

THE CURRENT STATUS OF POLLEN RESEARCH
AND PROSPECTS FOR THE FUTURE

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I think a forward is appropriate here: This paper presents material relating to botany and palynology. But I am a specialist in neither field--I am a research archaeologist.

I present the following paper in my role as General Projects Director of the Association of Scientists and Scholars International for the Shroud of Turin with a responsibility to present a detailed report on the nature of the Max Frei Collection to the ASSIST Board of Directors. The work on the material for that report is still in progress.

Early in 1986, responding to a request for information on the nature of the tapes in Dr. Frei's collection, Mrs. Frei kindly made 5 sticky tapes available to ASSIST. The study of those tapes produced an unpublished report, FIVE STICKY TAPES IN THE MAX FREI COLLECTION. A copy of this report was sent to Mrs. Frei. In July of 1987 she decided to make the entire collection available to the ASSIST Organization. The transfer took place on July 15, 1988 at the Hotel Thalwiler Hof in Thalwil, Switzerland.¹

We recognized the need for scientific verification of the 27 tapes. Therefore, on July 23, 1988, two scientists who had done extensive work with the STURP tapes and were thus well qualified to inspect them were invited to make the verification. They were Dr. Alan D. Adler of Western Connecticut State University, Danbury, Connecticut and Dr. Walter C. McCrone of McCrone Research Institute, Chicago and London. The exam was held before some 23 witnesses who were able to observe the micro-proceedings on two video monitors. This examination was conducted without removal of the sticky tapes from the slides on which they had been placed on the night of October 8, 1978 when they were taken from the Shroud. The entire proceedings were videotaped by Dr. and Mrs. Alan D. Whanger of Duke University. Both Drs. Adler and McCrone attested not only to the fact that the tapes had touched the Shroud but contained a wealth of materials valuable for further scientific testing.²

These tapes were but a part of the larger collection which Dr. Frei had assembled over the years during his study of the material he took in 1973 and 1978 from the Shroud. ASSIST acquired a large collection of literature, SEM

slides, SEM photographs, SEM transparencies of pollen, the botanical collection, a bloom-mount and small sample collection, the microscope slides containing the original pollen which Dr. Frei had removed from the Shroud, control slides made up of pollen from samples collected on 7 different trips to Cyprus, Israel, and Turkey, and areas in France, a box of slides on which Dr. Frei was conducting research at the time of his death, three flat slide trays which contained various experiments with iron oxide and explorations and resources of other pertinent topics including pollen from the cloth of Oviedo, 6 sticky tape samples from the Crown of Thorns, and 6 tape samples from the Tunic of Argenteuil. Additionally we obtained the manuscript which Dr. Frei was on the verge of publishing along with the large photo file for that manuscript and the 4 x 6 card file of geographic notes pertaining to that publication.

His Shroud pollen and the controls which matched them were kept in a grey box marked "S. Sindone". There were two series of slides. One series was coded "MS" and the other "MV". Although Frei wrote many of these notes in German he did not use the German word "Grabtuch" to represent the Shroud. He preferred the Italian word "Sindone". Hence the "MS" code probably represented "Mikroskopie Sindone". The "V" in "MV" probably represented "Mikroskopie Vergleich" for "comparison microscopy". The latter were his pollen controls.

Although his final manuscript would have formally published 57 different pollen from the Shroud, much of which had been published elsewhere in articles, Dr. Frei had continued his work on pollen grains which were in various stages of research. In a separate box he kept the slides which were not ready for publication. There are some 19 different items here which, when added to the 57 he intended to publish, would have brought the total to 76. I have provided the full list of these in appendix "A". They are among the handouts which most of you received today. One of these is Hypocym aegyptiacum A & S (Pl.1) which Frei had noted grows in Western Asia, North Africa, and the Mediterranean.

The photodocumentation of this collection is currently in progress. Approximately 50% of the work is complete. When finished it will become a tool for continuing with the research which Dr. Frei had begun. But what is emerging is a picture--a window to the mind of a man in pursuit of knowledge. From the collection, the notes, the microscope slides, and the few unpublished papers which are extant, we learn about his philosophy of the project, and clues to his methodology.

