6 B/d - more than 200 Pollens
4 3d - tape on arm - (Blood) - 162 Pollens

FIVE STICKY TAPES FROM DR. MAX FREI'S COLLECTION
Preliminary Report # 1

Late in January of 1986 the ASSIST Organization received five sticky tapes from the collection of the late Dr. Max Frei through the kind courtesy of Mrs. Gertrud Frei-Sulzer. This report, compiled by the General Projects Director, is the first of a projected series of preliminary reports, on the nature of the data preserved on these five tapes. The goal of this current report is to set forth the general context and findings of the initial examinations of the samples, to provide a framework within which the later reports will be issued, and to suggest areas which bear careful investigation.

The original collection is comprised of 27 tapes: one marked "supporto" is presumably from the Holland backing cloth; a second is marked "verso" which, we assume, was removed from the back side of the Shroud; 24 were labeled by Dr. Aurelio Ghio, who assisted Dr. Frei, according to the Bollone-Ghio Grid published in SINDON in 1977.[1] These came from the side of the Shroud on which the image is exposed to public view. Finally, one slide is unlabeled.

In her letter of April 15, 1986 Mrs. Gertrud Frei-Sulzer kindly provided a nearly complete list of all the sticky tapes taken from the image side of the Shroud. They are as follows:

2 Aa	4 Db	6 Ca	8 Aa	11 Aa
2 Bd	4 Bd	6 B/d	9/10,C/D,a/b	12 Bd
3 Cb	5 Ca	6 Dc	10/9 Aa	12 Aa
4/3 Aa	6 Bc	7/6 Aa	11 C/Db	12 Aa
			11 Aa	12 Cd

Mrs. Frei informed me that there were two sticky tape slides the labels of which she was uncertain. They are therefore not included in the above list. Also, according to the list, there are apparently two slides labeled 11 Aa and two labeled 12 Aa.

Using a reference photo-slide collection made available to this researcher by STURP photographer Barrie M. Schwortz and with consultation of an on-site map created by Dr. Ray N. Rogers I tentatively suggest the following locations for the above listed samples from the Max Frei Collection of sticky tapes:

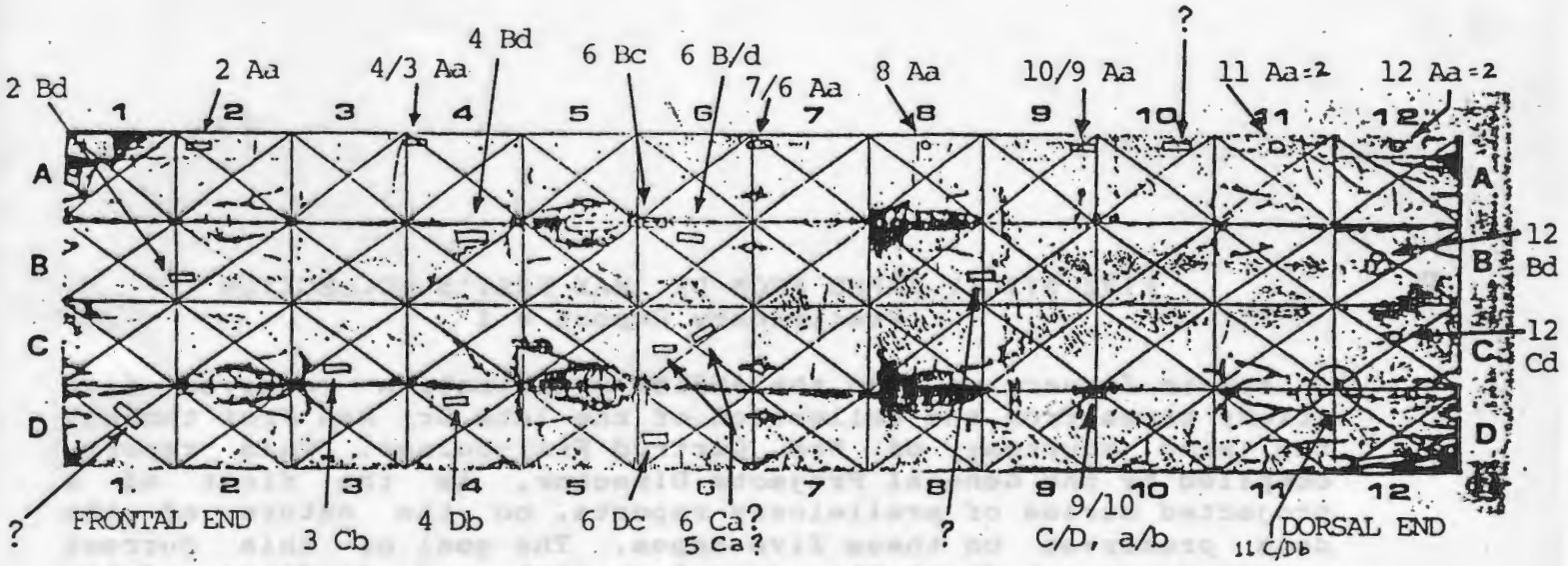


Fig. 1: Map of the Shroud created in 1977 by Drs. Pier Luigi Baima Bollone and Aurelio Ghio on which the 25 sticky tape locations have been superimposed. While these locations are subject to corrections and further information and confirmation about their placement we believe the above map to be very close to the original sites based upon our extensive researches.

How Many Sticky Tape Samples?

How many sticky tape samples did Dr. Frei remove from the Shroud during the 1978 exam? Mrs. Frei has 24 labeled slides in the collection clearly from the image side of the Shroud. If one carefully studies the STURP data (the Barrie M. Schwortz Collection, the magnetic marker placement, and Dr. Ray Rogers' Map) one can find independent verification for 24 slides.

However, if one matches the list of existing 24 labeled slides with the STURP data the list is not the same! There is absolutely no independent verifiable documentation for 11 C/Db! Yet it exists so there can be no doubt that it was taken from the Shroud. One can further determine, by comparing the two lists, that there are three slides which have not been identified. They are to be found in the following areas:

1. 1 D/ab 2. 8/9 Bb 3. 10 Aa

We believe that two of the above are those whose labels have not yet been read. Once these two have been identified, we believe the remaining area will have been the source of the unlabeled slide. We are therefore convinced that a total of 25 samples were removed from the image side of the Shroud by Dr. Frei in 1978.

The Tapes on Loan to ASSIST

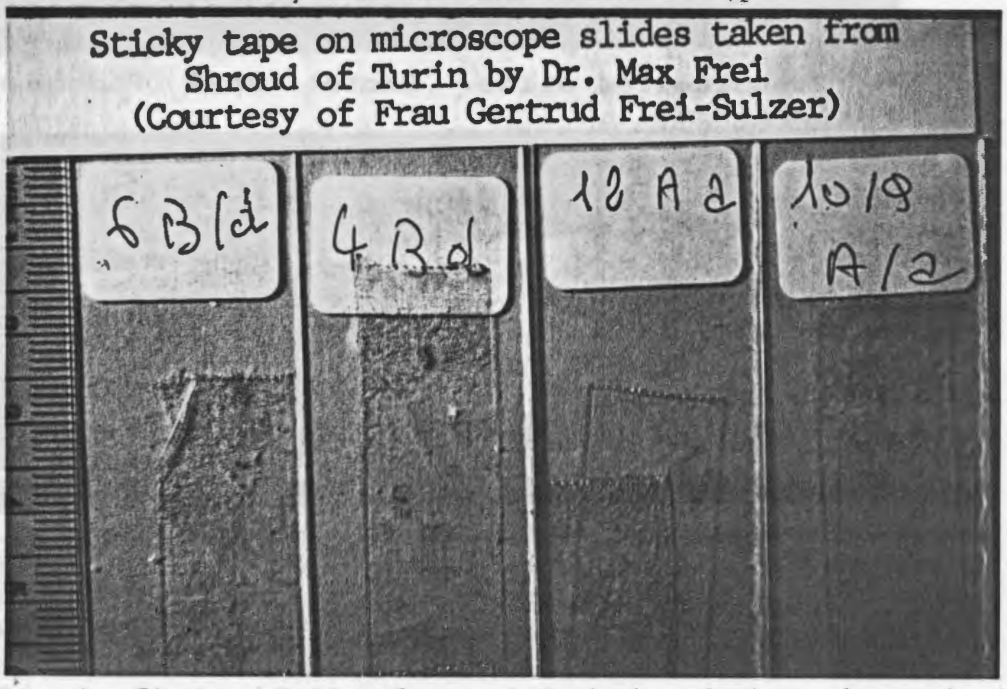
Of the sticky tapes listed above ASSIST was provided with the following:

1. 4 B/d from the frontal end near the "side-strip" adjacent to the area of the crossed hands but rather up near the elbow. A photograph of this sample being removed was published in the June 1980 issue of NATIONAL GEOGRAPHIC.

2. 6 B/d from the "side-strip" side of the head not far from the 1532 scorch line.

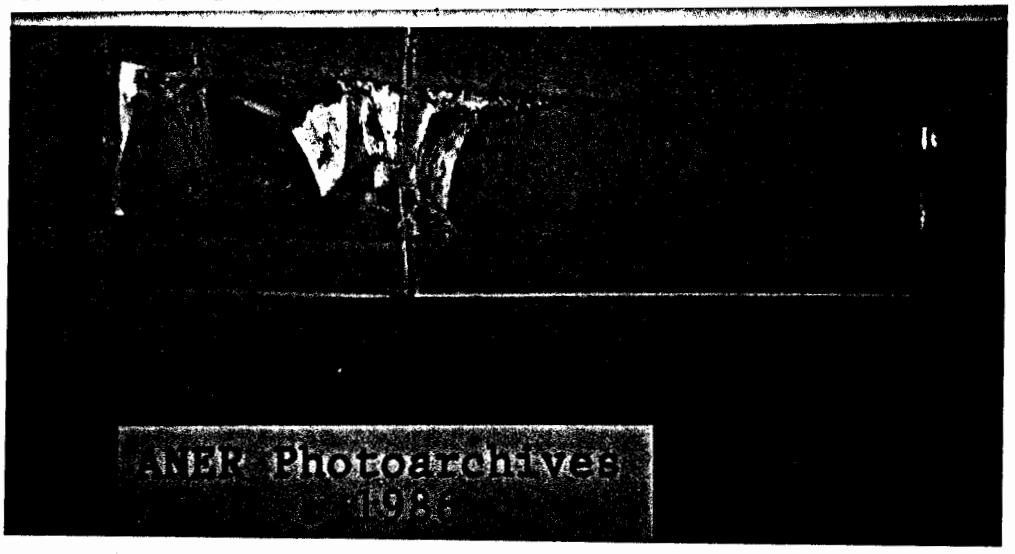
3. 10/9 A/a from the "side-strip" adjacent to the upper (frontal) end of the pre-1516 burn marks on the dorsal end of the Shroud.

4. 12 A/a from the patch on the dorsal end of the Shroud at the very end of the "side-strip".

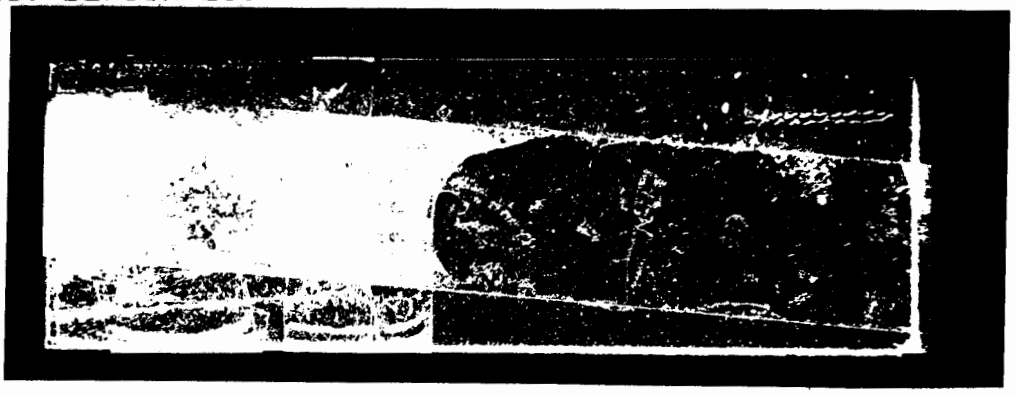


Pl. 1: Photo of the four labeled slides loaned to ASSIST through the kind courtesy of Mrs. Gertrud Frei-Sulzer. Photo: ANER Photoarchives. Code: S2/86R-28.[2]

5. A fifth, unlabeled, slide was also included in the same box as the above four labeled slides. This was apparently broken years ago and a portion of its tape had been pulled away and oxidized. While the original source of this sample is currently unknown it did come from the Shroud since the particle spectrum is the same as the other four.



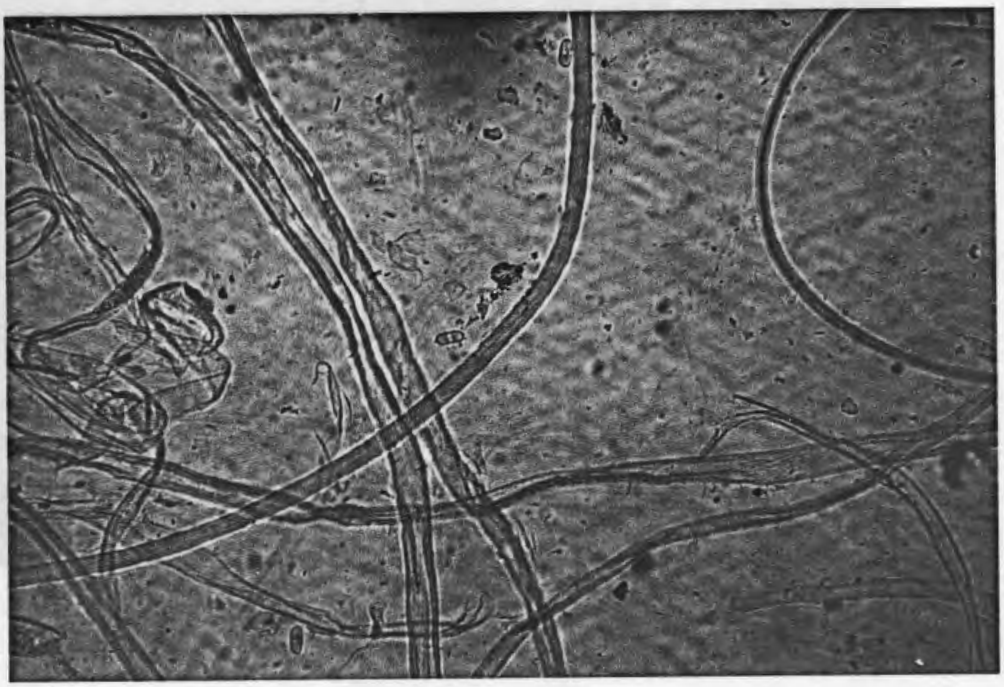
Pl. 2: Unlabeled slide. Photo: ANER Photoarchives. Code: S2/86R-23.



Pl. 3: Backlit photo of unlabeled slide showing the lefthand, loosened portion of the tape. The righthand portion is viewable under the microscope--the left has limited value for microscopy. Photo: Courtesy of ANER Photoarchives. Code: S3/86W4-23.

