa, an acheropite image (not painted by human hands) of the Holy Face[91]33. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.4]

75) *In conformity with the TS, there are dead Christ representations, antecedent 1200, with the right hand (because the image of the TS is specular) with **four fingers**, that covers the left one.* One notices, for instance, Pope John VII's Umbella of the XII cent. and also in the crucifix (1016) of the Sanctuary of Santa Maria a Mare in the Tremiti archipelago[3]. [a=.8, f=.01, n=.19, i_a=.09, i_f=.005, i_n =.09, p=.7]

76) *A **codex of the X cent.**, the Vat. Gr. 511, affirms that the imprint on the cloth coming from Edessa in the year 944 belongs to Christ*[93]. Even the II Council of Nicea in 787 A.D. mentions the image of Edessa "not made by human hands" [a=.9, f=.001, n=.099, i_a=.05, i_f=.005, i_n =.05, p=.7]

77) *It is previous than the **Pray manuscript** (Budapest, 1192-95)*. In an image, contained there, the thumbs, that on the TS are not visible, are not represented; on the contrary four little circles that remind the four burnings of an ancient fire suffered by the TS are evident[91]. [a=.7, f=.01, n=.29, i_a=.1, i_f=.005, i_n =.1, p=.8]

78) *The image of the face was the **prototype for different coins** issued by the Emperors of Byzantium*[94]. Since Justinian II (685-695 A.D.), until 1200, it appears a Pantocrator who has features similar to the MTS: through superimposition technique it was showed that there are more than 145 points of congruence[87]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=1]

79) *The Orthodox cross even antecedent to the Middle Ages represents "**Jesus lame**"*[95]. The Orthodox cross represents one of the 3 horizontal arms (the lowest one) inclined. The anomaly to the right foot, thin and turned of 90° respect to the left one, common also in the Eastern iconography, is in strict reference to what appears represented on the TS due to the rigor mortis of the feet deformed by the nail[94]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=1]

80) *It is antecedent the fall of **Constantinople** in 1204.* Every Friday a Sydoine, on which it was visible a Christ's figure, was showed in Constantinople[91]. There are testimonies of the XI-XII cent. Gregory the Referendarious describes an image impressed by beads of perspiration in which one can also see the blood come out of the side[93]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.6]

81) ***P. d'Arcis** in a long text addressed to the antipope Clement VII writes that theologians and trusty men had ensured that the TS was not authentic*. This because the Gospel doesn't speak about the human imprint and because there was the declaration of the painter who would have painted it. However P. d'Arcis brought neither documents nor evidences regarding the name of the painter or the technique used; maybe the painter confessed to have realized one of the many copies of shrouds that circulated at that time[96]. [a=.005, f=.99, n=.005, i_a=.002, i_f=.003, i_n =.002, p=.5]

82) ***Julius II** with a Bull of 1506 instituted the "Mass of the Holy TS", approves its canonic Office and establishes the date of the liturgical feast on May 4.* Moreover Pius XI defined it "certainly not a human work", John XXIII said "Here there is God's finger", Paul VI pointed out "the mystery of this astonishing, mysterious relic" and John Paul II said "a relic certainly it is" and "it is a mute witness but in the same time surprisingly eloquent"[97]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.7].

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[33]Even the Council of Nicea II (787) speaks about the image of Edessa not made by human hands and sent to Abgar. The image of Edessa was a cloth folded in eight layers: maybe, for respect, one preferred not to show the whole body with the Passion signs. Folding the TS in this way one has "the face released by the body" that one observes on the TS. This can be seen moreover in numerous reproductions of such image. Through photographs in grazing light, they found at least 4 traces of the ancient folds of the sheet[92]. Someone[88] states that if only the face part was exhibited for centuries, today one should notice a difference, that can't be noticed, in the cloth preservation. However it is likely that it was seldom showed.