There are two facets of Dr. Frei's philosophy of the pollen project that we would like to mention. First, he has

already published his view that the mechanism of deposition of the pollen on the Shroud was the wind. But in his unpublished manuscript and various notes he defends himself against his critics who have suggested that the wind can transport pollen for long distances and would therefore explain the presence of such pollen on the Shroud: "...a detailed examination of these events and a statistical approach to the problem show that the dominating plants in a pollen spectrum grow in zones surrounding the place of deposition up to a range of a few miles." ³ (His emphasis)

I submitted Dr. Frei's work to Dr. Aharon Horowitz, Israel's leading palynologist, and he agreed with Dr. Frei stating that he had studied the pollen spectrum of wind from North Africa as well as of Israel. He noted that the spectrum on the Shroud as presented in Dr. Frei's work matches that of Israel not North Africa.⁴

Also, Dr. Avinoam Danin, leading specialist in the desert flora of Israel at the Dept. of Botany of the Hebrew University, agrees and adds that it is possible to demonstrate from the pollen on the Shroud an itinerary through the Negev of Israel up through the highlands of Lebanon.⁵

A second facet to Dr. Frei's philosophy is the importance he placed on discovering pollen types which could provide convincing clues to where the Shroud had been. He was well aware that certain plants which grew all along the Mediterranean would not prove the Shroud's presence in a specific country. Last year, Dr. Uri Baruch, a botanist at the Hebrew University, expressed surprise on the British Q.E.D. program that no olive pollen had been found. But since olive is insect polinated perhaps we should not really expect to find it on the Shroud. Nevertheless, despite the fact that olive grows in many of the countries where the Shroud is known to have been, Dr. Frei himself also considered the possibility that olive might be found on the Shroud. He collected a sample of olive in Israel (Pl. 2) and had specifically listed it on a penciled note, presumably for further investigation. But Dr. Frei was unable to complete his work. No bloom mount or microscope slide of olive was found in his collection. Of the more than 300 plants Dr. Frei had collected, he had only made mounts of approximately 1/3rd of those before he died. But he would have emphasized that olive would have to be classified with his group C, "Mediterranean Plants" which grow not only in Israel, but also in Italy and elsewhere.

We turn now to Dr. Frei's methodology. Frei wanted to investigate the known as well as the unknown. His discussions with Don Coero Borga had given him clues as to where he should travel to collect samples to elucidate the known history of the Shroud. From a slide marked "Kirche St. Hip-

polyte" and from an envelope containing a small botanical sample which was marked "umbilifore" (Pl. 3) "St. Hippolyte-sur-Doubs" we know he made some botanical explorations along the River Doubs. I noticed a rather high number of a type of umbilifore pollen on several of the sticky tapes. Dr. Frei must also have noticed these. The only umbilifore which Dr. Frei listed as being on the Shroud is Ridolfia segetum. But there may have been others. Did these umbilifores come from Hippolyte-sur-Doubs? Dorothy Crispino notes: "...Marguerite de Charny was living at Hippolyte-sur-Doubs...and was exposing the Shroud quite openly, on a meadow on the banks of the Doubs..."⁶

From the slides and from an interesting unpublished manuscript, written by Dr. Frei in Italian, we learn about the way he handled the pollen themselves.⁷ He states that he made his survey of the tapes and circled the pollen he found. Then when he was ready to make a mount of each pollen he cut a "T" shaped incision into the tape, dissolved the adhesive with toluol, and very carefully lifted the grain of pollen out with a small wire loop. But this must have seemed to have been a very unsatisfactory method of manipulating the grains and ensuring that they were not lost during transport from the tape to the slide. Hence, Dr. Frei invented a very special technique using triangles of sticky tape. (Pl. 4). He would dip the point of the triangle (Pl. 5) into the incision and retrieve the pollen grain on the tip or edge (Pl. 6) of the triangle and then lay this down on a microscope slide. He would then put a drop of mounting medium on the slide and place control pollen with this and finish off the mount with a cover slip. This way he could compare the pollen on the triangular tape with the controls.

Before we procede further it may be useful to state the nature of the Frei sticky tapes which he took from the Shroud in 1978.⁸ The greatest concentration of particulates is located on the lead of the tape. When Frei removed the sticky tape from the Shroud after each application he would place pressure on the end of the tape while removing the body of it from the cloth. In this way a large amount of material stuck to the tapes. I therefore speak of the lead as being that place on the tape which carried the most pressure and thus the concentration point of the material that was down in the valleys between the crowns of the threads. An examination of the tape labeled "6 Bd" (Pl. 7) will suffice to illustrate my point. The phenomenon is best seen with back lighting (Pl. 8) where the concentration of cotton from Dr. Frei's gloves and the flax from the Shroud show up in stark contrast. I have stylized the pattern to distinguish the difference between the lead, where nearly all the pollen are to be found, and the body which is not as heavily laden with particulates. (Pl. 9)

It will also be useful here to make a brief comparison of the three methods of sample removal: Dr. Frei's, STURP's, and the vacuum method used by Dr. Riggi. (Pl. 10). We have already noted above that Dr. Frei pressed on the tape with finger or thumb before removing the sample. The plasticity of the tape allowed it to pick up the pollen from the valleys between the crowns of the threads. Early on it was a puzzle that STURP was only able to obtain one single pollen grain in 34 tape samples and Frei was finding a lot of pollen. The STURP method limited the pounds per square inch to about 60 and thus only removed material from the crowns of the threads. There is clearly a stratification of debris on the Shroud. STURP's single pollen has been identified as ragweed which grows in profusion around Turin.⁹ A comparison of the contents of the STURP tape with the body of Frei's tapes show they are quite similar.¹⁰