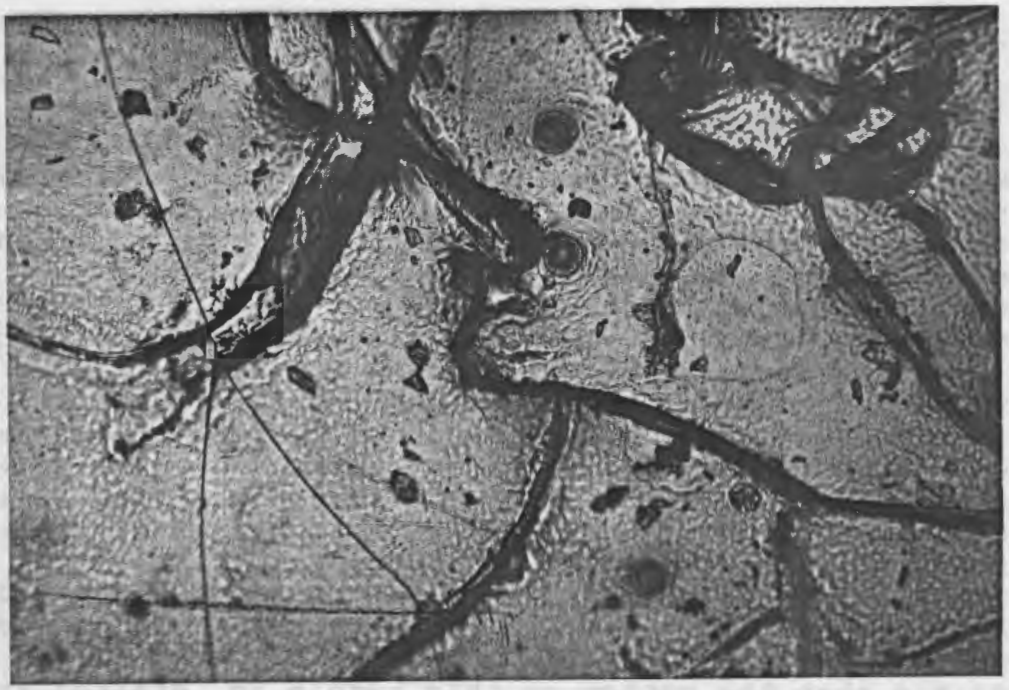
The following four photographs (courtesy of ANER Photoarchives) demonstrate that the above unlabeled slide is, in fact, a sticky tape sample from the Turin Shroud. Mrs. Frei informs me that she

has not yet discovered the 1973 samples among Dr. Frei's research materials. She therefore believes that the unlabeled slide comes from the 1978 researches.[3] But there are some differences between the unlabeled slide and the four labeled ones: The tape fully spans the entire length of the 3" slide with both ends having overlapped around the edges; the distribution of the pollen/spores on this slide does not match that of the labeled four since these occur well beyond the first 1/2 inch of the lead of the tape. On the other hand, we cannot compare this with the "lead" since it is not usable. See further regarding this phenomenon in section II below. There are comparatively more gymnosperm pollen on this slide than the labeled four. Also it appears to this researcher that the coloration of the cotton fibrils* on the unlabeled slide is darker or more yellowish than that of the cotton fibrils on the other four. Would this imply that the cotton on the unlabeled slide is older? Or is it possible that the cotton on this sample is stained from sampling near burn areas (Such as 1 Da/b). Or is it simply due to the accumulation of stains from continued use? There is every promise that the site from which this sample might have come may someday be identified. These suggestions need further research to verify the possibilities.

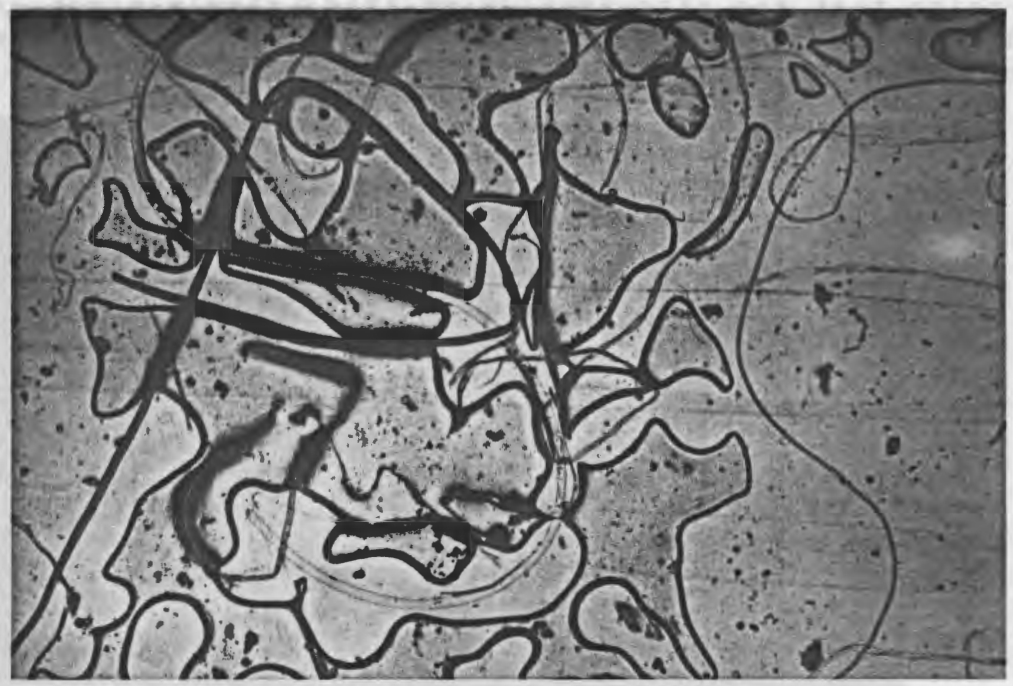


Pl. 4: Cotton and flax fibrils with 3 identical pollen/spores[4] on unlabeled slide. 100x. Code: S8/11/86-I-17.

*Please see footnotes.



Pl. 5: Cotton and poilen/spores on unlabeled slide. 100x. Photo: ANER Photoarchives. Code: S8/11/86-I-10.



Pl. 6: Red silk and cotton on unlabeled slide. 40x. Photo: ANER Photoarchives. Code: S8/11/86-I-18.

Pl. 7: One of the gymnosperm pollen on the unlabeled slide. Compare this with gymnosperm pollen on slide 4 B/d. There are other pollen/spores on the unlabeled slide not shown here. 100x. Code: S8/11/86-I-6.

THE STUDY OF THE TAPES

Phase I of the formal study of these tapes began at the Elizabethtown College Conference on the Turin Shroud, Sunday afternoon, Feb. 16, 1986 when Dr. Walter C. McCrone examined sticky tape 10/9 A/a. He had not looked long before he simply said, "There's a pollen." Dr. McCrone moved to one side and I glanced through the microscope. There in the center of the field was the golden orb of a pollen grain with an echinate exine.[5] In minutes a field was found in which at least 5 identical echinate pollen resided.

Shortly thereafter these pollen and other items on the sticky tape were observed by Drs. Alan Adler, John Jackson, Eric Jumper, Gilbert R. Lavoie, and others. Dr. Adler found evidence of a slender long curled pink fibril he tentatively labeled "Spandex"[6] and which, he noted, he had seen on the STURP sticky tapes. This was evidence that these tapes indeed had lifted material all from the same source: the Shroud of Turin. Dr. Adler also observed the presence of what he suggested were "blood shards", that is, possible pseudomorphs of blood fragments which had been popped off the surface of flax fibrils. Later the same afternoon Dr.

McCrone suggested that those shards were actually broken pieces of scorched flax, some of them of a rather brownish color.[7]

Dr. Jackson noted the heavy presence of cotton fibrils on the tapes which came from the cotton gloves Dr. Frei wore during removal of the tape samples.[8]

Pl. 8: Photo of cotton fibrils--note the telltale twist identifying it as such--on sticky tape 10/9 A/a as viewed by Dr. Jackson on Sunday, Feb. 16. 1986. 40x. Code: Pll/10/86-I-11.

This initial examination was little more than superficial but it set in motion the second phase of the investigation, a long range general examination of the four sticky tapes which has the following goals:

1. To establish a photomicrographic repertoire of all the particle types found on each of the tapes.

2. To confirm authoritatively the presence of pollen and spores on the slides and to study their distribution on each of the sticky tapes.

3. To initiate development of a "Relative Exposure Index" of pollen/spores on the Shroud as reflected by the four labeled sticky tapes.

4. To study the concept of translocation of particles as proposed by Dr. John Jackson by careful observation

of the blue silk fibrils which come from the borders of the Shroud.

5. To explore the accuracy of certain published conclusions regarding Dr. Frei's findings which attempt to cast doubt on the value of the presence of the pollen on the Shroud.

6. To provide data on which to base further proposals for the testing of the Shroud of Turin.

7. To prepare a general report on the nature of the tapes within which to set further specialized studies by other members of ASSIST.

All seven of the above goals have been realized in one way or another in this initial study and will be examined here. I wish to emphasize the preliminary nature of this report. It is not intended that any statement contained herein should be construed as final but rather as a statement of current findings and an impetus for further research.

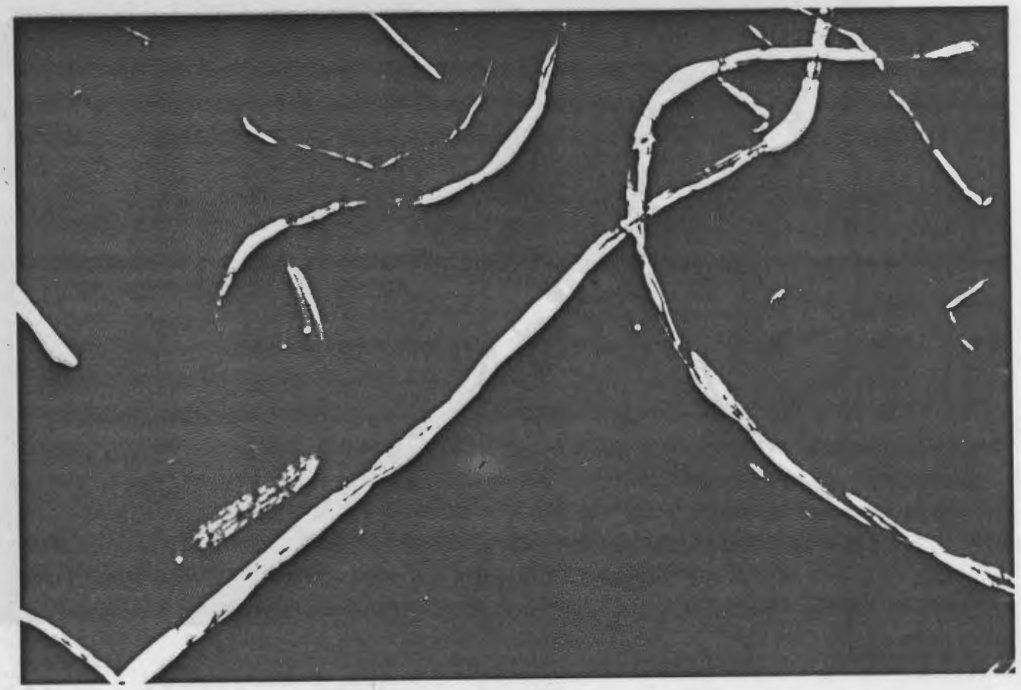
Through the kindness of one of the members of ASSIST, Dr. Isidore Mihalakis, a forensic pathologist with the Lehigh Valley Hospital Center, Allentown, PA, I was able to have access to a microscope outfitted with a camera, blue filter, polarizing filters, etc. for the initial extensive study of the tapes. I wish to express my thanks to him here for making this available to me.

I. The first goal was to begin gathering together a photographic repertoire of all the particles viewed on the tapes. Many are as yet unidentified. However, through the use of polarizing filters we have determined that numerous items on the tapes appear to be organic in nature. For example, the pollen will vanish into a black background as the polarizing filter is turned. We have viewed numerous reddish-orange amorphous items which also vanish into a black background as the polarizer is turned. We have made no actual attempt to identify these particles.

A. There are many types of fibrils found on the sticky tapes:

1. Most obvious among these are the cotton fibrils which are localized prominently in the lead portion of the sticky tapes. These will stand out brightly under the polarizer.

Pl. 9: Cotton fibrils on slide 4 Bd in normal light with blue filter. For identification of item in center see pl. 34. 40x. Photo: ANER Photoarchives. Code: P6/17/86-I-[FS26A].



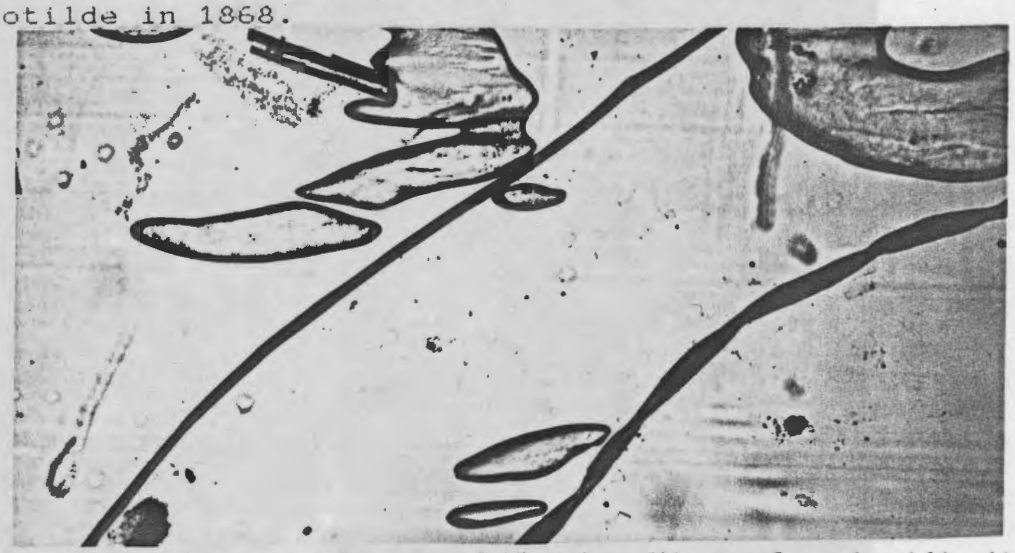
Pl. 10: Sticky tape 10/9 A/a; Cotton fibrils with polarizer turned. 100x. Photo: ANER Photoarchives. Code: S3/86-I-13.

2. Also outstanding in prominence on the tapes are the many flax fibrils which react in similar fashion as does cotton to the polarizer. While the flax fibrils are more heavily localized in the lead portion of the tape (often in a form I describe as "clumping") they can also be found as individual fibrils elsewhere on the tapes. Experiments with sticky tapes taken from ancient mummy wrappings, from 3rd-7th century Coptic funerary tunics, and from modern linen have shown that this "clumping" phenomenon is a combined reflection of the fibril assemblage in a thread, the tensile strength of those fibrils, the weave pattern, the amount of pressure applied, and the adhesiveness of the tape. Very often the "clumping" will show the actual direction of the thread of the warp and the wavy pattern caused by pulling the fibrils from the crowns of the threads. We shall explore the pressure sensitive sticky tape technique further when we discuss the distribution of the pollen on the tapes in section II below.

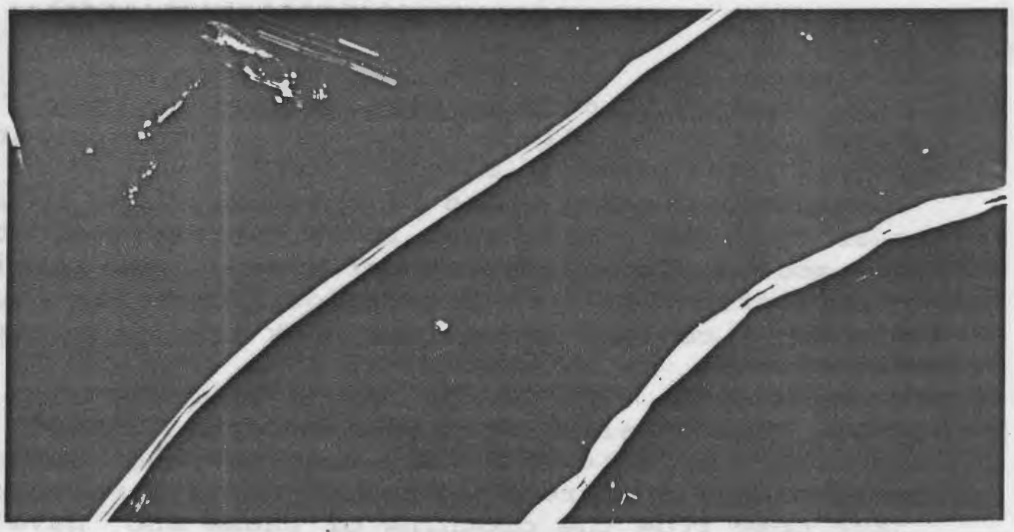
Pl. 11: "Clumping" showing flax fibrils pulled from crowns of threads. Slide 6 B/d. 40x. Photo: Courtesy of ANER Photoarchives. Code: P11/10/86-I-15[FS12A].