3h) ANALOGIES BETWEEN THE MTS AND CHRIST, FROM THE OLD AND THE NEW TESTAMENT[34]

83) *"And no sign shall be given to it except the sign of the prophet **Jonah**."* (Mat 16:4). *"And all flesh shall see the salvation of God."* (Luk 3:6). *"And I am with you always, even to the end of the age"* (Mat 28:20) The TS shows a sign promised by Jesus: like Jonah "who remained for three days in the stomach of the big fish", the MTS remained for three days inside the sepulchre[35]. On the TS one can admire the sign of the salvation (the resurrection). [a=.9, f=.001, n=.099, i_a=.05, i_f=.0005, i_n =.05, p=.5]

84) *"And being in agony,… His **sweat became like great drops of blood** falling down to the ground"* (Luk 22:44). Also the face of the MTS presents hematohydrosis[51]. [a=.99, f=.001, n=.009, i_a=.005, i_f=.0005, i_n =.005, p=.8]

85) *"The plowers plowed on my back"* (Psa 129:3) "Then Pilate took Jesus and **scourged** Him."(Joh 19:1). "*I gave My back to those who struck Me"* (Isa 50:6). The whole body of the MTS is cruelly scourged, except for the breast where, hitting, one could cause the death. The scourging was given like punishment apart, more abundant (120 strokes) than the normal (39 strokes) as a prelude to crucifixion[89]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.7]

86) "*Then they **struck Him on the head with a reed** and spat on Him"* (Mar 15:19) "*And they struck Him with their hands"* (Joh 19:3). The MTS was hit to his face: for instance various tumefactions and the breakage of the nasal septum result evident[51]. [a=.99, f=.001, n=.009, i_a=.005, i_f=.0005, i_n =.005, p=.7]

87) "*And the soldiers twisted a **crown of thorns** and put it on His head"* (Joh 19:2). *"When they had twisted a crown of thorns, they put it on His head"* (Mat 27:29 etc). the MTS was crowned with thorns. The head presents a fifty of wounds caused by sharp bodies[35]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.7]

88) "*And He**, bearing His cross**, went out to… (the) Golgotha"* (Joh 19:17) the MTS presents on the shoulders excoriations imputable to the transport of the horizontal part of the cross (patibulum) [52]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04 , p=.7]

89) "*Now as they came out, they found a man of **Cyrene**, Simon by name. Him they compelled to bear His cross***"** (Mat 27:32). The MTS fell repeatedly to the ground; this is demonstrated by the dust particles on the nose and on the left knee. Likely he was however helped in the transport of the cross[31]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.5]

90) "*I thirst"* (Joh 19:28)."*My throat is **dry**"* (Psa 69:3), *"And for my thirst they gave me vinegar to drink"* (Psa 69:21). From the forensic medicine analysis it results that the MTS died dehydrated[98]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.6]

91) "*Where (on the Golgotha) they **crucified** Him"* (Joh 19:17). *"They pierced My hands and My feet. I can count all My bones"* (Psa 22:16-17) "You have taken by lawless hands, have **crucified**, and put to death" (Act 2:23) The MTS too was crucified[82]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.7]

92) "***Reproach has broken my heart**"* (Psa 69,20). *"And Jesus cried out again with a loud voice, and yielded up His spirit"* (Mat 27:50). "*My heart is like wax; It has melted within Me"* (Psa 22:14). The hemopericardium, diagnosed to the MTS like consequence of the infarct, causes a violent dilatation of the pericardic pleura with consequent shooting pain from the back breast-bone and immediate death[53]. The hemopericardium is the terminal moment of a myocardic infarct and it is caused by spasms in coronaric branches under the push of violent psychophysic stresses. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.4]

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[34] In the hypothesis that what written in the O.T. and in the N.T. corresponds to truth, the following groups of evidences show the authenticity of the TS since on the cloth they found various correspondences with what described in the holy texts. Since the data regarding Jesus come in their turn from such holy texts, one assigns a parameter p_3[1] lower than 1 to consider such dependence in the statistic analysis. Moreover we have to remind the difficulties met by an hypothetical forger in reproducing all the quoted correspondences. The evidences listed here below consist in comparing some quotations with what found on the TS.

93) *"And saw that He was already dead**, they did not break His legs**"* (Joh 19:33).*"Nor shall you break one of its bones"* (Exo 12,46). From the analysis of the MTS, on the contrary of many Roman crucifixions, it results that they didn't break his legs[53]. [a=.9, f=.01, n=.09, i_a=.04, i_f=.005, i_n =.04, p=.5]

94) *"But one of the soldiers **pierced His side with a spear**"* (Joh 19:34), *"But He was wounded for our transgressions"* (Isa 53,5). *"then they will look on Me whom they pierced"* (Zec 12:10). The MTS too was pierced to the side after his death[53]35 [a=.98, f=.01, n=.01, i_a=.007, i_f=.005, i_n =.005, p=.9]