But more puzzling still are the findings of Dr. Riggi who vacuumed his samples from the backside of the Shroud--i.e. the side which does not bear the image. He has noted that he found pollen grains with a mineral coating. During my discussion with Dr. Riggi he looked at the photo-inventory of the pollen on tape 4 Bd and noted that possibly only one of the more than 160 grains on that tape was actually mineral coated. He informed me that fully 50% of all his pollen samples were mineral coated! Hence, we must resolve the question: "Why are nearly all of the mineral coated grains on the backside of the Shroud with few if any on the front?"

So far as Dr. Frei's surveys of the tapes are concerned the evidence indicates that he made a kind of random analysis of the contents of each tape, circling items of interest which came to light at low power. (Pl. 11). Those experienced in microscopy know that the higher the power the more time consuming it is to do survey work. Dr. Frei once told Dr. Walter McCrone that he (Frei) was finding approximately 1 to 2 pollen per square centimeter on the tapes.¹¹ Projecting this figure onto the Shroud it would imply that there are between 47,000 and 94,000 pollen grains on the cloth.

I have used a different approach. Beginning at the upper right hand corner of the tape I surveyed down, moved over one tenth of a millimeter and continued upward. Following that pattern I have nearly completed my survey of pollen on at least 3 of the 27 sticky tapes. But quick preliminary analysis of all the tapes have proven that on every single tape taken directly from the Shroud, there are apparently many times the figure given by Frei. For example on the tape which Frei took from the blood flow from the heel I have made a quick count of at least 7 pollen. And 7 were found in a quick count of the tape from the blood flow across the back. But such quick counts do not really tell

the story. My nearly completed photo-inventory of a tape from the dorsal "side-strip" shows a count of more than 80, and the one from the blood flow down the anatomical left arm holds more than 160, while the one from near the forehead of the man of the Shroud exhibits more than 275 pollen, all of these concentrated in the approximate 2 square centimeters of the lead end of the tape!¹² These findings imply that there are simply incredible amounts of pollen on the Shroud. One need only find 21.1 pollen per square centimeter to project a million on the cloth.

The question, therefore, is not "Are there pollen on the Shroud?" nor even how many. I am convinced that although wind certainly did play a role in the deposition of pollen on the cloth as Dr. Frei believed, we must look for another explanation for the bulk of the pollen found there.

In May of 1986 Dr. A. Orville Dahl, professor emeritus of palynology at the University of Pennsylvania, and visiting professor of palynology at the University of Stockholm, examined Dr. Frei's unpublished manuscript and noted the rather high number of floral pollen types on the Shroud. (Pl. 12). That is, these are insect polinated plants. He counted some 32 different plants which fell into this category out of the 57 in the manuscript¹³ and noted that during 20 years of changing slides in his study of airborne pollen at the University of Minnesota, floral pollen were almost non-existent on his slides. He proposed the hypothesis that human activity must be involved and that, perhaps flowers had been laid down on the Shroud in a liturgical context. (See appendix B).

More than a month later I was doing microscopy on one of the tapes from near the forehead on the frontal end of the Shroud (6 Bd) and found what appeared to be an anther. (Pl. 13). Dr. Dahl confirmed my finding by pointing out that the pollen grains could still be seen inside it. (Pl. 14). My survey conducted since then has uncovered numerous evidences of botanical debris from many areas on the Shroud. On 4 Bd from the anatomical left arm there is a bract. A similar one was found also on 2 Bd on the anatomical left shin on the frontal end of the Shroud. Other evidences of botanical debris are testimony to the fact that flowers were physically laid down on the cloth. (Plates 15-18).

Some time ago Dr. Alan D. Whanger of Duke University, while studying Zohary's FLORA PALESTINA, made the observation that 27 of 28 flowers which he had identified in a special project (more of which later) on the Shroud, actually flourished in the Spring of the year.

If we look for a liturgical context in the Spring of the year it seems to me that the most likely option is a ceremony held at Easter time. It is well known that today

in the Eastern Rite (Greek and Russian Orthodox as well as Coptic rites) that flowers play a very important role in the commemoration of the death and burial of Jesus. Actual flowers are laid down on an epitaphios. But this suggestion would imply that the Shroud was once used as an altar cloth.