Pl. 12: Sample taken from the crowns of the threads of a 3rd-7th century Coptic funerary tunic showing a similar pattern. (Sample courtesy of Ms. Jean Mapes, Curator,(Dr. Frank T. Koe, Director) Philadelphia College of Textiles, Paley Design Center (Collection #: 1974.52.5). 100x. Photo courtesy of ANER Photoarchives. Code: P11/10/86-I-16[FS13A].

3. Among the many minor fibrils represented on the tapes there is a red translucent fibril which we identify as silk. The silk was used as a backing cloth for the Shroud, having been attached to it by Princess Clotilde in 1868.



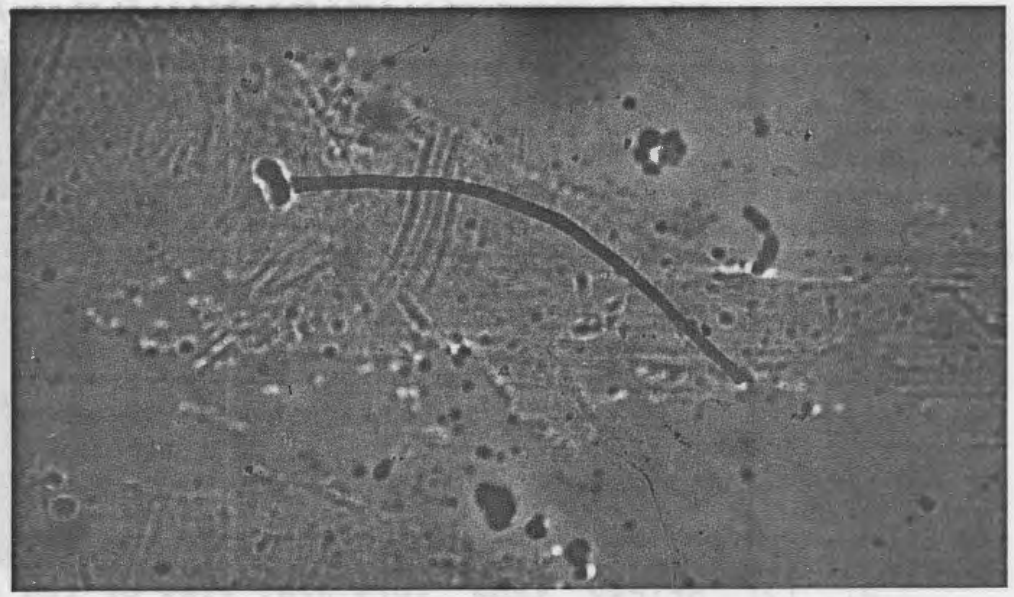
Pl. 13: Sticky tape 10/9 A/a. View of red silk (to left) and cotton (to right) under normal light. 100x. Photo: ANER Photoarchives. Code: S3/86-15.



Pl. 14: Sticky tape 10/9 A/a. Same view under polarized light, 100x. Photo: ANER Photoarchives. Code: S3/86-14.

4. There is also present, albeit in smaller amounts, a certain number of blue translucent fibrils. Some of these these we also identify as silk. John Jackson has

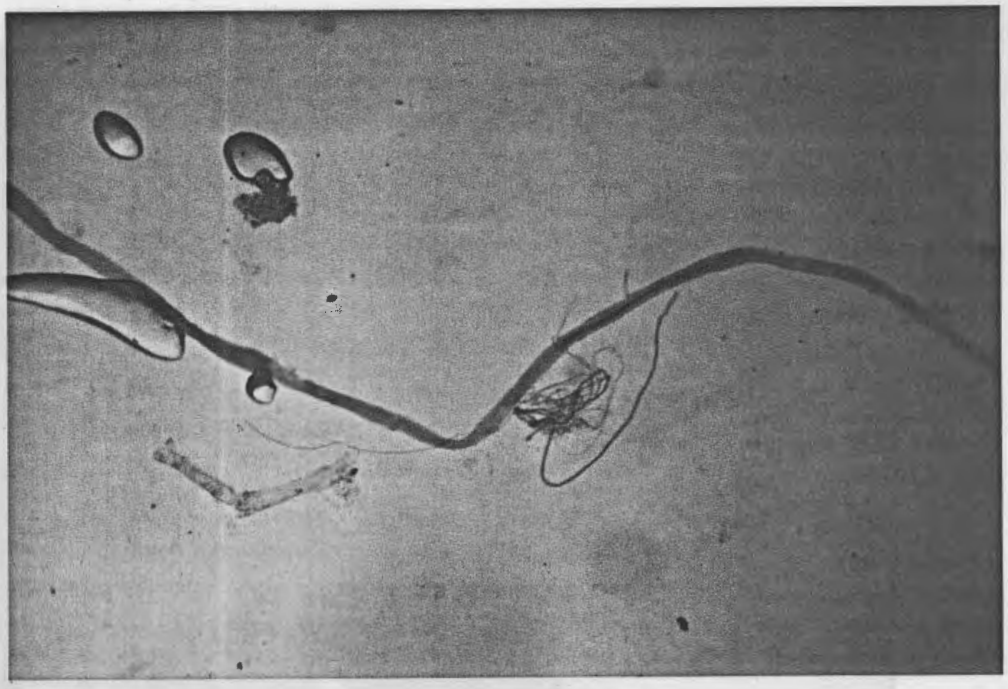
informed this researcher that they likely come from the blue silk surround also attached to the Shroud by Princess Clotilde in 1868.[9]



Pl. 15: Blue silk on slide 6 B/d. 100x. Photo: ANER photoarchives. Code: S6/13/86-I-22.

5. We have adopted the tentative term "Spandex" suggested by Dr. Alan Adler to label another curious fibril for want of a better term. Dr. Adler is not absolutely certain this is Spandex but he believes the characteristics show that it is synthetic and therefore of modern technological origin. The fibrils are characterized by a pinkish color, and are very very slender, coiling around and back again sometimes over themselves.

6. Occasionally we have seen dyed cotton fibrils, particularly a lavender or purplish hue, but sometimes also orange and green. These, too, are rare and must have come from the clothing of those who have handled the Shroud throughout its history.



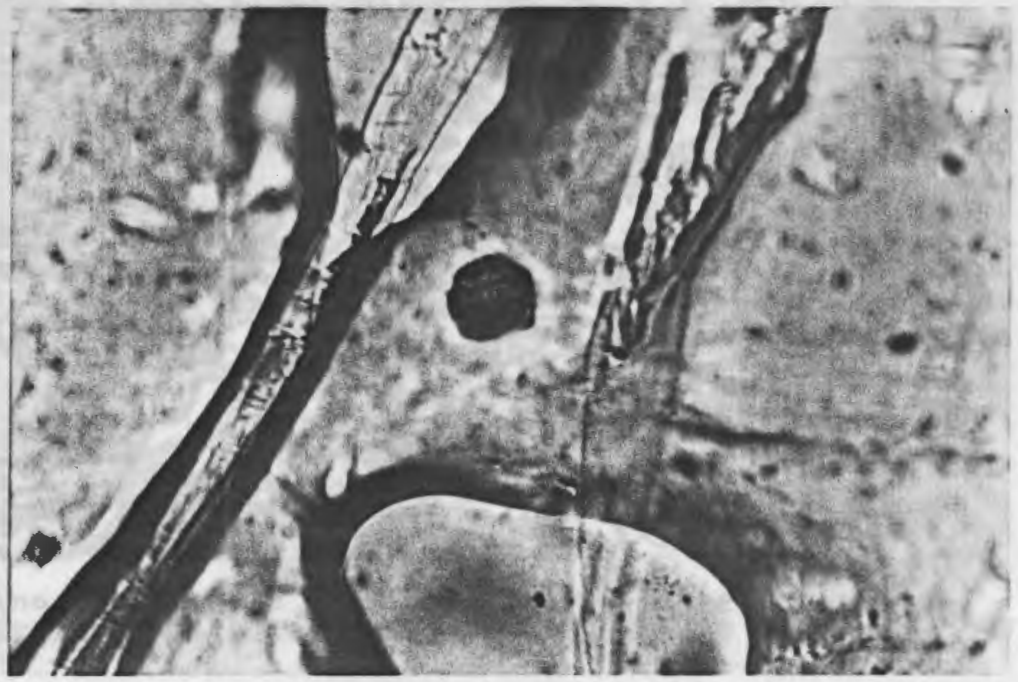
Pl. 16: Photo of sticky tape 10/9 A/a (100x) showing the "Spandex" and purple cotton. Code: S3/86-16.

7. We have seen a few brownish fibers which may be wool but they are rare on these tapes. Certainly, there is no evidence to demonstrate that they came from anywhere but the surface of the Shroud and are likely contaminants from extraneous sources.

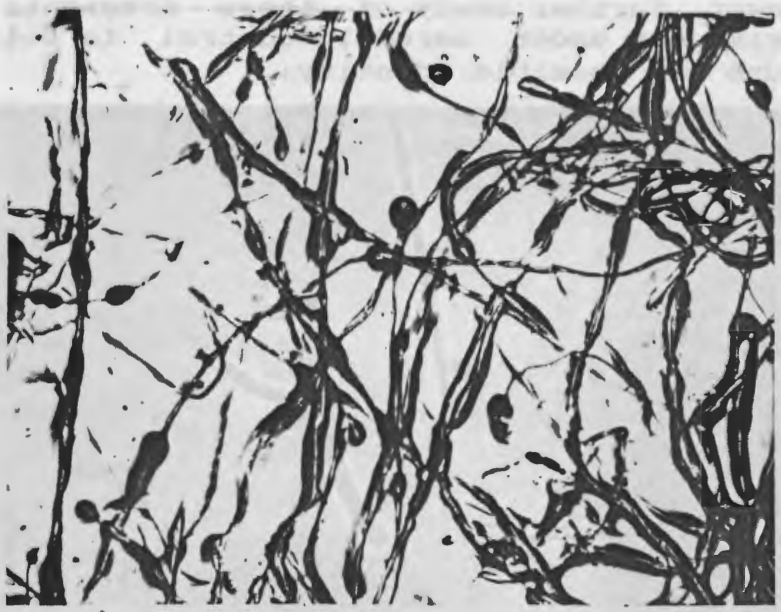
The Particles on the Shroud

B. Of the various particles found on the Shroud we list the following:

1. All five of the sticky tapes have pollen/spores on them. However, some tapes have more than others. We will discuss this phenomenon further under section III.



Pl. 17: Sticky tape 12 A/a showing pollen/spore. 400x. ANER Photoarchives. Code: P5/30/86-II-38[FS36A].



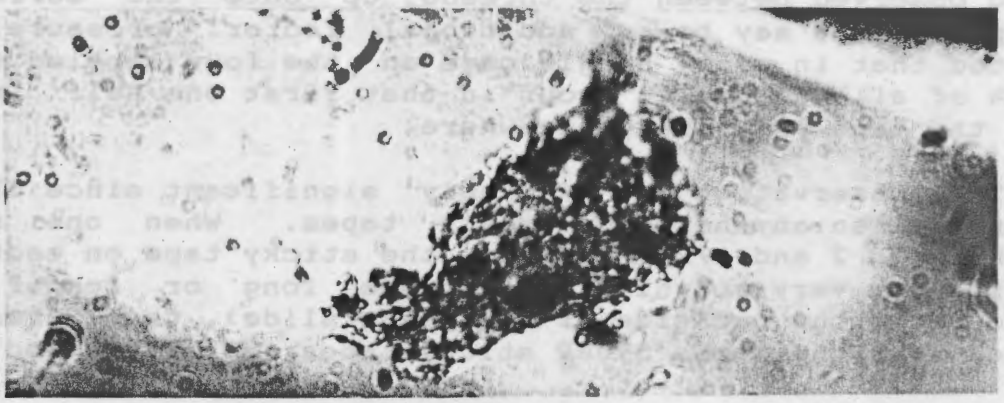
Pl. 18: Sticky tape 4 B/d showing pollen/spores. 40x. ANER Photoarchives. Code: S6/30/86-III-6[FS7].

Pl. 19: Sticky tape 10/9 A/a showing pollen/spores. 40x. ANER Photoarchives. Code: P6/10/86-I-37[FS36].

2. There are what appear to be broken shards which are strikingly like flax in structure. These are the shards which Dr. Adler believes may be fragments of blood but which Dr. McCrone believes are scorched and broken fragments of flax. They do fluoresce under the polarizer implying that they may not be blood. However, further study of these fragments need to be carried out under careful control to determine their nature and possible identity.

Pl. 20: Sticky tape 10/9 A/a showing shards of "blood" or scorched flax. 100x. ANER Photoarchives. Code: S8/19/86-II-25.

3. Reddish, reddish-orange to orangish, to yellow-orange globules. Sometimes these have an angular shape to them. They vanish into a black background under the polarizer implying they are organic. We have not tried to identify these. Some of them may be blood particles. Others may be iron oxide in an amorphous form. A few may be similar to what Dr. Eugenia Nitowski has been labeling "myrrh and aloes".[10]



Pl. 21: Sticky tape 6 B/d showing, in normal light, a reddish-orange aglomerate particle. 1000x. This sample comes from the off-image area not far from the face on the frontal end of the Shroud fairly near the 1532 burn line on the "side-strip" side of the Shroud. Code: S3/12/86-I-38.

4. Plant debris has also been found on three of four sticky tapes. The tape which has not yet been shown to contain plant debris is 12 A/a which comes from the patch at the dorsal end of the "side-strip". This same sample also has the least number of pollen/spores.

The above, in general, are the fibrils and particles this researcher has found. Additional items may be turned up during further research by specialists in the next phases of this study.

II. Since Dr. Frei had published the results of his pollen findings from the 1973 and 1978 examinations of the Shroud, we were anxious to view those findings in the context of these five sticky tapes. There is absolutely no question but that all five of the tapes have pollen/spores on them. This has been kindly

verified for us by consultant to ASSIST, Dr. A. Orville Dahl, Prof. Emeritus of Pollen Researches at the University of Pennsylvania. and Visiting Professor of Palynology at the University of Stockholm, Sweden.

We were interested in the actual distribution of the pollen/spores on the tapes since Dr. Frei had written to this researcher in late 1982, only months before his passing, to say that his own technique was to apply the tape to the Shroud and move the threads latterally, thus lifting the pollen, which he had observed between the threads, up onto the surface of the tape. There may be an additional factor: pressure. We have noted that in every single case on the four labeled sticky tapes 99% of all the pollen occur in that first one half inch portion of the tape and rarely elsewhere.

This observation is extremely significant since STURP did not find pollen anywhere on their tapes. When one studies the remaining 2 and 1/2 inches of the sticky tape on each slide (the tapes are very roughly three inches long or longer, extending around to the backside of the glass slide), these areas look very much like the three STURP sticky tapes ASSIST studied in 1985.[11]

Hence. we believe a combination of pressure and latteral movement enabled Dr. Frei to retrieve the pollen from the Shroud.

The structure of the 4 labeled tapes may be portrayed as follows:

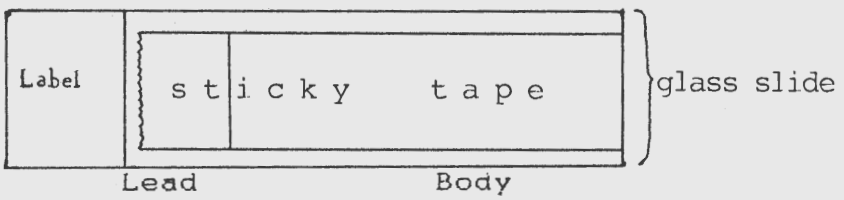


Fig. 2: Structure of the Frei sticky tapes.

Virtually 95% of the cotton fibrils, 80% of the flax fibrils, and 99% of the pollen/spores are located in the lead portion of the tapes. It was here that the pressure and latteral movement of the tapes was the most pronounced. We believe this now bids fair to explain why STURP did not obtain pollen on their tapes.