95) *"And immediately **blood and water came out**"* (Joh 19:34). *"Flowing from under the threshold of the temple toward the east, for the front of the temple faced east"* (Eze 47:1). *"This is He who came by water and blood Jesus Christ; not only by water, but by water and blood*" (1Joh 5:6) The MTS too presents in correspondence of the side a blood and serum flow[53]. [a=.98, f=.01, n=.01, i_a=.007, i_f=.005, i_n =.005, p=.5]

96) *"And Nicodemus, who at first came to Jesus by night, also came, bringing a mixture of **myrrh and aloes,** about a hundred pounds"* (Joh 19:39). *"Then they took the body of Jesus, and bound it in strips of linen with **the spices**, as the custom of the Jews is to bury"* (Joh 19:40). The body of the MTS was buried with aromas such as aloe and myrrh because on the cloth they found their traces[34]. [a=.98, f=.01, n=.01, i_a=.007, i_f=.005, i_n =.005, p=.5].

97) *"When Joseph had taken the body**, he wrapped it in a clean linen cloth (or shroud)**, and laid it in his new tomb"* (Mat 27:59-60). The MTS too was wrapped in a new and precious sheet, bought by a wealthy person[99]. [a=.98, f=.01, n=.01, i_a=.007, i_f=.005, i_n =.005, p=.7]

98)*"Nor will You allow Your Holy One to see **corruption**"* (Act 2:27). *"For You will not leave my soul in Sheol, Nor will You allow Your Holy One to see corruption"*(Psa 16:10). The TS doesn't show signs of putrefaction[35]. [a=.99, f=.005, n=.005, i_a=.003, i_f=.002, i_n =.002, p=.7]

99) *"You shall let none of it (the Lamb) **remain until morning**, and what remains of it until morning you **shall burn with fire**. It is the Lord's Passover"* (Exo 12:10). The TS presents a double sign: the disappearence and the burning, if one refers to the radiant theory of Rinaudo[22]. [a=.99, f=.001, n=.009, i_a=.004, i_f=.0005, i_n =.004, p=.5

100) *"Then the other disciple, who came to the tomb first, went in also; and **he saw and believed**. For as yet they did not know the Scripture, that He must rise again from the dead[36]."* (Joh 20:8-9). *"David, foreseeing this, spoke concerning the resurrection of the Christ"* (Act 2:29-31). According to one of the most accredited theories, the MTS became mechanically transparent respect to the sheet[56] and shed a flash of energy that would be the cause of the body image formation. [a=.99, f=.001, n=.009, i_a=.004, i_f=.0005, i_n =.004, p=.6]

4) RESULTS

The 700 coefficients the authors defined, relative to the 100 considered statements, were inserted in a software purposely written in the language for the "Mathcad 7".

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35 In correspondence of the right side of the chest one notices an ellipsis shaped wound with the major axis of 4 cm and the minor one of 1 cm. The borders of the MTS side wound are enlarged, precise and linear, typical of a stroke given after the death.

36 It is most significant the literary translation from Greek of A. Persili[6]: *"the other disciple (John), faster than Peter, runs ahead and reaches first the sepulchre and, stooped, sees the lying bands (weakened, empty, but not tampered with) and the sudarium, that was on his head, not lying with the bands, but on the contrary wrapped (remained in the wrapping position, lifted, but not supported in its inside, because empty) in a unique position (extraordinary, exceptional because against the law of gravity).*Similar is the translation of G. Zaninotto[100] who continues:*" Therefore Simon Peter, who was behind following him, arrives too and went into the sepulchre; and observes that the clothes are lying (because emptied) and that the sudarium, that was on his head, is not lying together with the clothes, but out (separated from them) it is still wrapped on a sole place (that of the head). Then John too went in and saw and believed"* (Gv 20,4-9).

The software starts from the definition of 7 vectors (a, f, n, i_a, i_f, i_n, p) of which the first three in reference to the probability that the alternative A, F or N was happened, the second three in reference to the corresponding uncertainties in the assignment of the probabilities and at last a weigh assigned in relation to the importance of the statement.
Therefore one obtained the following results:

- alternative A (authentic) : probability of 100% and uncertainty equivalent to 10^{-83};
- alternative F (medieval or post-medieval false): probability of 0% and uncertainty equivalent to 10^{-183},
- alternative N (neither authentic, nor medieval or post-medieval false): probability of 0% and uncertainty equivalent to 10^{-83}.