With regard to an earlier time witness the following note:

It is well known that (the) liturgical aspect of the mystery of the passion, death and resurrection, ... is connected with a liturgical prescription concerning the Altar-cloth for every celebration of the divine worship. This has been so from the very earliest days of liturgical worship. At the local council held in 325 at the Baths of Trajan in Rome, in the presence of 267 Bishops and the Emperor Constantine, Pope Silvester established 'the holy sacrifice of the Mass be celebrated on a cloth of linen consecrated by the Bishop as if it were the clean Shroud of Christ.'¹⁴

Fr. A. M. Dubarle has already suggested that the pre-1516 burn holes may actually have been caused by hot coals dropped from a censor swung over the center of the Shroud as it was folded in quarters and laid on an altar. I believe the presence of the very large abundance of pollen and botanical debris may hark back to exactly this kind of context. If so, it becomes a powerful physical argument for the presence of the Shroud in an Eastern Rite.

But there is another option we should make note of. It is also possible that the very burial which such Easter celebration commemorated also left its traces on the Shroud. In fact, if flowers were banked about the corpse before the cloth was drawn up over the body it might explain why there is so little distortion in the image and why there is no distorted evidence of the sides of the face and the body: the flowers would have supported the cloth and prevented draping.

With the huge numbers of pollen on the Shroud there will be no quick resolution of the pollen questions. We do not know the distribution patterns of the various pollen types across the Shroud. The high number of pollen found on tape 6 Bd near the forehead (more than 275) may imply longer exposure to the air as well as to a liturgical setting. This might support Ian Wilson's suggestion that the face was exposed for a long period of time and the remainder of the cloth was protected. The possibility is a most intriguing one. In order to sort out and reconstruct the botanical history of the Shroud we shall have to make careful note of the exact distribution of all the pollen types on the cloth and develop some idea of their statistical representation.

The data is available on the tapes. I predict a new chapter in Shroud research in which a field we may call "Sindonic Botany" will be established. The challenge will be for a wide number of specialists in palynology and historical and geographical botany to bring their expertise to the study of the Shroud. The urgent immediate need is for us to develop a complete photo-inventory of all pollen on the tapes so that this can become a tool for advancing our understanding of the many pollen types and their statistical data.

The matter is of interest from another point of view: I referred above to a special project by Dr. Alan Whanger. On a suggestion from Oswald Scheuermann, Dr. Whanger applied his polaroid overlay technique to the possibilities that perhaps there might be floral images on the cloth. This can be illustrated by one which he tentatively identifies as Chrysanthemum coronarium. (Pl. 19) He believes he has identified as many as 28 which appear in Zohary's FLORA PALESTINA. This entire subject needs to be carefully investigated in conjunction with the pollen studies.

Are there coated pollen on the Shroud? Dr. Frei indicated he never saw any.¹⁵ However, can it be determined that there are coated pollen in the blood areas? Certain pollen there do look suspiciously as though they have a closely associated bit of extraneous matter, opaque to light, adhering to them.

Were the pollen which Dr. Frei believed came from the Near East laid down by wind or deposited by human activity? The pollen by themselves do not suggest a date for the cloth--only that the cloth was once in the Middle East. But one may argue that a medieval artist purchased a Middle Eastern cloth for his work. It is therefore of paramount and singular importance to resolve this question.

Beyond the study of the pollen, the tapes have a wealth of other materials which might be used to elucidate other aspects of the Shroud. For example, the tapes from the right foot blood flow, the left foot blood markings, the blood flow down the anatomical left arm, and the blood flow across the back all preserve flax fibers coated with material from those areas. (Plates 20, 21). 15 tapes come from the off-image areas while only one comes from a non-blood/image area. Included also are materials from patches, from burns, from the Holland cloth and one from an area on the backside of the Shroud at the dorsal end. (Plates 22, 23).

Since the formal release of the carbon date there have been many questions raised about the chemical and physical nature of the Shroud. It is the unanimous decision of the ASSIST executive council that the Frei sticky tapes should be made available to science to help unlock some of the

mysteries of the Shroud. I am therefore pleased to announce that ASSIST will be willing to accept scientific proposals for the use of the tapes. We do not yet have a protocol for the control of the tapes as a resource. But we wish to use the proposals as a means for the intelligent development of such a protocol. Please refer to the handout with the map of the Shroud on it for further information. (Appendix C).

It is my conviction that the Shroud has yet to yield up all of its secrets but that intelligent and careful application of what science has to offer will bring rewarding results.