Using a torque applicator which pressed straight down and lifted straight up there was no latteral movement in the STURP methodology. Further, the amount of pressure achieved by the torque applicator was intentionally limited by STURP to something like 60 pounds per square inch.

III. Since one of the reasons for studying Dr. Frei's sticky tapes is to gather further details about the pollen research, we have wondered whether or not we can extrapolate any information about the number of pollen in any given area on the Shroud. Certainly, we cannot safely base any firm and final conclusions on the statistical data found on the sticky tapes since this technique has been shown to be pressure sensitive. In theory, the harder one may press one may retrieve more pollen and other debris. Conversely, the lighter one might have pressed the fewer the particles which might have been retrieved from any given area.

Nevertheless, when statistical data from all four labeled sticky tapes are compared the numbers of pollen which have been retrieved are suggestive of the possibilities of creating what we term a "Relative Exposure Index". For example, sticky tape 10/9 A/a from the so-called "side-strip" has at least 37 pollen/spores. Yet, 12 A/a, taken from the patch at the dorsal end of the "side-strip", not very far away from 10/9 A/a, has only approximately 7 pollen/spores. Since the patch has almost certainly been added in more recent centuries as a repair to damage caused by handling the corners during its many known exhibitions it is not surprising to find relatively fewer pollen/spores. A "Relative Exposure Index" would seek to establish a sampling of pollen/spores based upon a standard amount of space sampled and taken at random from the various zones on the Shroud suggested by previous research. The seeds for this concept were sown already in 1982 by Don Luigi Fossati.[12]

In 1978 Ian Wilson proposed that the reason the Shroud is not so readily known from early historical sources was because it was folded in four so as to exhibit the face portion of the cloth. His suggestion therefore was that only the face was exposed for many years, thus prompting the many stories about the Edessan Image and the Veronica or Mandylion.[13] If his thesis is correct it would seem logical that with the remainder of the Shroud relatively protected there would be fewer pollen per square centimeter in those protected areas whereas in the highly exposed head region the number should be considerably higher.

Our goal therefore is to establish a firm count of pollen/spores on each of the ~~four~~ five sticky tape samples. Thus far we have determined that there are roughly 7 on 12 A/a, ca. 20 on 4 B/d, ca. 37 on 10/9 A/a, and more than 90 on 6 B/d. The count as of this writing is not complete. However, we must say that while the counting is very nearly complete for the three tapes with the lowest number of pollen/spores, we are far from finished

with 6 B/d. It appears that the count on this tape will go well over 100.[14] The final number should be established by using a photomosaic of the four sticky tapes (at 40x) and pinpointing each location (and hence, count) on these photomaps. In this way an exact figure can be determined. This work is continuing.

What is highly suggestive for future research is the very large number found on the sticky tape which comes from the head region of the cloth. As we have noted it is precisely this area which would have received the most exposure if Ian Wilson is correct. ASSIST has therefore developed a proposal for a new examination of the Shroud to address this question based upon the suggestive data of these sticky tapes.

IV. One of the research potentials these tapes have offered has been to examine the possibilities of the translocation thesis. The translocation thesis as proposed by Dr John Jackson began with the observation that material has been abraded from the blood areas and suggests that the missing material is to be found scattered throughout the image area, this due to the fact that blood areas are folded against image areas.

ASSIST's investigation of the translocation thesis began with the observation of what has been identified as blue fibrils on STURP sticky tape 6AF from the lance wound area. When we received the ~~four~~ five sticky tapes from Mrs. Gertrud Frei-Sulzer we wanted to know whether or not these tapes might confirm the presence of blue silk in the central region. That confirmation is now a positive one.[15]

One possible implication is that if the blue silk surround was added to the Shroud in 1868, and blue silk fibrils are now found in the center of the cloth, it has taken slightly more than 100 years from 1868 to 1978 for the the silk to have traveled from the edge to the position where it was picked up by the sticky tapes. This, of course, assumes a straight forward translocation from edge to center during folding and unfolding of the cloth in the intervening years.[16]

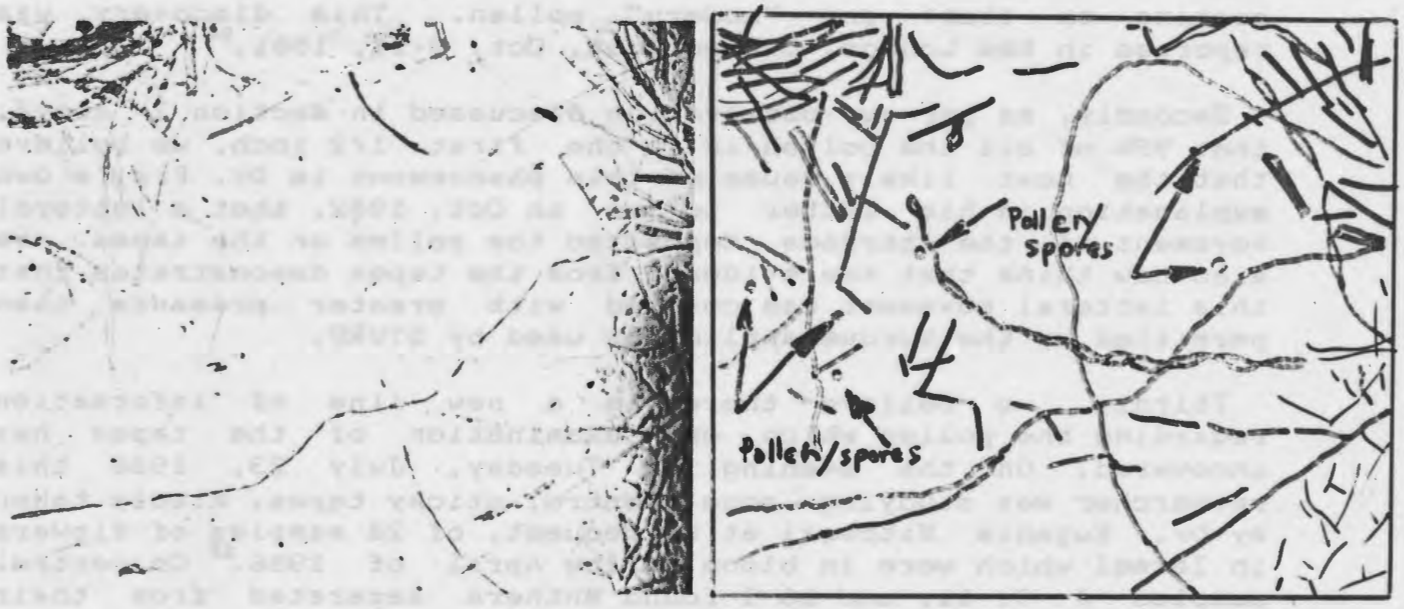
Further careful study of the red particulate matter on the four sticky tapes may shed more relevant light on the translocation thesis. However, see further below (Section VI) regarding the red particulate material on the Shroud.

V. At INTER/MICRO-82 (July 23, 1982), Mr. Steven Shafersman, a student in micropaleontology at Rice University, publically charged that Dr. Max Frei had personally put pollen on the Shroud. This charge was labeled "highly provocative,

unprofessional, and slanderous," by Mr. Thomas Kubic, a chemist who had been in attendance at that meeting. Mr. Kubic's letter and Mr. Shafersman's reply, were published in THE MICROSCOPE, Vol. 30 (1982), pp. 343-352. Shafersman's essential conclusion, despite some of his apologetic demurings, is that "honest error or scientific deception has taken place."[17] But in the light of the contents of his letter Mr. Shafersman places emphasis upon the latter view recanting nothing except his "admittedly emotional overtones".[18]

In the intervening years there has been no review of the issues nor any further reply to his charges. We believe that the ~~four~~ five sticky tapes permit some new and objective data to be entered into the record which firmly argue against Mr. Shafersman's unfortunate conclusions.

Mr. Shafersman's basic thesis is that since "Frei's data are such excellent evidence because pollen almost invariably falls to the ground within 100 meters of the parent plant"[19] it must be "regarded as incorrect...because the only other possible explanations are that the Shroud of Turin is authentic, that a miracle occurred, or both..."[20] Since the Turin Shroud cannot be authentic, Dr. Frei, in Shafersman's view, must have put the pollen on the cloth.



Pl. 22: 6 B/d. There are many pollen/spores on this tape taken from near head. Those seen here are relatively large. 40x. Photo: ANER Photoarchives. Code: P5/30/86/-I-5 [FS3].

On the other hand Shafersman uses STURP against Dr. Frei: "The reaction of all the STURP scientists is instructive: they either ignore it or explain it away by saying that winds can transport pollen for great distances and thus it is not reliable evidence."[21] He notes that independent analyses of the STURP sticky tapes by McCrone, Rogers, Heller, Adler, and Riggi turned up nothing "more than a few sporadic pollen grains on the tapes, certainly nothing close to the four or five specimens from 49 different species."[22]

For the sake of the record let us briefly list the two possible causes which had heretofore been suggested for the deposition of most of the pollen on the Shroud.*

1. Wind deposition.

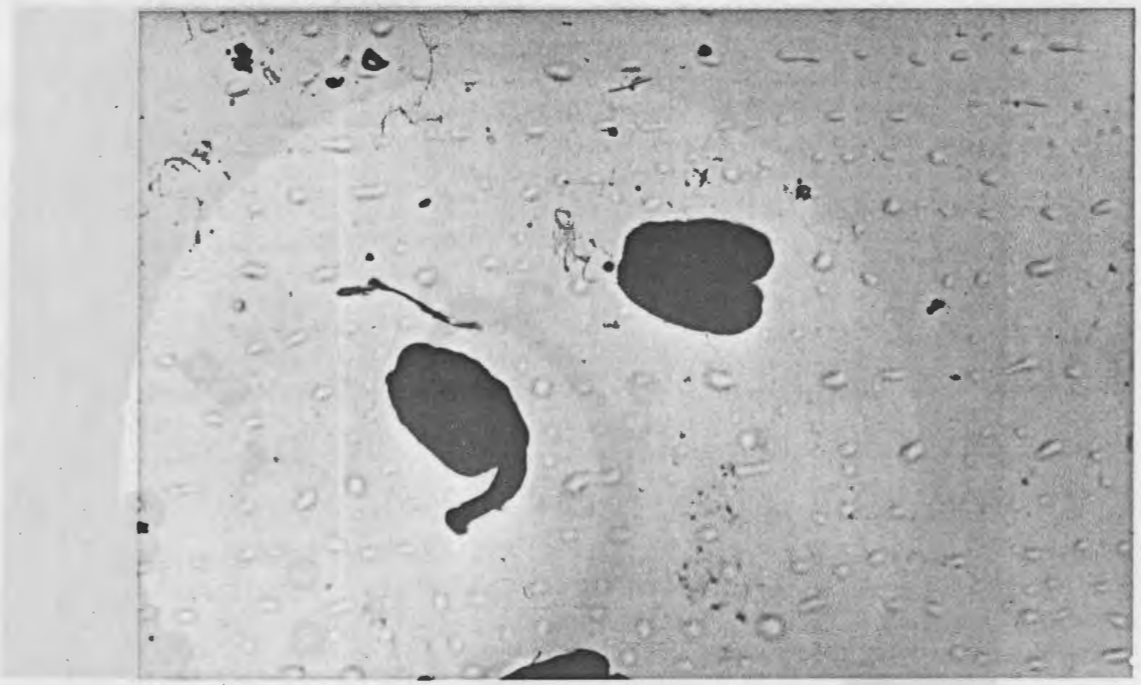
2. Fraudulence (Dr. Frei, or someone else, "spiked"[23] the Shroud or his sticky tape samples).

First, although Shafersman refers to Dr. Giovanni Riggi's analysis, his information is inaccurate regarding the findings. In actual fact Dr. Riggi has found many pollen on the Shroud which he categorizes in two groups: "ancient" (having a mineral coating on them) and "modern" pollen. This discovery was reported in New London, Connecticut, Oct. 9-11, 1981.[24]

Secondly, as per our observation discussed in section 2 above, that 99% of all the pollen is in the first 1/2 inch, we believe that the most likely cause of this phenomenon is Dr. Frei's own explanation in his letter to me in Oct. 1982, that a latteral movement of the threads deposited the pollen on the tapes. We also now think that the evidence from the tapes demonstrates that this latteral movement was coupled with greater pressure than permitted by the torque applicator used by STURP.

Thirdly, we believe there is a new line of information regarding the pollen which our examination of the tapes has uncovered. On the evening of Tuesday, July 23, 1986 this researcher was studying some control sticky tapes, kindly taker by Dr. Eugenia Nitowski at my request, of 28 samples of flowers in Israel which were in bloom during April of 1986.[25] On control samples # 9, 11, and 16 I found anthers separated from their filaments. The shapes of the separated forms stirred memory of a similar form on sticky tape 6 B/d. I immediately inserted the latter under the microscope and examined the heretofore unidentified debris.

*There are actually 3 suggestions which have been made to explain pollen on the Shroud. The third item which should have been included is trace contamination from the clothing of [illegible]s from the Middle East. See ADDENDUM, p. 46f.



Pl. 23: Israel Control Slide # 9, 40x: note individual anther as well as a complete stamen with anther attached to filament. Courtesy of Dr. Eugenia Nitowski. Photo: ANER Photoarchives. Code: S7/28/86-SFW.

Pl. 24: Israel Control Slide # 9, 40x: Filament separated from anther. Note the curved "neck" of the filament. Code: S8/19/86-I-15.

Pl. 25: Israel Control Slide # 11 (Courtesy of Dr. Eugenia Nitowski). 40x. Note pollen closely associated with filament. Photo: ANER Photoarchives. Code: S8/19/86-II-1.

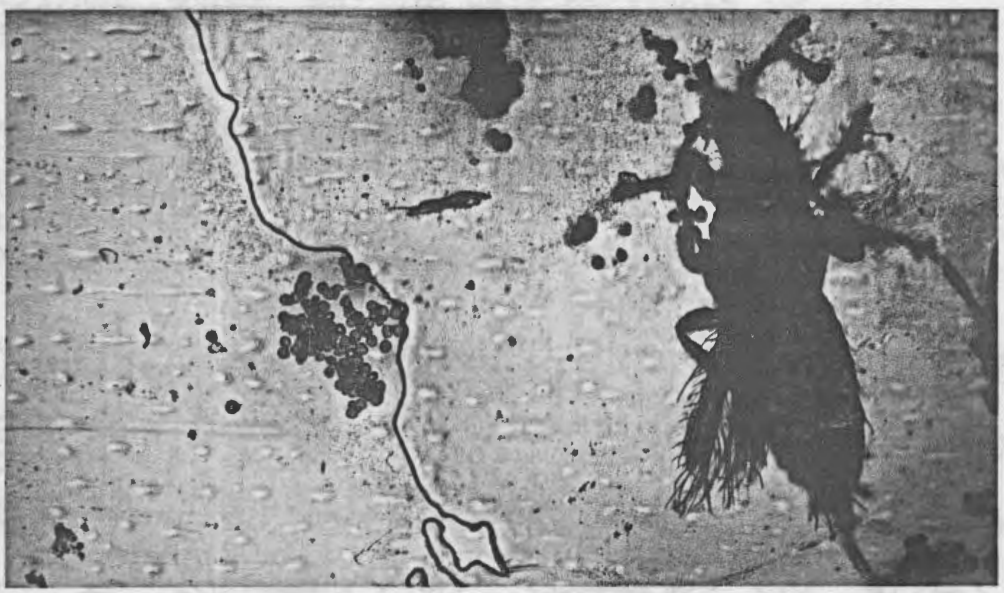
Pl. 26: Anther on Israel Control Slide # 16 (Courtesy of Dr. Eugenia Nitowski). 40x. Photo: ANER Photoarchives. Code: S8/19/86-I-16.

