AN INTERIM PROGRESS REPORT ON THE PHOTO-INVENTORY/SURVEY PROJECT

The Max Frei Sticky tape collection on loan to ASSIST

At a meeting with Prof. Luigi Gonella on March 10, 1987 the need for some sort of statistical data on the pollen from the Shroud of Turin was discussed. Prof. Gonella's challenge was that in order for the presence of the pollen on the Shroud to have genuine significance one needed to know how many of each type were represented. Those which appeared in trace amounts would certainly not have as much meaning as those which appeared in higher numbers especially in concentrated areas. This project was therefore undertaken to attempt to discover information bearing on this question.

ASSIST has currently on loan, through the kindness of Mrs. Gertrud Frei-Sulzer, five sticky tapes taken from the Shroud on the night of Oct. 8, 1978. Four of these are labeled tapes:

12 A/a (Sample sequence no. 3) taken from the patch at the end of the so-called "side strip" on the dorsal end of the Shroud.

10/9 A/a (Sample sequence no. 6) taken from the so-called "side strip" adjacent to the pre-1516 burn holes on the dorsal end of the Shroud.

6 B/d (Sample sequence no. 23) taken from between the 1532 burn line and the face on the "side-strip" side of the frontal end of the Shroud.

4 B/d (Sample sequence no. 13) taken from the "side-strip" side in an area of the crossed wrists approximately one half way up the arm perhaps not far from where the elbow might be.

A fifth slide was also included. But this slide is broken and unlabeled and it is not known at this point in time from where this sample was removed. However, a preliminary and very tentative survey of this particular slide reveals that there are not only pollen/spores on it but that some of them actually match identical pollen/spore types found elsewhere on the Shroud. Furthermore, when statistical data are available we believe there may be some significant correlations with the data found on other tapes being studied. A formal preliminary photomicrographic survey was conducted on all four of the labeled sticky tapes. However, work on 12 A/a, 10/9 A/a, and 6 B/d is incomplete as of this time. Our preliminary count for 6 B/d has reached a high of between 275 and 300 pollen/ spore grains. Compare this with a preliminary count of 7 pollen/ spore grains found on 12 A/a from the patch. The preliminary count has reached 88 on 10/9 A/a. However, none of the above has entered the correction process.

Most of the work has thus far been done on 4 B/d where the pollen/ spore count has reached 162 grains. But we must set this raw data within a proper context.

On 4 B/d the tape itself actually overlaps the label on the slide by ca. 6 mm. This is that portion of the lead of the tape which currently has no scientific value. But it seems almost certain that were this portion of the tape viewable under the microscope many more pollen/spore grains would be added to the total count. The reason for the importance of the lead in the pollen study was pointed out in our previous report: FIVE STICKY TAPES FROM DR. MAX FREI'S COLLECTION: Preliminary Report # 1 (see p. 19). We now believe, however, through further experimentation, that the soft flesh of the thumb combined with à concentration of pressure and latteral movement forced the pliable plastic backing of the tape down between the threads so that the adhesive could bring up the pollen which are located down in the valleys between the crowns of the threads. That the pollen are between the threads is clear not only from a survey of the four labeled tapes (the body of the tapes are virtually devoid of any pollen/spores) but also from the fact that of 34 tape samples STURP only retrieved one pollen grain. [Prof. Gonella, on Nov. 21, 1987, informed me that this grain has been identified as rag weed which grows in abundance around Turin].

The photoinventory is currently being done on a Nikon Optiphot kindly made available to this researcher by Dr. David Wright, Director of the lab at North Penn Hospital, Lansdale, Pennsylvania. Every pollen/spore grain is being photographed on Kodak KPA 5070 slide film (ASA 40) at 200x. Each microscopy session lasted between three to four hours covering an average of 2 mm space on the tape which is 1/2 inch wide. Usually two rolls of film were used per session.

The actual statistics of photographed grains are as follows:

7/25/87 = 30 grains per 2 mm.

8/13/87	**	47	grains	per	2	mm.	
8/15/87	=	17	grains	per	2	mm.	
8/22/87	=	21	grains	per	2	mm.	
8/29/87	=	18	grains	per	2	mm.	
9/5/87	=	13	grains	per	2	mm.	
9/12/87	=	21	grains	per	2	mm.	
10/3/87		5	grains	per	2	mm.	
10/10/87		: 3	grains	per	2	mm.	
10/17/87	-	: 1	grain p	per 2	2 π	m.	
10/24/87	-	: 0	grains	per	2	mm .	