FOOTNOTES

1. For further details please see my article "ASSIST Announces the Acquiring of the Max Frei Collection for Shroud Research." in the premier issue of the ASSIST Newsletter, Vol. 1, no. 1, June 1989, p. 1-3.
2. For further details please see Mr. T. Flaherty's article "Verification of the Max Frei Collection" in the premier issue of the ASSIST Newsletter, Vol. 1, no. 1, June 1989, p. 4f.
3. Max Frei-Sulzer, THE POLLEN FROM THE SHROUD OF TURIN. Unpublished manuscript, p. 15.
4. Private communication.
5. Private communication.
6. D. Crispino. "Doubts along the Doubs.", SHROUD SPECTRUM INTERNATIONAL, year IV, no. 14, March 1985, p. 19.
7. I am using the English version of this manuscript translated for ASSIST by Dr. Anna M. Ottolenghi of Durham, North Carolina: "A Contribution to the Study of the Problem of the Authenticity of the Shroud based on Microscopic Traces", p. 10f.
8. We do not have access to the eleven sticky tapes Dr. Frei removed from the frontal end of the Shroud in 1973. They may have been lost in Vercelli.
9. My thanks to Prof. Luigi Gonella who kindly supplied this information to me during a meeting on Nov. 21, 1987.
10. In 1985 ASSIST was able to examine three of the tapes taken from the Shroud by Ray N. Rogers.
11. Using the same random method of examination last

July 23, Dr. McCrone tended to agree with Dr. Frei regarding this figure.

12. The tape coordinates are: 10/9 Aa from the "side-strip", 4 Bd from the anatomical left arm, and 6 Bd from an off image area at the point of a scorch plume adjacent to the forehead of the Man of the Shroud on the "side-strip" side of the frontal cloth.
13. Please see appendix "B" for this list and a comparison of the insect pollen types with wind blown and those which fall into both categories.
14. Labbe, Scr. Conc., p. 1542. I owe this reference to the Revd. Albert R. Dreisbach, Jr., Director of the Atlanta Center for the Continuing Study of the Shroud of Turin.
15. Max Frei, THE POLLEN FROM THE SHROUD OF TURIN, p. 15.

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Captions for the Plates

1. *Hypocymus aegyptiacus* A & S. This particular specimen was collected by Dr. Frei in Turkey.
2. *Olea europaea*. This specimen of olive was collected by Dr. Frei in Israel.
3. Umbilifere pollen. The photomicrograph is from a lengthy piece of sticky tape on a microscope slide which is labeled: "Kirche St. Hippolyte". We believe this sample comes from France near the Jura Mountains.
4. Triangular tape with Shroud pollen sample on it.
5. Closer view of plate 4.
6. Photomicrograph of the tip of the tape. See pollen grain.
7. Microscope slide of tape "6 Bd" from near the face on the off-image area of the Shroud.
8. Backlit photo of the same slide showing the concentration of cotton and flax fibers filtering out some of the light.
9. Stylized illustration of the nature of the Frei tapes with the lead (smaller portion) and the body (larger portion). The distribution and types of particulates on the larger portion (body), by comparison, are similar to some STURP tapes we examined in 1985.
10. The Three-Method Comparison. This is a stylized illustration of all three sampling methods, Frei's, Riggi's, and STURP's, comparing their respective methodologies. It is important to note that all three sampling techniques present the researcher with different facets of information about the Shroud so that no one method provides the entire picture.

11. Circled area on Frei tape "6 Ec".
12. Echinate pollen grain found on tape "4 Bd" from the anatomical left arm. Pollen grains with such spines are common among floral groups which are insect pollinated.
13. An anther from tape "6 Bd" near the face in an off-image area on the frontal end of the Shroud. The filament which probably was originally associated with this anther is to be found only 5/16s inch away on the same tape.
14. A closeup view of the anther in plate 13. Note the small round structures embedded in the anther. These are pollen.
15. A bract (possibly from an inflorescence of a bloom).
16. Piece of botanical debris also from a bloom.
17. A fiber from a plant.
18. Cellular material common in plants.
19. An "image" on the Shroud near the frontal head and near the plume of a scorch mark which Dr. Alan Whanger tentatively identifies with Chrysanthemum coronarium. Note that the closer the image is to the scorch the clearer the pattern is. West German physicist, Oswald Scheuermann, has found that ultraviolet images are latent until made visible through heat. Samuel Pellicori also artificially aged his cloth samples by using heat to "develop" his images.
20. A flax fiber from tape "9 Bd" taken from the blood flow across the back. Note the particulate matter adhering to the fiber. The photo was taken with a polarizing filter.
21. Particulate material from the blood flow down the anatomical left arm (tape "4 Bd"). Photo taken with a polarizing filter.
22. The dorsal end of the Shroud showing the locations of the Max Frei sticky tapes taken in 1978.
23. The frontal end of the Shroud showing the locations of the Max Frei sticky tapes taken in 1978.