Dr. Dahl, drawing from his 53 years experience as an atmospheric palynologist, had already suggested to me during ou

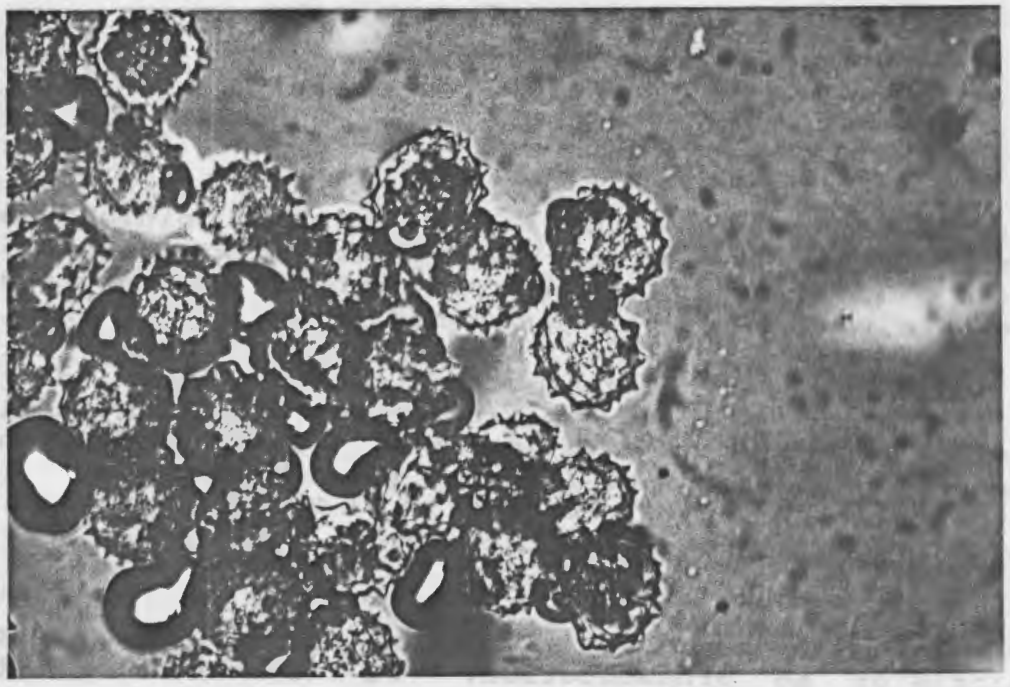
discussion on Tue., May 27, that in his opinion the high number of floral pollen--32 species of them not wind-blown-- could only have gotten onto the Shroud through human activity, though certainly not through fraudulence, as charged by Mr. Shafersman.

I was therefore convinced that surely here was evidence of floral parts and that the implication was unmistakable: that the pollen could indeed have gotten onto the Shroud when some person or persons laid actual flowers down on the cloth. This finding supported Dr. Dahl's contention. We shall examine his specific suggestion in another context below.

In general, wind-blown (anemophilous) pollen may be placed at one end of a continuum. They tend to be relatively smooth having little or no ornamentation. At the other end of the continuum are the insect pollinated pollen (entomophilous) which have various types of ornamentation such as spines (echinate pollen).



Pl. 27: Control slide of entomophilous pollen in association with a pollinator (hymenoptera). 40x. Other slides show evidence of visitation by lepidoptera. Photo: ANER Photoarchives. Code: S6/28/86-III-17.



Pl. 28: Magnified view of the above control slide with echinate pollen. 400x. Photo: ANER Photoarchives. Code: SB/23/86-III-19.

When I began to suspect the presence of floral debris, I made an appointment with Dr. Dahl for him to examine the unidentified debris on the sticky tapes. By Aug. 8 the following items (including those from 10/9 A/a) were definitely confirmed and are duly recorded in my notes as follows: "On sticky tape 6 B/d:

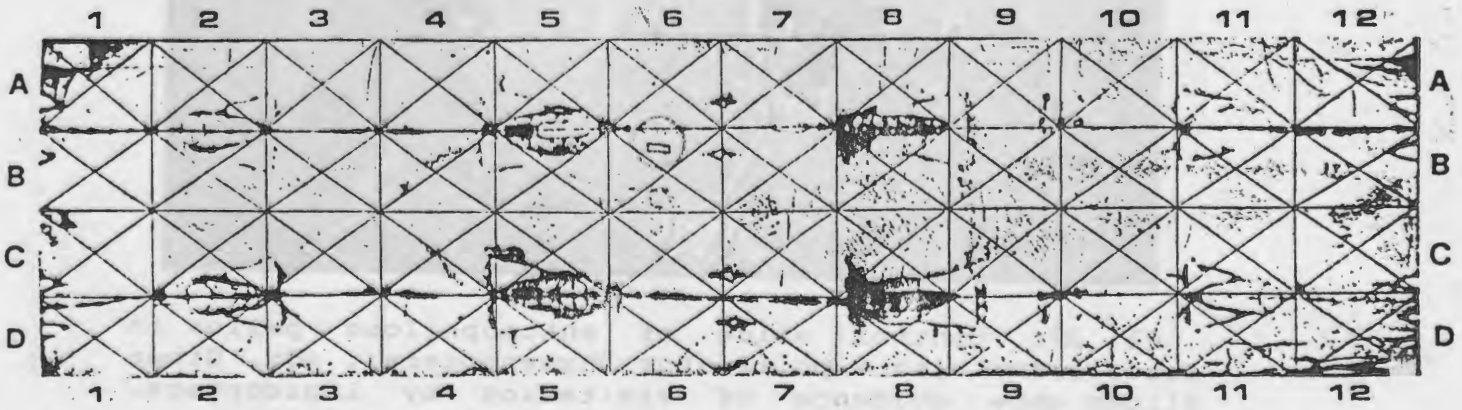
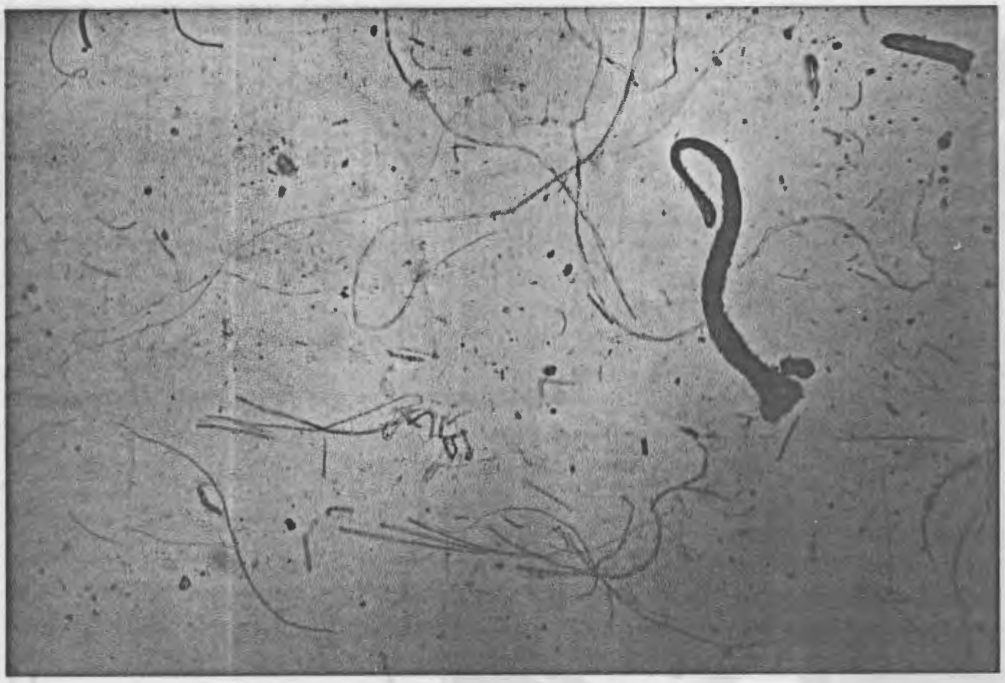


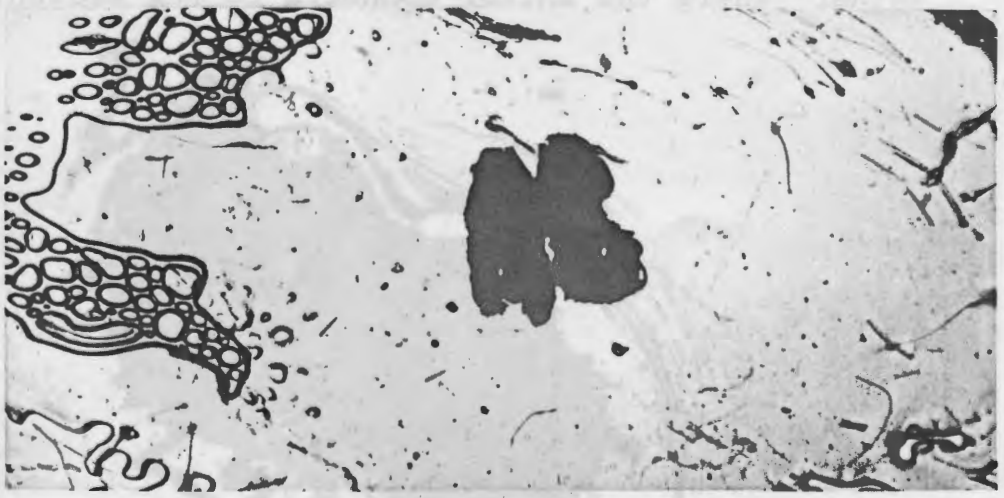
Fig. 1: Bellone-Ghio Grid showing location of 6 B/d.

1. "A filament of a stamen (or else it is a pistil--in either case, a floral fragment)."

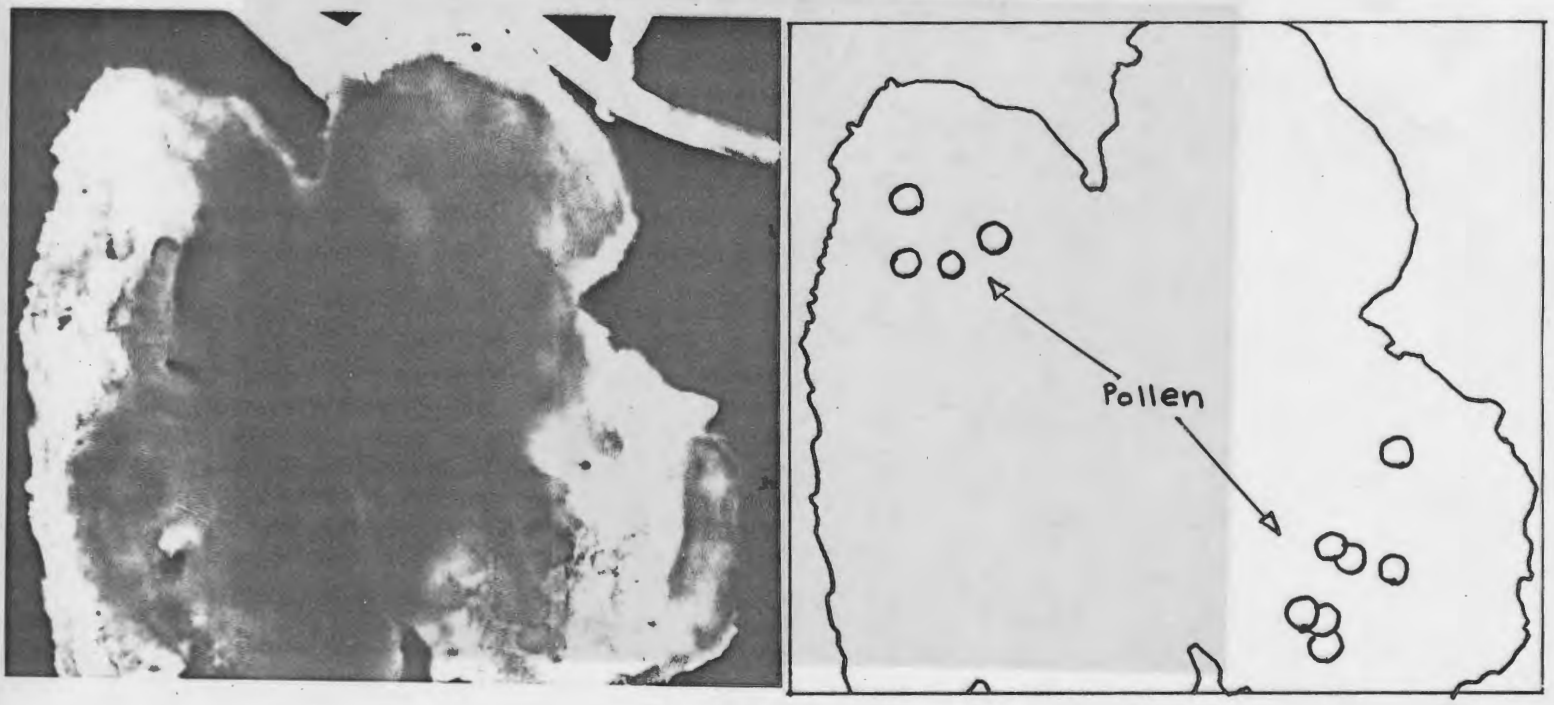


Pl. 29: Filament or pistil on sticky tape 6 B/d. 25x. Photo: ANER Photoarchives. Code: S7/22/86-II-23.

2. "An anther of a stamen. The anther has at least 10--possibly 11 pollen inside. (It seems reasonable to assume that item # 1 is a filament since it is only 5/16" away from the anther.)"



Pl. 30: Anther on sticky tape 6 Bd. 25x. The filament in Pl. 29 is separated from this anther by only 5/16ths of an inch. It seems reasonable to believe they may be parts of the same stamen. Photo: ANER Photoarchives. Code: S7/22/86-II-22.



Pl. 31: Magnified view of anther accompanied by light intensifier on microscope (Note the small round internal features which demonstrate the presence of pollen). 100x. Photo: ANER Photoarchives. Code: S8/4/86-I-9.

3. "The conductive or vascular tissue of an anther--where the anther connects to the stamen."

Pl. 32: Sticky tape 6 b/d. Vascular tissue of a rather large anther. 100x. Photo: ANER Photoarchives. Code: P11/10/86-I-33 [FS31A].