As of this writing we have virtually finished with the lead of the tape and are now beginning the survey of the body of the tape. Hence, the above distribution can be shown to be concentrated in two centimeters of space as follows:



The photoinventory has been tentatively sorted into types on the basis of three factors: 1. Size; 2. Shape; 3. Ornamentation (or the lack thereof). On this basis we have made a preliminary determination of 55 pollen/spore types. There has been no attempt yet to link this current survey with Dr. Max Frei's findings but we have noted some interesting similarities. We will mention at least one of these shortly.

We find the following raw statistical data:

type	1		20	type	8 = 1	12	type	15	= 3	3			
type	2	=	15	type	9 .= 4	1 ando in	type	16	= 7	2			
type	3	=	7	type	10 =	3	type	17	= 2	2			
type	4	=	7	type	11 =	2	type	18	= 2	2			
type	5	=	7	type	12 =	2	type	19-	55	=	one each	= 3	37.
type	б	=	5	type	13 =	3	Uncla	assi	fie	be	= 23.		
type	7	=	4	type	14 =	2							

total: 162 grains



The following graph will set forth the tentative breakdown of the types into comparative statistical groups.

number of observations: First, we note that any We can make a general breakdown of the material must be into four separate II. Windblown/floral pollen. groups: I. Windblown pollen. III. Floral pollen. III. Spores. These categories represent a kind of Dr. A. Orville Dahl, a palynologist with the continuum. University of/Pennsylvania, notes that pollen can be charted by their size, smoothness and proliferation (windblown) on through those which border both windblown and floral types, to strictly floral which tend to have ornamentation on them (such as spines) to the very small.



Pl. 1: Type 1.

The most common pollen (type 1 on graph above) is smaller by comparison to the others found. Although 20 occur on 4 B/d it remains for the specialists to determine if all are identical.

For type 2 on 4 B/d we have counted 15 grains which appear to be a floral pollen and with which we would compare Echinops glaberrimus found by Dr. Frei in his study. However, we do not wish at this time to say that type 2 is definitely Echinops. We have also been able to make a correlation between this type and the very similar pollen from the "Parasol" flower which also grows in Israel. (This sample was kindly made available to us by Sr. Damian of the Cross, OCD (aka Dr. Eugenia Nitowskil).



.P1. 2: Type 2.

Type 3 is tricolporate of a type noted by Dr. Dahl which is very similar to Dock. He stated that this particular type could

possibly be <u>Cistus creticus</u>. Only further study can determine this. But if so it would also be catagorized as a floral pollen. There are at least seven of these found on 4 B/d. (For photo please see report # 1, [plate 43].

Type 4, which is the echinate (having spines) group, also is represented by 7 grains)--six of one type and one of another. All would be floral pollen.



P1. 3: Type 4.

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Type 8 is a collection of some relatively large round pollen which may or may not be related to each other. But they are comparable in size, shape, and texture of their exine (i.e. their outer "skin").



P1. 4: Type 8.

Type 10 is of some interest. This appears to have three lobes.

However, one of these grains is completely opaque to light and this researcher suspects it may be a <u>coated</u> pollen. Dr. Giovanni Riggi, a microanalyst in Turin, Italy, and member of STURP, has already discovered mineral coated pollen on the Shroud which, he explains, can be replicated by soaking fresh pollen in tap water for about 1/2 hour. However, the coating is translucent to light. Dr. Riggi looked at photo slides of all 162 pollen grains found on tape 4 B/d and noted that this opaque grain is <u>not</u> typical of his coated pollen. He believes that this opaque coating is caused by something else. Extensive research will be required in order to determine its nature.



The above two pollen grains are both found on 4 B/d--their slight variation in size is not significant since control samples taken from fresh blooms often show such size variations. On the other hand, we must await precise identification to be certain that these two are in fact from the same species.

We note here that there appears to be a relatively high representation of floral pollen types on 4 B/d. There may be more than these but we shall have to await further careful study before these can be sorted out and more clearly identified.

As for windblown pollen, we note that one gymnosperm (type 19) was found on 4 B/d (i.e. from a pine or cedar or some such conifer).