APPENDIX A:

NEW POLLEN FROM THE SHROUD OF TURIN IN THE MAX FREI COLLECTION

- I. Pollen which were very nearly ready for publication but for which Dr. Frei had not quite completed his research. Each of these had a 4 x 6 entry card as do most of those he published. Both the genus and species name are provided. In some cases the slides are still preserved in the collection.
- A. *Halmione portulacoides*
 - B. *Hypecolum procumbens* L.
 - C. *Onosma cinerea*
 - D. *Platanus orientalis* [Dr. Frei may not have planned to publish this because he may have thought the original sample from the Shroud was lost. It has now been rediscovered].
 - E. *Tamarix macrocarpa*
 - F. *Zyzyphus spina-Christi*
- II. Pollen which were not ready for publication because Dr. Frei had not yet established the geographic areas of distribution. There is no entry card but he had determined both the genus and species and had prepared "S" slides to preserve the pollen he had removed from the Shroud.
- A. *Hypecolum aegyptiacum* A. & S.
 - B. *Quercus pseudo-coccifera*
- III. Pollen for which Dr. Frei had not yet established the exact species. However, he had prepared a slide mount of the pollen which he had removed from the Shroud.
- A. *Picea* ...
 - B. *Plantago* ...
- IV. Pollen for which Dr. Frei had established the genus and species and had even prepared a control slide, giving it a code number in the MV series, but the "S" slide was lost. We have not yet discovered any documentation to further explain this category.
- A. *Andropogon ischaemum* L.
- V. Pollen for which Dr. Frei had only established the genus and had prepared a control slide, providing it with a code in the MV series. But the "S" slide is missing and presumed lost years ago.
- A. *Salicornia* ...
- VI. Pollen for which Dr. Frei had not yet made permanent control mounts. However, he had marked envelopes containing samples of the plant with three crosses--his apparent symbol for pollen types he thought he had found on the Shroud. We believe the Shroud pollen were left intact on the tapes (circled) until he had established the species. Only the genus is suggested.
- A. *Centaurea cyanus**
 - B. *Dipsacus* ...
 - C. *Reseda* ...

*The species name was found in Dr. Frei's notes only after this typed list was prepared for the Paris Symposium. It was therefore not included on the handouts available at the conference.

VII Pollen for which Dr. Frei had established the genus and species and which he may have suspected matched pollen he saw on his sticky tapes. But he did not rate these with as high a priority as he did those with three crosses.

A. *Linum pubescens* B. & S.

VIII. Pollen for which the evidence is ambiguous. Dr. Frei had established the genus and species of these plant types and slide mounts or sticky tapes of the sample were found in his research box but there were no priority crosses marked on them and no MV code was provided. We cannot be absolutely certain Dr. Frei had found matching pollen for these on the Shroud.

- A. *Cedrus glutinosa*
- B. *Ceratonia siliqua*
- C. *Suaeda vera*

Note: The Frei Collection contains slides of the pollen from the Shroud for the following:

1. *Hypecolum procumbens* L.
2. *Onosma cinerea*
3. *Platanus orientalis* [The plant hair from the Shroud].
4. *Tamarix macrocarpa*.
5. *Zyzyphus spina-Christi*.
6. *Hypecolum aegyptiacum* A. & S.
7. *Quercus pseudo-coccifera*
8. *Picea* ...
9. *Plantago* ...

We suspect the others were never removed from the tapes (1973). But only the 1978 tapes remain in the collection. The previous tapes may have been lost in Vercelli.

APPENDIX B:

POLLEN FROM THE TURIN SHROUD: A Categorizing List.

This list presents Dr. Frei's data under three categories:

- A. Wind blown pollen (anemophilous).
- B. Possibly both wind-pollinated and insect-pollinated.
- C. Insect pollinated (entomophilous).

This list is constructed from data kindly provided by Dr. A. Orville Dahl Prof. Emeritus of Pollen Studies, Dept. of Biology, the University of Pennsylvania, and Visiting Prof. of Pollen Studies, the University of Stockholm, Stockholm, Sweden.

A. Wind-pollinated (anemophilous).

- E1. *Alnus glutinosa* Vill.
- E2. *Anaranthus aphylla* DC.
- N3. *Anabasis aphylla* L.
- N4. *Artemisia herba-alba* Asso
- N5. *Bassia muricata* Asch.
- E6. *Carpinus betulus*
- 7. *Cedrus libanotica* Lk. (gymnosperm)
- E8. *Corylus avellana* L.
- 9. *Cupressus sempervirens* L. (gymnosperm)
- E10. *Fagus sylvatica* L.
- N11. *Haloxylon persicum* Bg.
- 12. *Juniperus oxicedrus* L. (gymnosperm)
- E13. *Oryza sativa* L.
- 14. *Pinus halepensis* L. (gymnosperm)
- E15. *Scirpus triquetrus* L.
- E16. *Secale montanum* Guss.
- N17. *Suaeda aegyptiaca* Zoh.
- E18. *Taxus baccata* L.

Note: There are four gymnosperms on Dr. Frei's list. Their presence on the sticky tape would appear to be confirmed on slide 4 B/d, coordinates: 56.3/102.9 Careful study of this sample may help determine the species.