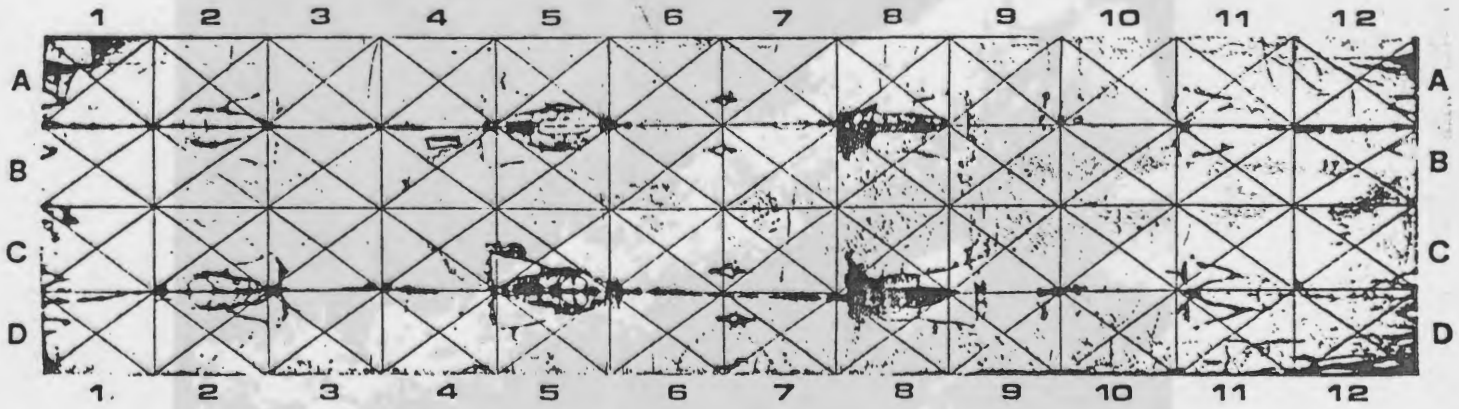
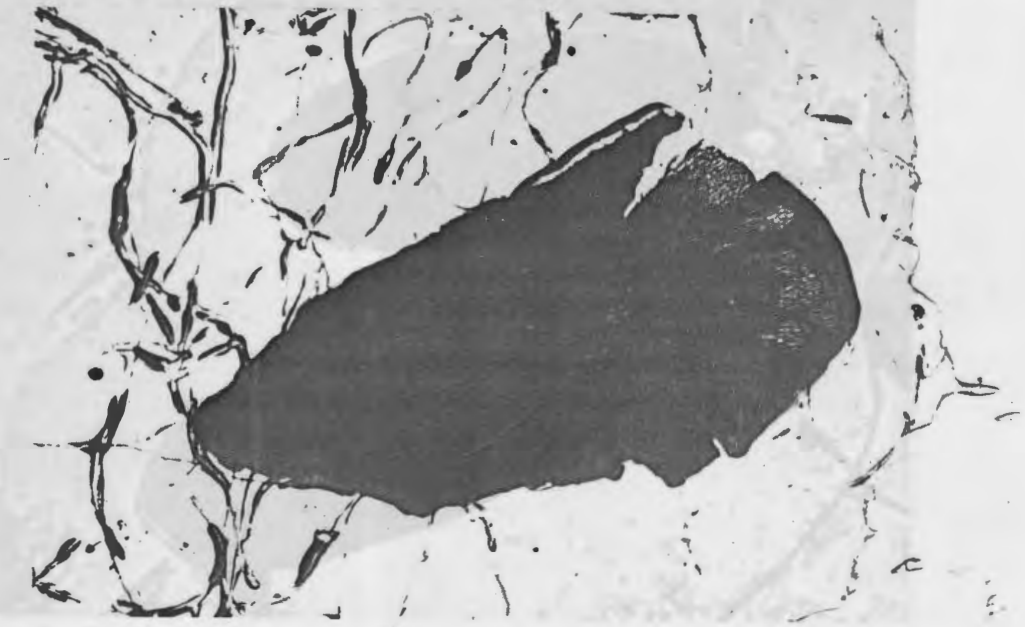


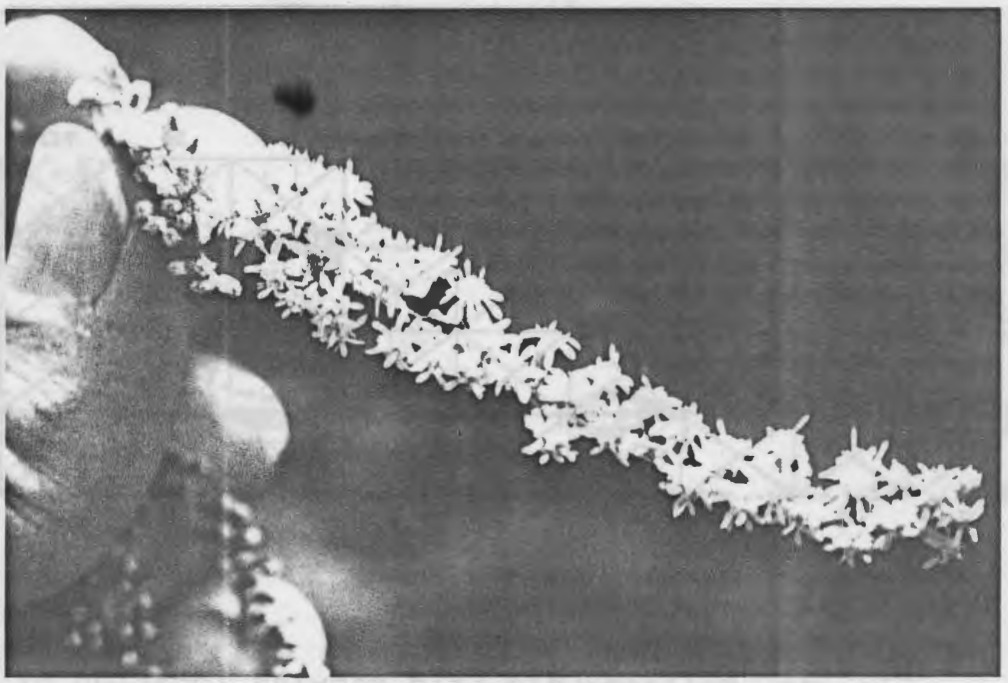
Fig. 4: Bollone-Ghio Grid showing location of 4 B/d.

"On 4 B/d:

1. "A bract--a tiny leaf-like scale from an inflorescence or cluster of small flowers."



Pl. 33: Bract on sticky tape 4 Bd. 25x. Photo: ANER Photoarchives. Code: P11/10/86-1-33 [FS30A].

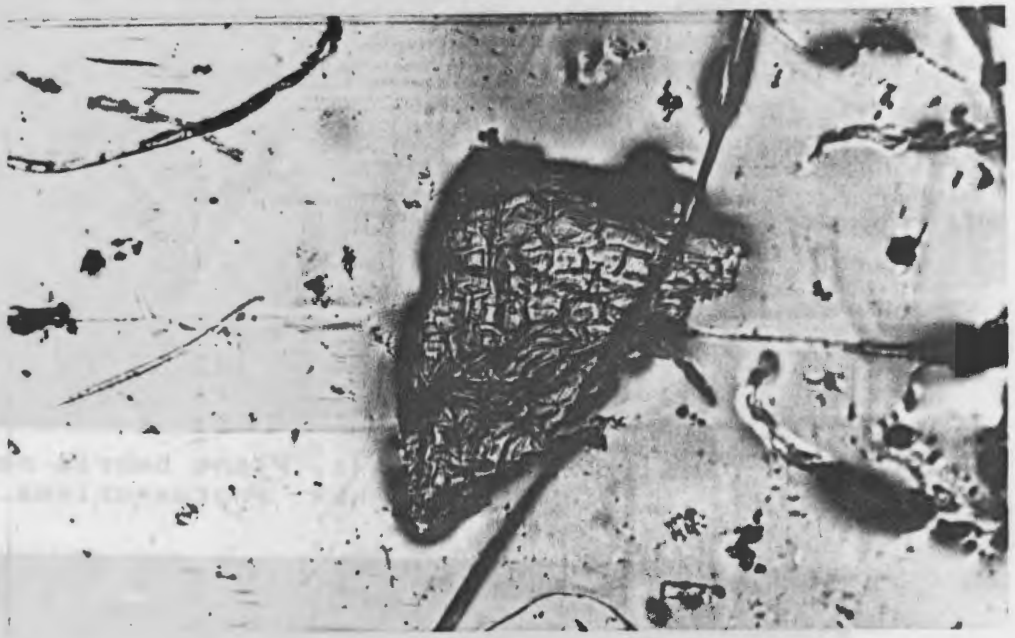


Pl. 34: Goldenrod is an example of a type of flower with tiny inflorescences composed of bracts. Photo: ANER Photoarchives. Code: S9/22/86-I-3.

Pl. 35: Goldenrod control slide (25x) showing two types of bracts. At 25x these are slightly smaller than the bract from sticky tape 4 Bd. Code: S8/19/86-I-5.

2. "Schizogenous cells--the cells which are inside an anther and are very sensitive to dry weather--they open

the 'mother cells' to release the pollen."



Pl. 36: Sticky tape 4 bd. Magnified view of schizogenous cells. 100x Photo: ANER Photoarchives. Code: P6/17/86-I-5 (FS2A).

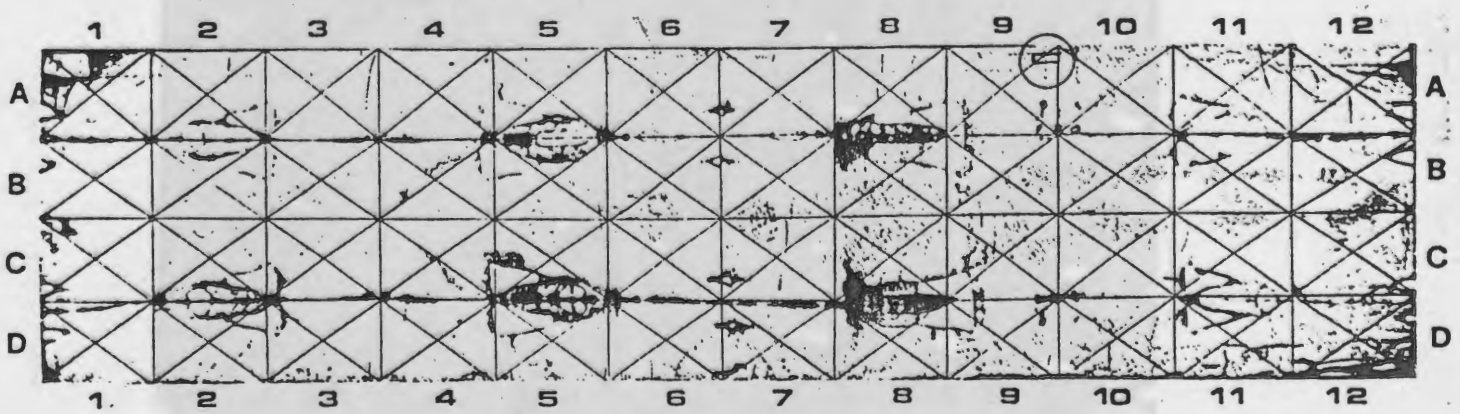
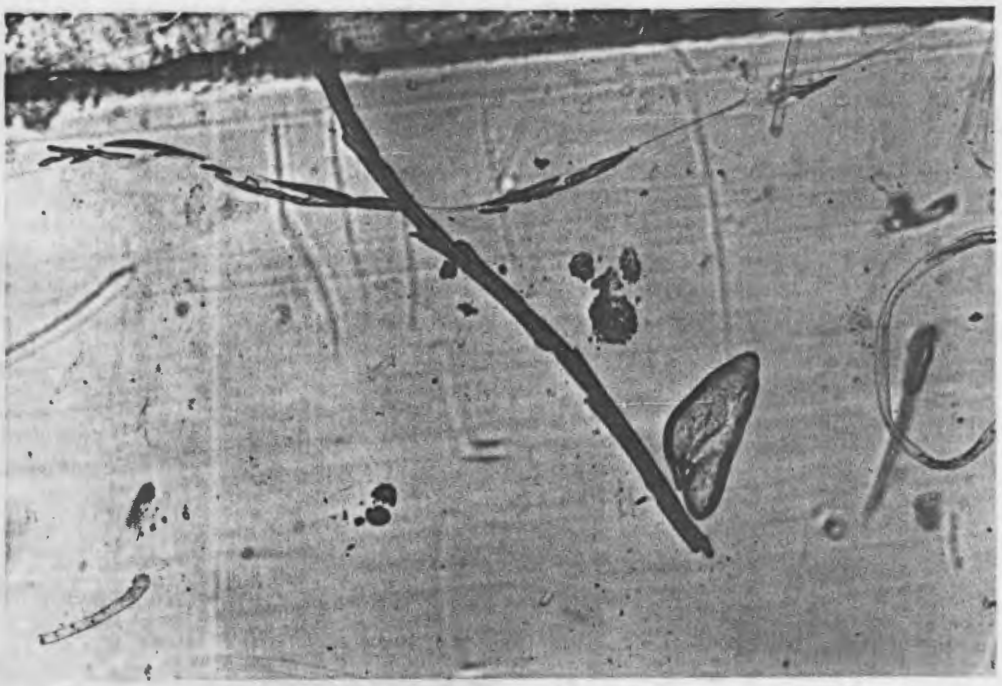
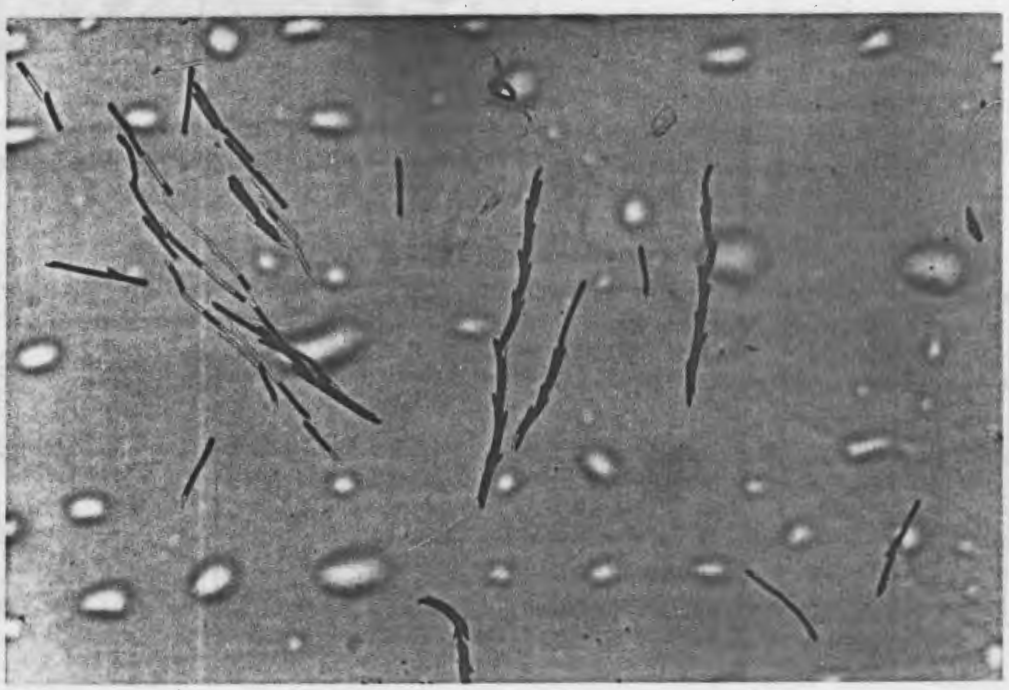


Fig. 5: Bollone-Ghio Grid showing location of 10/9 A/a.

On the evening of Nov. 10 I was working with sticky tape 10/9 A/a when I came across a "twig-like" feature I recalled having seen on one of the control slides from Israel. I found the structure (though not entirely identical) on control slide # 1 "Tick Seed" from the Daisy family and taken from a specimen by Dr. Nitowski in Emmaus some 12 miles west of Jerusalem.

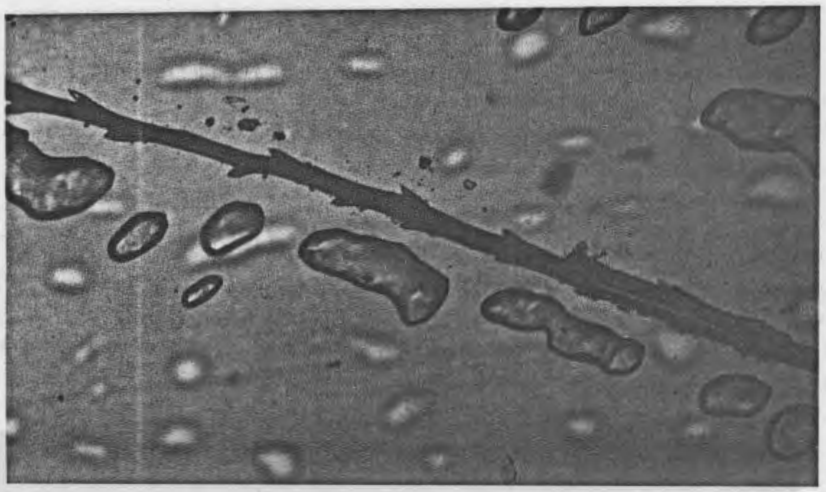


Pl. 37: Sticky tape 10/9 A/a. Plant debris near edge of tape. 100x. Photo: ANER Photoarchives. Code: P11/10/86-I-37[FS34A].



Pl. 38: Israeli Floral Control tape # 1: "Tick Seed" structural items. 100x. Code: P11/10/86-I-39[FS36A].

An interesting sidelight to this discovery is a nearly identical discovery made while studying some slide samples from tombs also taken in Israel by Dr. Nitowski.