One can think of the analogy with the roulette game: the probability that comes out number 36 after a stake is 1/37 (there are all the possibilities between zero and number 36; the probability that comes out ten times running number 36 is $1/37^{10}$ that is a one divided a number with 15 zeroes.
With reference to the probability that the alternative A, F or N happens, is equivalent to state that it is more likely to let come out:

- for 116 times running the same number to the roulette game rather than stating that the TS is false, medieval or post-medieval.
- for 52 times running the same number to the roulette game rather than stating that the TS is neither authentic nor false, medieval or post-medieval.

At this point it's necessary to verify if the result is stable also following the hypotheses done in the model[1]. For this reason the following cases are considered:

-1) the seventh paramenter, weight, introduced into the model for differentiate the reliability of the various statements, makes them implicitly depedent. To eliminate the dependence we put in this case the weight equal to 1.
-2) the statements about the Holy Scriptures (n°83-100) can introduce a dependence and be not accepted, so the weight in them is equal to 0.
-3) if the statements n° 2, 7, 13, 15, 16, 17, 22, 23, 24, 28, 30, 36, 37, 56 are discussed in a very critical way, such statements are attributed a weight equal to 0.

In Chart 1 the results obtained from the calculus program are reported.

Chart 1: stability analysis through the comparison with the borderline cases discussed.

CASE	Alternative probability A	Alternative uncertainty A	Alternative probability F	Alternative uncertainty F	Alternative probability N	Alternative uncertainty N	Constant of Bayes
Proposed	100%	10^{-83}	0%	10^{-183}	0%	10^{-83}	10^{-17}
1	100%	10^{-73}	0%	10^{-165}	0%	10^{-73}	10^{-23}
2	100%	10^{-46}	0%	10^{-125}	0%	10^{-46}	10^{-22}
3	100%	10^{-38}	0%	10^{-98}	0%	10^{-38}	10^{-20}

From the results shown in Chart 1 no discussion on the probability of the alternative A is proper that, anyway, is 100% with a infinitesimal uncertainty. To obtain results of alternatives which do not exclude each other, as to other probabilistic models[101], we should multiply the probability obtained by the Constant of Bayes in the cases we have examined above.

5) CONCLUSIONS

It was applied a probabilistic model, developed by the same authors in another work, to 100 statements resulting from the researches till now carried out on the Shroud of Turin.
They established three different possible alternatives regarding the origin of the TS: the alternative A (authentic) affirms that the TS wrapped Jesus's body, the alternative F (false) affirms that the TS has a medieval origin, while the alternative N (not authentic, but neither a medieval false) considers all the other possible origins, miracle not excluded.
To each statement they assigned 7 coefficients of which the first three refer to the probability that the alternative A, F or N happened, the last three refer to the correspondent uncertainties in the assignment of the probabilities and at last a value assigned in relation to the importance of the statement.
The 700 coefficients assigned by the authors to the 100 statements have been inserted in the probabilistic model to define the reliability degree of the three different alternatives.
It results that the TS is authentic with a probability of 100% and a corresponding uncertainty equivalent to 10^{-83}; the alternative F has a probability of 0% and a corresponding uncertainty equivalent to 10^{-183}, the alternative N has a probability of 0% and a corresponding uncertainty equivalent to 10^{-83}. That is the same as stating that it is most probable to let come out for 52 times running the same number at the roulette game rather than affirming that the TS is not authentic.
A subsequent development of this work is that to let assign the probabilistic coefficients of the same statements to other researchers and therefore to compare the results obtained.

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CARD FOR THE PROBABILISTIC JUDGEMENT ABOUT THE 100 STATEMENTS PROPOSED

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N°aff.	a [%]	var. a	f [%]	var. f	n [%]	var. n	I_a [%]	var. i_a	I_f [%]	var. i_f	I_n [%]	var. i_n	p	var. p
1	45		5		50		10		2		10		1	
2	49		1		50		10		0.5		10		1	
3	49		1		50		10		0.5		10		1	
4	98		1		1		15		0.5		0.5		2	
5	80		5		15		6		2		6		1	
6	49		1		50		10		0.5		10		1	
7	79		1		20		10		0.5		10		1.3	
8	30		40		30		30		40		30		0	
9	49		1		50		10		0.5		10		1	
10	49		1		50		10		0.5		10		1	
11	49		1		50		10		0.5		10		1	
12	49		1		50		10		0.5		10		1	
13	49		1		50		10		0.5		10		1	
14	90		1		9		4		0.5		4		3	
15	90		1		9		4		0.5		4		1.2	
16	90		1		9		4		0.5		4		1	
17	89		1		10		5		0.5		5		1	
18	90		1		9		4		0.5		4		3	
19	90		1		9		4		0.5		4		1.3	
20	90		1		9		4		0.5		3		2	
21	90		1		9		4		0.5		3		1.4	
22	69		1		30		10		0.5		10		1.5	
23	59		1		40		10		0.5		10		1.2	
24	90		1		9		5		0.5		4		0.7	
25	69		1		30		10		0.5		10		1	
26	99		0.5		0.5		0.3		0.2		0.2		2	
27	49.5		0.5		50		10		0.3		10		1	
28	69		1		30		10		0.5		10		1	