B. Possibly both wind-pollinated and insect-pollinated.

- N1. *Acacia albida* Del.
- A2. *Atraphaxis spinosa* L.
- 3. *Pistacia vera* L.
- N(A)4. *Prosopis farcta* Macbr.
- N5. *Reaumuria hirtella* J. & Sp.
- 6. *Ricinus communis* L.
- N7. *Tamarix nilotica* Bunge

Note: There are additional gymnosperms on 10/9 A/a and the unlabeled slide. The latter has a higher number and different distribution pattern than other samples.

C. Insect-pollinated (entomophilous).

- 1. *Althaea officinalis* L.
- 2. *Anemone coronaria* L.
- N(A)3. *Capparis* spec.
- E4. *Carduus personata* Jacq.
- 5. *Cistus criticus* L.
- N6. *Echinops glaberimus* DC.
- A7. *Epimedium pubigerum* DC.
- N8. *Fagonia mollis* Del.
- A9. *Glaucium grandiflorum* B. & H.
- N(A)10. *Gundelia tournefortii* L.
- N11. *Haplophyllum tuberculatum* Juss.
- N12. *Helianthemum vesicarium* B.
- N13. *Hyoscyamus aureus* L.
- N(A)14. *Hyoscyamus reticulatus* L.

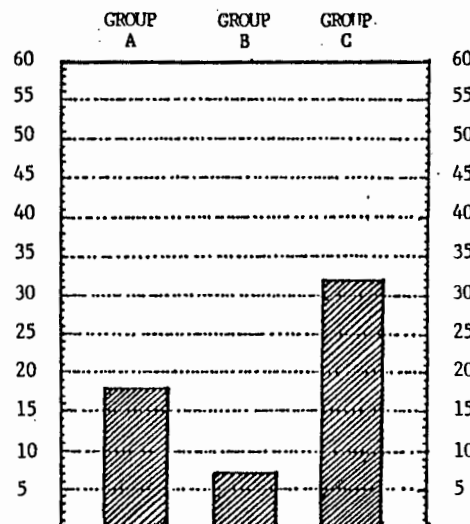
KEY:

- A=Plants found in Anatolia. (also Cons.)
 - *N=Plants found in the Near East with special emphasis on Palestinian plants.
 - E=Plants found in Europe—not in the Near East or Anatolia.
 - Blank=Plants of Mediterranean type which grow both in Italy but also in the Near East. Their presence on the Shroud would be consistent with the thesis that the Shroud is a Near Eastern burial cloth, but these pollen cannot be used to prove the case.
- (Adapted from M. Frei, SHROUD SPECTRUM INTERNATIONAL, Vol. 1/no.3, June 1982)
*Frei's lists A & B are conflated.

C. Insect pollinated (entomophilous) (Cont'd):

- A15. *Ixolirion montanum* Herb.
- 16. *Laurus nobilis* L.
- A17. *Lirum mucronatum* Bert.
- E18. *Lythrum salicaria* L.
- N19. *Oligomeris subulata* Boiss.
- N20. *Onosma syriacum* Labill.
- 21. *Paliurus spina-christi* Mill.
- N(A)22. *Pegaron harmala* L.
- 23. *Phillyrea angustifolia* L.
- 24. *Pistacia lentiscus* L.
- 25. *Poterium spinosum* L.
- A26. *Prunus spartioides* Spach. (Also known as *Amygdalus srbica* Oliv)
- N(A)27. *Pteranthus dichotomus* Forsk.
- 28. *Ridolfia segetum* Moris
- A29. *Roemeria hybrida* DC.
- N(A)30. *Scabiosa prolifera* L.
- 31. *Silene conoidea* L.
- N 32. *Zygophyllum dumosum* Boiss.

A COMPARISON OF THE THREE GROUPS



Appendix C, pt. 1:

THE STICKY TAPE SAMPLES AND THEIR REMOVAL SEQUENCE

Note: The following numbers match the map on the other side. The beginning number is the sequence in which Dr. Frei removed the sample from the Shroud. He began at the dorsal end of the cloth, then went around to the "side-strip" side of the Shroud and moved from the dorsal end to the frontal end removing samples closest to the edge. He then went back to the dorsal end and removed samples further in moving from dorsal end to frontal end. He then went to the opposite side of the Shroud, and beginning again at the dorsal end he removed samples moving to the left toward the frontal end of the Shroud. Finally he removed two more samples at the area around the face.

There are three additional samples for which we do not know the sequence. Two of these are not identified as to exact location of removal ("supporto" and the unlabeled tape).

The code numbers match the map created by Drs. Balma Bollone and Prof. Aurelio Ghio. Since no grid was superimposed on the Shroud at the time of sample removal we are not precisely certain about all of the sample sites. Most sample sites were marked by STURP using magnetic markers. We have access to photographs of each sample site beginning with sample 11 Aa in the Barrie M. Schwartz Collection. Only sample 11 C/Db is not represented by a magnetic marker and/or photograph. Therefore its precise location is totally dependent upon the label on the slide as it represents the Bollone-Ghio grid.