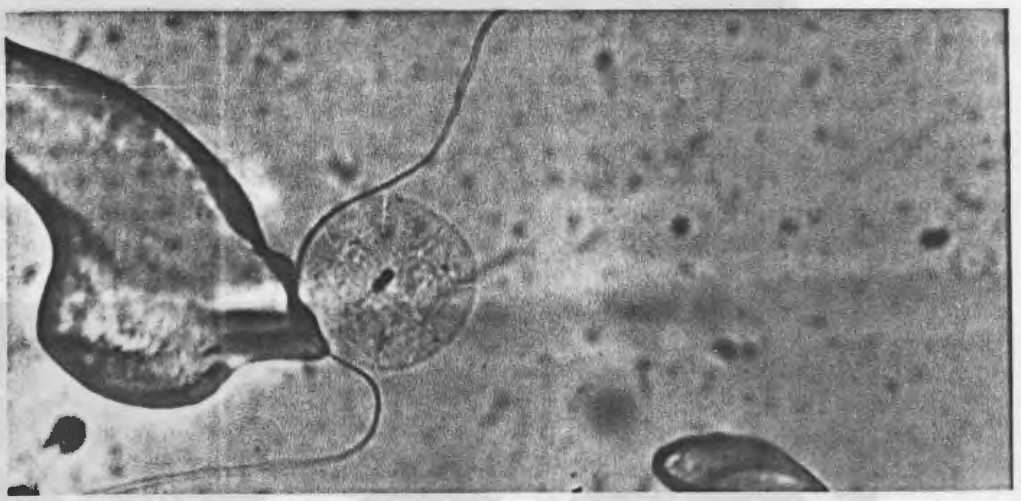


Pl. 39: Tomb Sample Slide # 4: from inside the "Garden tomb" not far from the Damascus Gate just outside of the walls of Jerusalem. 100x. (Courtesy of Dr. Eugenia Nitowski). Photo: ANER Photoarchives. Code: S11/25/86-I-37[FS36].

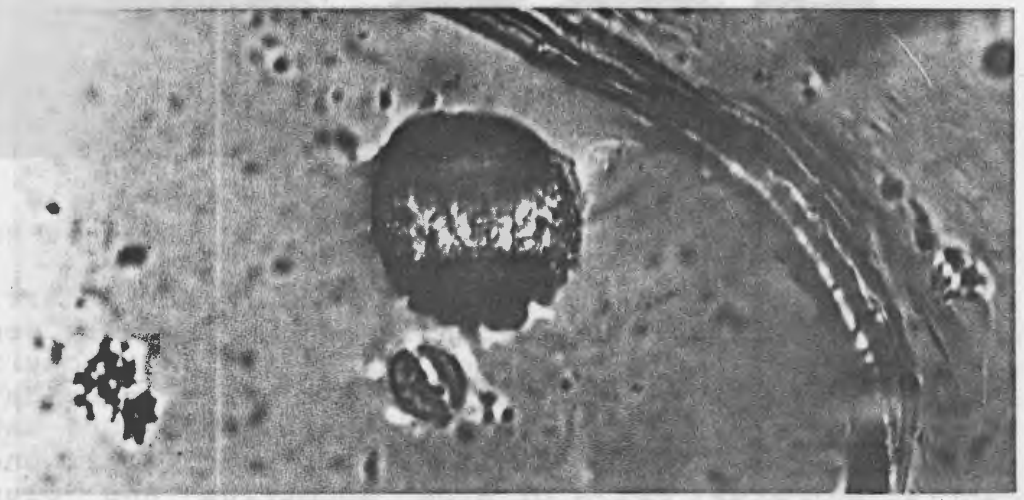
Pl. 40: "Tick Seed" flower from the Daisy family. Emmaus, Israel. Photo courtesy of Dr. Eugenia Nitowski.

Hence, as of this writing at least 6 items identified as floral or plant debris have been confirmed on 3 widely separated areas of the Shroud. There is one other item on sticky tape 10/9 A/a which appears to me also to be a strong candidate for this category but it has not yet been examined by Dr. Dahl. Moreover, this researcher is reminded that Dr. Frei also found other plant debris: epidermal cells of Aloe socotrina and plant hairs of Platanus orientalis. In view of this evidence we believe it is necessary to test formally the hypothesis that actual flowers were laid down on the Shroud. The two aspects of this hypothesis will be presented below.

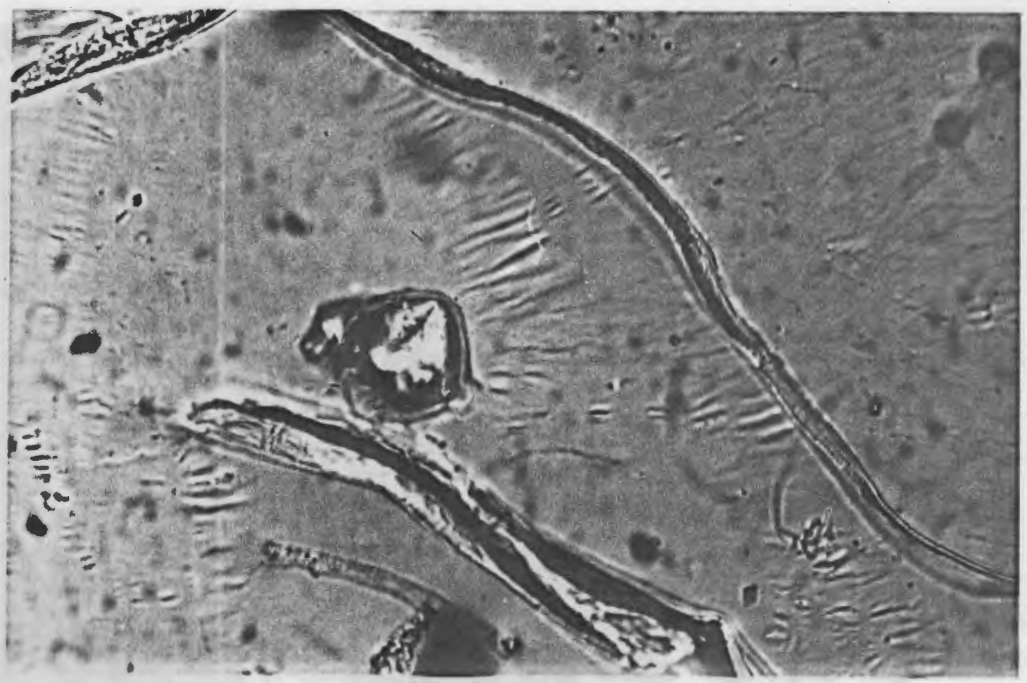
All of the sticky tape slides, as noted above, show evidence of pollen/spores. We have not attempted to identify in this report various pollen or even to distinguish the difference between pollen and spores. We show here some of the general types of pollen/spores which have been observed.



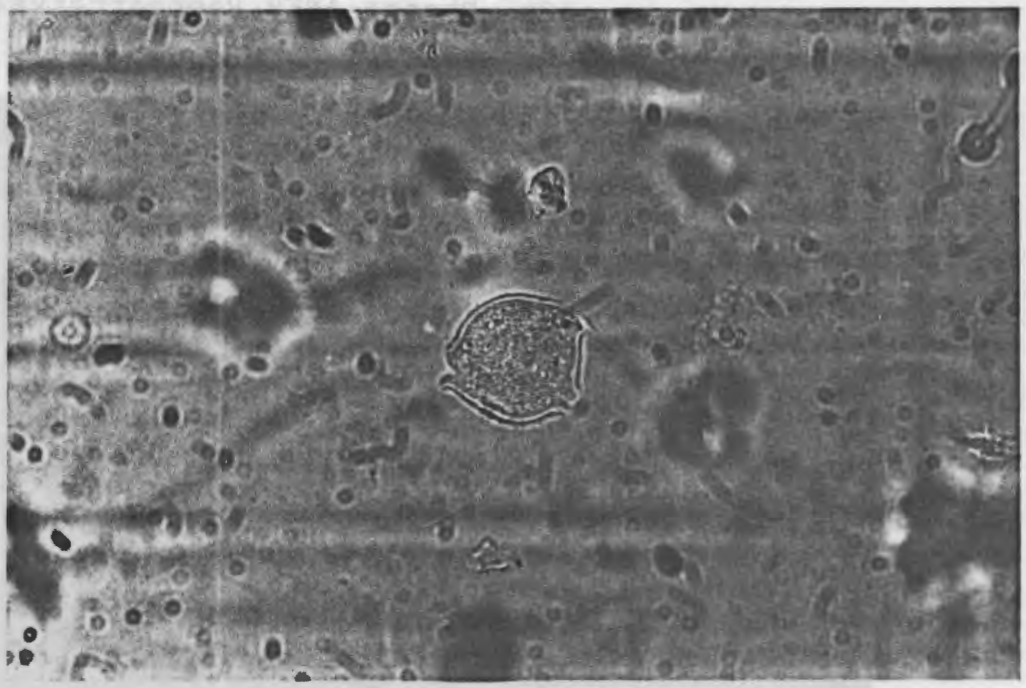
Pl. 41: Slide 10/9 A/a. Round type (Note the "soccer ball" type of pattern. The fibril in the photo may be an example of the "Spandex" referred to by Dr. Alan Adler.)[26] 400x. Photo: ANER Photoarchives. Code: P6/30/86-I-3[FS2].



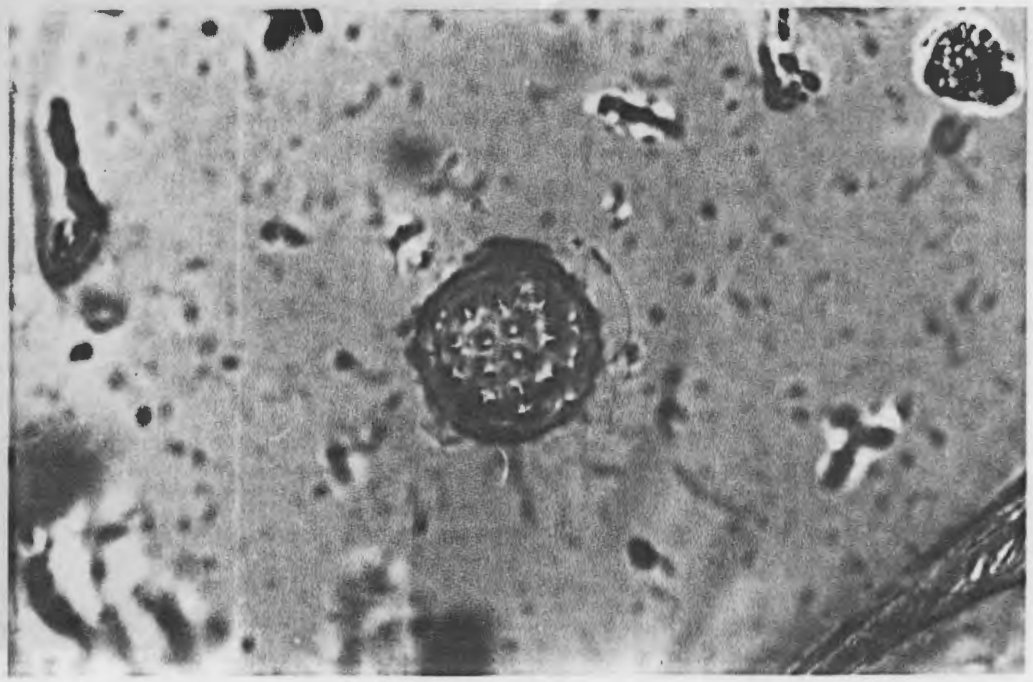
Pl. 42: Slide 4 Bd. Gymnosperm pollen (note bladders in direct contact with sticky tape). 400x. Photo: ANER Photoarchives. Code: P6/30/86-II-38.



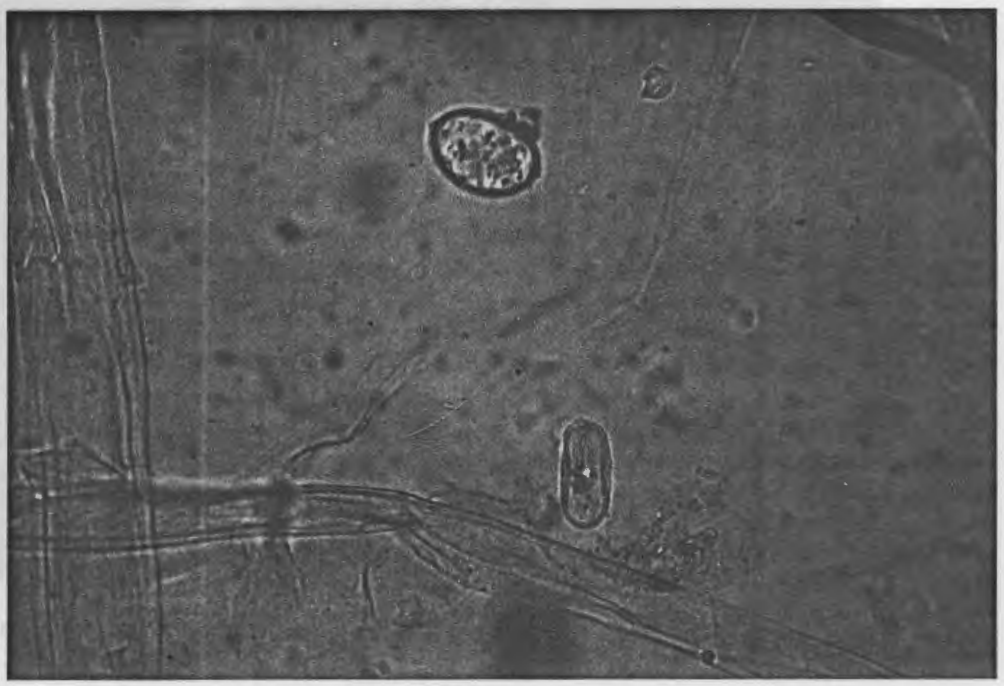
Pl. 43: Slide 4 Bd. Tricolporate pollen. 400x.
Photo: ANER Photoarchives. Code: P6/17/86-I-1.[FS5A]



Pl. 44: Slide 6 B/d. Tricolporate pollen. 400x.
Photo: ANER Photoarchives. Code: P5/30/86-I-25.[FS23A]



Pl. 45: Slide 4 Bd. Echinate pollen. (Note the spines protruding from the exine. This is a typical floral pollen.) 400x. Photo: ANER Photoarchives. Code: P6/17/86-I-2 (FS1A).



Pl. 46: Unlabeled slide. Miscelaneous pollen/spores. 100x. Photo: ANER Photoarchives. Code: S8/11/86-I-16.

It would seem that two possible avenues of human activity ought to be thoroughly explored:

1. Dr. Dahl has suggested that the Shroud might have been used during its past history as an altar cloth and that flowers could have been laid upon the cloth as part of the commemoration of Jesus' death and burial. Ian Wilson has shown that liturgical banners existed but were these used as altar cloths and were flowers used in the ceremony?[27]

2. Archaeological evidence would support another thesis: that the flowers were laid on the cloth during the burial of the Man of the Shroud. The archaeological record from first century A.D. Jerusalem shows evidence of flowers in a secondary burial. Also, Mr. John Beers' research has uncovered considerable evidence of the presence of flowers in Egyptian burials. Finally, Dr. Robert Drews has kindly informed me that flowers were used in some Roman burials of the 1st century A.D.

In the light of the above evidence we therefore staunchly repudiate any public or private charge or innuendo that Dr. Max Frei spiked the Shroud with pollen. We firmly believe that Dr. Frei's reputation should stand untarnished and his integrity solidly intact.[28] Since Dr. Dahl believes that the presence of wind blown pollen on the Shroud are of little consequence and that the presence of the 32 floral pollen types on the Shroud are the all important clue, it remains, instead, for researchers to pursue the issues on four fronts:

1. The collection of new pollen data from the Shroud.

2. A thorough historical investigation of the liturgical and archaeological possibilities of placing flowers on the cloth.

3. A thorough study of the geographical distribution of the floral pollen on Dr. Frei's list to determine and verify the "smallest common denominator" of floral plant groups which grow only in Europe and only in the Middle East.

4. A study of the seasonal distribution of the floral pollen on Dr. Frei's list (especially in the light of the study produced for no. 3 above) to determine if a pattern exists. For example, how many can be shown to bloom commonly in the Spring?