29	99		0.5		0.5		0.2		0.1		0.1		2	
30	99		0.5		0.5		0.3		0.2		0.2		1	
31	15		70		15		7		10		7		0.2	
32	79		1		20		1		0.3		1		2	
33	94		1		5		2		0.5		2		2	
34	59.5		0.5		40		10		0.2		10		1	
35	40		20		40		10		10		15		1	
36	49		1		50		10		0.5		10		1	
37	59		1		40		10		0.5		10		1.5	
38	59		1		40		10		0.5		10		1	
39	59		1		40		10		0.5		10		1	
40	59		1		40		10		0.5		10		1	
41	59		1		40		10		0.5		10		1	
42	60		10		30		7		5		5		1	
43	10		80		10		40		70		40		0	
44	80		1		19		11		5		9		1	
45	10		80		10		40		70		40		0	
46	5		90		5		2		40		2		0.7	
47	20		55		25		10		15		10		0.5	
48	99		0.5		0.5		0.3		0.2		0.2		2	
49	80		0.1		19.9		10		0.05		10		1.5	
50	80		0.1		19.9		10		0.05		10		0.4	
51	99.9		0.05		0.05		.03		0.02		0.02		2	
52	70		1		29		10		0.5		10		1	
53	79		1		20		10		0.5		10		1.5	
54	49		1		50		10		0.5		10		1	
55	59		1		40		10		0.5		10		1	
56	69.9		0.1		30		10		0.05		10		1	
57	20		60		20		10		15		10		0.4	
58	25		50		25		10		15		10		0.5	
59	69		1		30		10		0.5		10		1	
60	59		1		40		10		0.5		10		1	
61	99		0.5		0.5		0.3		0.2		0.2		1.5	
62	80		1		19		10		0.5		10		1.2	
63	59		1		40		10		0.5		10		1.2	
64	69		1		30		10		0.5		10		2	
65	59.9		0.1		40		10		0.05		10		1.2	
66	90		1		9		4		0.5		4		0.3	
67	49		1		50		20		0.5		20		0.7	
68	35		30		35		10		15		10		0.5	
69	80		10		10		7		5		5		1	
70	40		30		30		10		15		10		1	
71	80		10		10		7		5		5		1	
72	59		1		40		10		0.5		10		1	
73	90		1		9		4		0.5		4		1	
74	90		1		9		4		0.5		4		0.4	
75	80		1		19		9		0.5		9		0.7	
76	90		0.1		9.9		5		0.5		5		0.7	
77	70		1		29		10		0.5		10		0.8	
78	90		1		9		4		0.5		4		1	
79	90		1		9		4		0.5		4		1	
80	90		1		9		4		0.5		4		0.6	
81	0.5		99		0.5		0.2		0.3		0.2		0.5	
82	90		1		9		4		0.5		4		0.7	

83	90		0.1		9.9		5		0.05		5		0.5	
84	99		0.1		0.9		0.5		0.05		0.5		0.8	
85	90		1		9		4		0.5		4		0.7	
86	99		0.1		0.9		0.5		0.05		0.5		0.7	
87	90		1		9		4		0.5		4		0.7	
88	90		1		9		4		0.5		4		0.7	
89	90		1		9		4		0.5		4		0.5	
90	90		1		9		4		0.5		4		0.6	
91	90		1		9		4		0.5		4		0.7	
92	90		1		9		4		0.5		4		0.4	
93	90		1		9		4		0.5		4		0.5	
94	98		1		1		0.7		0.5		0.5		0.9	
95	98		1		1		0.7		0.5		0.5		0.5	
96	98		1		1		0.7		0.5		0.5		0.5	
97	98		1		1		0.7		0.5		0.5		0.7	
98	99		0.5		0.5		0.3		0.2		0.2		0.7	
99	99		0.1		0.9		0.4		0.05		0.4		0.5	
100	99		0.1		0.9		0.4		0.05		0.4		0.6	