1. 11 C/Db: from dorsal area of non-side strip side near a water stain from the 1532 fire.
2. 12 Cd: from right foot heel flow on dorsal end.
3. 12 Bd: from left foot blood markings.
- 4-5. 12 Aa: from corner of dorsal end on "side-strip" side of Shroud.
6. 11 Aa: from "side-strip" adjacent to a patch from the 1532 fire.
7. 11 Aa: from "side-strip" located between pre-1516 fire stain and 1534 patch. (note: since we have a photo of this sample it is clear that the two tapes labeled 11 Aa come from roughly the same general area. We do not have precise information on the location of sample no. 6).
8. 10/9 A/a: from dorsal "side-strip" adjacent to the frontal end of the pre-1516 burn holes.
9. 8 Aa: from "side-strip" adjacent to a 1534 patch parallel to the dorsal back. The precise location of this tape depends upon the label on the slide plus the magnetic marker. There is no photo of this sample.
10. 7/6 A/a: from the "side-strip" at the juncture "line" where the frontal and dorsal ends of the Shroud meet.
11. 4/3 Aa: from "side-strip" adjacent to the crossed hands on frontal end.
12. 2 Aa: from "side-strip" adjacent to shins of the frontal legs.
13. 9 Bb: from center of back on dorsal end partially taken from blood flow across back.
14. 6 Bc: The photo appears to place this sample on a 1532 burn line on the "side-strip" side of the Shroud adjacent to the mouth of the Man of the Shroud. However, microscopy of the tape sample has thus far discovered only one burn shard. Therefore further research is required to pinpoint the tape's location.
15. 4 Bd: from the blood flow down the arm on the "side-strip" side of the Shroud.
16. 2 Bd: from the shin of the leg on the "side-strip" side of the frontal end.
17. 9/10 C/D d/b: from the pre-1516 burn holes (center one) on the non-"side-strip" side of the Shroud, dorsal end.
18. 5 Ca: from a spot parallel to the nose on the non-"side-strip" side of the Shroud.
19. 6 Dc: from near the edge of the non-"side-strip" side of the frontal end parallel to the mouth of the Man of the Shroud.
20. 4 Dd: at a spot parallel to the 1532 burn line on the frontal end quite near the pre-1516 burn holes. (non-"side-strip" side of Shroud).
21. 3 Cb: at a spot parallel and near the 1532 burn line on the non-"side-strip" side quite near a 1534 patch (inner one).
22. 1 Dd: from a spot near the frontal end of the Shroud not far from a 1534 patch (outer one) on the non-"side-strip" side.
23. 6 Ca: from an off-image spot on the non-"side-strip" side adjacent to the top of the head on the frontal end.
24. 6 Bd: from an off-image area on the "side-strip" side of the Shroud adjacent to the forehead area.

A REQUEST FOR PROPOSALS

No protocol yet exists for making the Frei sticky tape collection available for scientific research. To enable ASSIST to intelligently develop such a protocol we make the following request for proposals:

In keeping with the general principle that non-destructive testing shall precede destructive testing on all material taken from the Frei collection we invite the international community of scientists and Shroud researchers to propose tests which would reveal a new understanding of the Turin Shroud. Each proposal should contain the following points:

1. A statement of the goal the proposal seeks to achieve by the proposed test.
2. A list of equipment which the project would apply to the sticky tapes.
3. A description of the procedure to be followed during the testing proposed for the tapes.
4. A statement about whether or not the testing could be done on the tapes without removal of the tapes from the microscope slides. (Removal of tapes from their slides falls into the category of destructive testing)
5. A statement about the financial backing for each proposed project. There must be a way to cover the organizational costs, research costs, and publication, of every project completed.
6. An estimate of the length of time required for access to the tapes. This information will enable us to project a schedule for other testing on the same resource.

ASSIST will use these proposals to forge the needed protocol for making the tapes available. Each serious proposal will receive a response. Although we cannot promise to make the tapes available immediately we shall strive to expedite the drafting of plans and each serious proposal will ultimately receive a copy of the protocol and a response regarding the disposition of ASSIST toward the proposal submitted. The general timetable will, in part, be contingent upon the total number of proposals received, their nature, and the resultant schedule which can only be worked out in tentative fashion.

All proposals should be sent to the following address:

Paul C. Maloney
General Projects Director
ASSIST Investigations Group
P. O. Box 334
Quakertown
Pennsylvania
18951
U. S. A.

A report will be prepared from the proposals received and submitted to the ASSIST Board of Directors. The deadline for these preliminary proposals shall be December 31, 1989.

Appendix C, pt. 2.

A PRELIMINARY MAP OF THE 1978 STICKY TAPE SAMPLES DR. FREI REMOVED FROM THE SHROUD