VI. We have suggested that a new examination of the Shroud should collect new information regarding the pollen and floral debris. We think the four labeled sticky tapes support an investigation of the following questions:

1. Can we establish a "Relative Exposure Index" for the various areas of the Shroud? If we attempt to follow the ancient fold lines as proposed by Dr. John Jackson, we may have access to zones which can be tested for a relatively high or low frequency of pollen.[29] We would expect that many years of public exhibition with only the facial area exposed would have accumulated a larger number of pollen/spores in that area than those areas which were folded out of the way and protected. Such a high concentration of pollen/spores would support Wilson's thesis. A relatively high frequency especially of wind-blown Anatolian pollen particularly in the frontal face region would tend to confirm it.

On the other hand if a high frequency of Middle Eastern floral pollen and floral debris is found both in the frontal and dorsal head region as well as elsewhere we may suggest support for the burial thesis.

2. Can we discern patterns of distribution on the cloth which might support the liturgical suggestion? If the Shroud was once an altar cloth it seems reasonable to believe that it would have had an elongated format. The most likely pattern would have been to fold the Shroud in four--perhaps first along the warp, then across the middle to form a four-thickness piece of cloth approximately 7' 1 1/2 inch in length by 1' 9 1/2 inches wide. That such a configuration existed during the Shroud's history is proven by the position of the pre-1516 burns. If the above configuration were laid upon an altar 7 feet long, those burn marks would appear exactly in its center extending even to one edge of the folded cloth. We propose looking for a European floral pollen distribution which might match this pattern.

3. Since the sticky tapes have shown that this technique is pressure sensitive we have looked for an alternative method whereby we might be reasonably certain we could retrieve all or nearly all of a sample

in a given area--say, the contents of a single square centimeter. The vacuum approach would appear to be the best method since this would remove material from between the threads.

4. Since we believe the sticky tape approach still has value in a study of the red particulate matter, particularly where we wish to count such particulates to achieve a statistical data base for on-image and off-image areas, we will find it useful to determine wave-length information of the various tapes employed so as to use the best tape possible. Combining a proper wave-length plastic tape with the correct adhesive would surely enable us to retrieve the data we seek from the surface, using the vacuum to retrieve loose material from below the surface and micro-manipulation to retrieve specific samples from specific areas for precise study.

VII. Excursus on the red particulate controversy.

One of the knottiest problems regarding the nature of the image has been the identification and distribution of the red particulate matter found on the Shroud. Throughout their many reports STURP has indicated that perhaps the largest amount of the red particulate material is "blood" abraded from the blood areas and redistributed throughout the image area via translocation.

Dr. Walter McCrone, using the same sticky tapes taken by STURP, has stated that the red particulate matter is "iron oxide" and is statistically high in the image area and virtually non-existant in the off-image area.

Dr. Eugenia Nitowski, in her recently released report, ha added a new dimension by suggesting that some of the red-orange particles may be a mixture of "myrrh and aloes".[30]

Clearly, these various suggestions plus the sticky tapes we have been studying indicate to us that the matter is not so simple as to yield a straight forward solution. For example, on 6 B/d we have observed a reddish orange aglomerate particle which is not birefringent. (See pl. 21 above). The fact that this comes from an off-image area demonstrates that not all the red particulate matter is exclusive to the image area alone.

The following photograph of microscopic red particulate deposits in Tomb Sample # 7 from Roman Sepphoris in Israel is

highly interesting:

Pl. 47: Non-birefringent red particulate matter from a tomb in Roman Sepphoris. 400x. Photo: ANER Photoarchives. Code: S11/25/86-I-8[FS7].

Unless this material is amorphous iron oxide the fact that it is not birefringent implies an organic material. However, preserved as long as this has been in the tomb environment it does not seem likely that it is blood. Therefore, extensive chemical analysis of the material would be quite valuable. Dr. Nitowski's suggestion that this is a mixture of myrrh and aloes may be correct but we urge that no conclusions be drawn either for the tomb samples or for the red particulate matter on the Shroud until further chemical testing for the variously suggested material has been conducted by specialists.

VIII. This general report is exactly that. It has covered the high points of the findings on the tapes from a broad perspective. But we also council caution. We cannot draw solid scientific conclusions from only five sticky tapes:

A. The tape technique is <u>pressure sensitive</u> and therefore may, in that respect, be unduly selective in the data it has taken from the Shroud.

B. Only five tapes, four of which are labeled.

represent the data from the Max Frei Sticky Tape Collection. Since we have not examined the other tapes we cannot say how representative these five are of the collection as a whole.

C. None of the pollen on the five sticky tapes have been identified. We therefore cannot say whether their ultimate identification will support the European or the Middle Eastern plant population.

D. Although we have made a clear case for the presence of floral debris on the Shroud we do not think three sticky tapes tell us much about their distribution--either horizontally across the surface or vertically, between the threads. We do not know how much of this debris was translocated early in the Shroud's history before it may have been pressed between the threads. On the other hand, although it seems highly curious to find at least three tapes out of five containing floral debris we wonder how coincidental this is. Only further careful examination of the other tapes or the Shroud itself can answer this question.

E. Many questions remain to be dealt with. Very little high powered microscopic examination has been done: most of these studies did not go above 100x and certainly, with a few exceptions, 400x was the upper limit (largely confined to a study of the pollen/spores). The presence (or absence) of micron or sub-micron sized red particulate matter has not been generally addressed. Nor do we know how these off-image sticky tapes would compare with those Dr. Frei took from the image areas of the Shroud since we do not currently have access to any of these (unless it can eventually be shown that the unlabeled slide came from the dorsal back area. We would also be interested in exploring the identification of the flower represented by the anther on 6 B/d.

It remains for forensic pathologists, imaging specialists, physicists, chemists, palynologists, and photomicrographers to examine these tapes, each in their professional capacities and from their own viewpoints to identify, refine, correct, and expand upon what has been reported here.

Aside from the above general outline of plans, work is continuing on the photomosaic of the four labeled sticky tapes

and precise coordinates will be established so that an exact count of the pollen and spores on each tape can be obtained. Also, we project further examinations and discussions with Dr. A. Orville Dahl before releasing the tapes for further study by other ASSIST specialists.

FOOTNOTES

* Throughout much of the published scientific literature on the Shroud the term "fibril" appears. Dr. Jeanette Cardamone, of the Dept. of Textiles at Virginia State University, has kindly pointed out that the correct term in the textile field is "fiber". Technically, the terms move from the macroscopic to the microscopic to the electron microscopic with "yarn", "fiber", "fibril", the latter being a component part of a fiber. Hence, unless one is discussing the subject from the electron microscopic point of view, and specifying the details of the structure of a fiber, one should use "fiber" for what is viewed under the light microscope. For the literature discussing the subject see N. I. Nikitin, THE CHEMISTRY OF CELLULOSE AND WOOD. Israel Prog. for Sci. Translation, 1966. Distributed by Daniel Davey & Co., Inc., N.Y., N.Y. See p. 211. See also T. P Nevell & S. Haig Zeronian, CELLULOSE CHEMISTRY AND ITS APPLICATIONS. Halsted Press: a Div. of John Wiley & Sons, N.Y., pp. 19f. I am indebted to Dr. Cardamone for these references.

1. See Prof. Dr. Pier Luigi Baima Bollone and Dr. Aurelio Ghio in SINDON, Oct. 1977. However, the grid was inadvertently published in inverted form. This was later corrected, a copy of which was published in SSI, Vol. III, no. 13 (Dec. 1984).

2. The photographic code # will enable other researchers to make specific enquiries. The code number can be translated as follows: P=Photographs (usually from Fujifilm HR100), S=Slides (most often Kodak KPA 5070 ISO 40). This is followed by the date on which the photomicrograph was taken, then the film roll # and note #. Occasionally the actual film sequence (FS) number is included especially where that differs from my notes.

3. According to information kindly provided to the author by Prof. Dr. Werner Bulst, S.J. there were six sampling sites from the 1973 researches. The matter is dealt with briefly in my

unpublished manuscript: "Shroud Photograph and Overlay Sequence", p. 30, the section entitled: "The Max Frei Sticky Tape Collection--Addendum: The 1973 Samples".

4. The combined term "pollen/spores" will be used in this report since I have generally not tried to distinguish the difference. Generally, spores are much smaller than pollen--the smallest being ca. 4 microns in size.

5. Echinate meaning with "spines"; the exine generally refers to the outside "skin" of a pollen grain.

6. See pls. 16 & 41 below.

7. Dr. Adler called Mr. Maloney the following day and noted that "the shards looked brownish because the blue filter was in place during the viewing of the slide".

8. See the Barrie M. Schwortz Photo-documentation Collection for the many views of Dr. Frei removing sticky tapes from the Shroud. Mr. Schwortz informs me that Dr. Frei obtained the cotton gloves from STURP.

9. Not to be confused with the above translucent fibers, there is a darker blue fiber which tends to show striations in the lengthwise structure. We have not identified these fibers but we wonder if they may possibly have come from the black backing cloth which was once placed on the Shroud in 1694 by the Blessed Sebastian Valfre but since removed. Dr. McCrone informs me that black often looks blue under the microscope.

10. This interpretation first appears in her unpublished particle atlas on the Shroud based upon the Rogers collection of the STURP sticky tapes. But more details (including comparative color photographs) are now provided in her recently released THE FIELD AND LABORATORY REPORT OF THE ENVIRONMENTAL STUDY OF THE SHROUD IN JERUSALEM. Salt Lake City, Utah: ESSJ, Sept. 14, 1986. [1-2 pp., 31 b/w photos, 49 in color, 19 line drawings, 3 tables, 17 graphs]. See the chapter entitled "Myrrh and Aloes", pp. 85-89 and figures 86a-91. The report may be obtained by writing: Sr. Damian of the Cross, OCD, Carmelite Monastery, 5714 Holladay Blvd., Salt Lake City, Utah, 84121. Price: slightly more than $30.00.

11. The original STURP tapes were 1/2" x 2" long. Dr. McCrone cut these into smaller portions and put them on microscope slides providing tape areas that were, microscopically speaking, more manageable. McCrone had virtually the entire set. Later, some

of these samples were sent to Drs. Heller and Adler. The remainder were returned to Dr. Rogers who loaned them to J. A. Kohlbeck, a chemist with Hercules Aerospace in Salt Lake City, Utah. ASSIS. studied 6AF, 3BF and 3EF from the latter collection. These three have now been returned to Dr. Ray Rogers.

12. For Don Luigi Fossati's original suggestion see "Was the so-called Acheropita of Edessa the Holy Shroud?", SSI, vol. 1, no. 3, (June, 1982), p. 30.

13. Ian Wilson. The Shroud of Turin. Garden City, N.Y.: Doubleday & Co., 1978, 1979.

14. See Pl. 22 showing sticky tape 6 B/d.

15. See Pl. 15.

16. However, Dr. Lawrence Majewski, of the N.Y. Institute of Fine Arts, has suggested that another scenario may be possible which could render the use of blue silk unsuitable to such a study. He notes that it is possible that when the blue silk was added it might have been laid out indescriminately upon the surface of the cloth before being sewn into position at the edges. This now seems to me to be a strong possibility since one suspects that Princess Clotilde, adding a surround to what she would surely have considered a special treasure, would not have wished the silk to touch the floor.

17. Op. cit., p. 352.

18. Op. cit., p. 345.

19. Op. cit., p.348.

20. Idem.

21. Op. cit.. p. 350.

22. Idem, p. 351.

23. Ibid.

24. See further G. Riggi, RAPPORTO SINDONE, 1982, the chapter entitled "I Resultati Delle Ricerche".

25. With each control slide Dr. Nitowski photographed the flower sampled *in situ* and noted the city in Israel where the flower was growing. In most cases she has tried to

identify the flower sampled.

26. See above pl. 16.

27. Ian Wilson. THE MYSTERIOUS SHROUD. Garden City, N.Y.: Doubleday & Co., 1986, pp. 114, 116.

28. For further information regarding the pollen controversy and attendant research, see my lecture to be published in the Elizabethtown, PA Conference papers on the Turin Shroud held Feb. 15-16, 1986. The lecture has been updated and footnoted throughout.

29. See Dr. John Jackson's article "Foldmarks as a Historical Record of the Turin Shroud", SSI, vol. 3, no. 11, (June, 1984), pp. 6-29.

30. See n. 10 above.

ADDENDUM

On p. 23 above we failed to add a third suggestion which had been made to explain the presence of pollen on the Shroud: Trace contamination caused by the touching of clothing of pilgrims from the Middle East. By this is meant that pollen might have been in or on the fabrics worn by persons visiting and touching the Shroud. The thought is that the pollen would have been transferred from the pilgrims clothing to the cloth of the Shroud.

There are a number of reasons why we believe this mechanism may not adequately explain the presence of pollen on the Shroud. But we are especially concerned with the presence of floral pollen--not with those which are wind blown.

1. The distribution of the pollen on the Max Frei sticky tapes show that virtually all (99%) of the pollen are in that first one half inch of the tape lead. This was the area of greatest pressure. This indicates to me that, as Frei observed in his article "Nine Years of Palinological Studies on the Shroud" (SHROUD SPECTRUM INTERNATIONAL, Vol. I, no. 3 (June 1982), pp. 3-7), the pollen are between the threads, not on the surface.

2. In 1978 STURP took 34 sticky tape samples from the surface of the Shroud. Only one of these sticky tapes had a pollen on it and this was identified as "American". This singular sample could have come from the cotton gloves worn by some of the researchers or it could have come from their clothing. Since the STURP sticky tapes are otherwise devoide of pollen and since the adhesive on the mylar tape is surely more agressive than the adhesiveness of cloth we suspect that the proposal that cloth-to-cloth transfer ence

mechanism explains the presence of floral pollen on the Shroud does not really adequately account for the high number of species (32) of such pollen. We are not suggesting that cloth cannot act as such a transference mechanism, rather, we are saying that there are too many species of floral pollen to be explained in this way.

3. The presence of floral debris, indeed, of plant debris on the Shroud cannot be adequately explained through the cloth-to-cloth mechanism. There is too much of it and it is too widely distributed across the Shroud. Such plant debris has been found on 10/9 A/a on the "side-strip" adjacent to the pre-1516 burn marks on the dorsal end of the Shroud. It has been found at 4 B/d on the frontal end on the "side-strip" side of the crossed hands mid-way along the arm area. It has also been found on the "side-strip" side of the frontal face not very far from the 1532 scorch line. Please see p. 38 for two suggestions which more adequately explain the presence not only of the plant debris but also the high presence of floral species.

4. On sticky tape 10/9 A/a I found a cluster of floral pollen--4 or 5--in an area of approximately a single square millimeter. In any proposed transfer mechanism such as cloth-to-cloth I would expect only trace transference--i.e. single grains. The cluster is better explained through the suggestion that actual flowers were laid down on the Shroud.

5. Pollen do land on clothing; pollen and spores are to be found everywhere. I took sticky tape samples from a Coptic funerary tunic and could only discover a single pollen grain on each of two out of a total of five samples removed from the fabric. This textile dates from between the 3rd to 7th century AD and comes from the Middle East. However, it must be noted that this tunic certainly cannot have received the exposure that the Shroud has. Therefore it would seem appropriate to explore old textiles which have probably received such exposure. Nevertheless, if we use modern pollen analysis techniques as an analogy then the extremely low presence of floral pollen on slides collected twice a day for each day of the year by Dr. Dahl for four years, then once a day for the next sixteen, implies that the high presence of floral pollen on the Shroud must be explained by means of another mechanism other than cloth-to-cloth transference.

We have suggested in this report that the best way to explain the high presence of floral pollen on the Shroud is through the laying of actual flowers down on the cloth. On p. 38 two avenues of research have been offered: 1. The liturgical and 2. The archaeological. I am indebted to Mr. Ian Wilson, President of the British Society for the Turin Shroud for the following reference:
On p. 775 of the National Geographic (Vol. 132, No. 6; Dec. 1967) there is a photograph of Eastern Orthodox priests laying rose petals down on an epitaphios in a ceremony conducted in Jerusalem to commemorate the burial of Jesus.