We conclude our remarks about the pollen with a note that there is one catch-all 'category of pollen composed of 23 grains. However, in the current state of the inventory, although we can say they are probably pollen they cannot be identified for various reasons. Caught at the edge of air bubbles, hiding partially behind flax or cotton fibers or amongst the clutter of debris, the study at 200x is 'not sufficient to allow these to be sorted into their respective categories. They must be held in abeyance for a future time when their disposition can be more carefully determined. Certainly, none have distinctive characteristics--such as spines, or the lobes of the tricolporate pollen--which would enable us to determine a possible category. Most are of a round type of various sizes. Some appear to be "coated" and others are of an off-yellow color or orange cast Still others may not even be pollen but may be of organic origin. These must await the verdict of the specialist.

In our previous report we noted Dr. A. Orville Dahl's suggestion that actual flowers were physically laid down on the Shroud. That suggestion was made by him on the basis of his analysis of Dr. Frei's unpublished report. Within two months after he had made that suggestion we began finding the actual traces of botanical debris on the Shroud tapes. The first found was a virtually complete anther with the pollen still inside. We have continued to build the photoinventory of potential botanical debris items. Using 58 control slides of sticky tape samples taken in Israel from flowers for comparison we have accumulated some 45 items on 4 B/d which appear to have originated from plants--many of these seem to come from the bloom itself. The full report on botanical debris will be presented later. However, we illustrate some of the plant debris types which illustrate our contention that plants have been in intimate contact with the Shroud.



P1. 6:

I: Sepul-like item (possibly from bloom).



-9-



P1. 10:IV: An "ovale like" item [probably from bloom]. (fungus)

The survey work on 4 B/d continues. We already know that there are a new more pointen on the remainder of the tape and these will be photographed and included in the photoinventory. Also, 14

particles of a pollen/spore-like nature were not included in the above count--which would raise the total to date to 176--pending further study.

Aside from the pollen/botanical debris project we are also attempting to classify the flax fibers found on this tape. There are probably four or five types of flax fibers from the Shroud and photoinventory work is underway on these to determine the complete nature of the fiber resources available.

Upon completion of 4 B/d the work will resume on the other labeled tapes to complete their photoinventories before a final report can be made on the total number of such particles and their preparation for the next phase of the study: the identification of the individual grains themselves.

On Saturday evening, Nov. 21, I discussed the pollen with Dr. Giovanni Riggi in Port Chester, New York. He examined the photographic slides of the 162 pollen on 4 B/d and told me that of these only one pollen might have a coating--an echinate pollen. But he said that approximately 50% of the pollen he vacuumed from the Shroud were <u>coated</u> pollen! This supplies us with further information about the stratigraphy of the pollen materials on the Shroud. Apparently, the coated pollen are deep between the threads beyond the reach of any sticky tape method.

There is therefore the following apparent vertical stratification of material on the Shroud:

I. Stratum one: Crowns of the threads--

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Large botanical debris items, synthetic fibers from extraneous sources, extraneous cotton fibers, broken (and sometimes heavily scorched) flax fibers, red and blue silk, iron oxide, "blood" (not yet defined), volcanic and industrial ash, etc.

II. Stratum two: Valleys between the crowns of the threads--

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Smaller botanical items, pollen, spores, iron oxide, possible cometary dust, smaller grains of industrial and volcanic dust, "blood" shards, pollen opaque to light.

III. Stratum three: Sandwiched between the weave of the threads-out of reach from the sticky tape and available only through vacuum sampling-- Dr. Riggi's mineral coated pollen.

It is highly striking that of the 162 pollen found on 4 B/d Dr. Riggi pointed to only one which might be mineral coated. In 1981 Dr. Riggi suggested these were "ancient". We tend to agree that the coated pollen are definitely older than the non-coated pollen. Otherwise, the mixture of coated to non-coated would be more evenly represented on the sticky tapes.

In this report we have shown that some of the non-coated pollen have a higher statistical representation than others. Question: Can a similar difference be demonstrated among the coated group? All pollen with higher statistical representation should be investigated carefully to determine their pollination type (wind blown? insect pollinated?) and their geographical distribution. While trace pollen may also be suggestive of certain geographical areas we believe that those with higher statistical representation on the Shroud must have been very close to the source of parent plant.

These most recent discussions have also now raised a question as to why one of the pollen found on 4 B/d does not transmit light. Why is it completely opaque? Dr. Riggi indicates that it is not to be classified as one of his mineral coated pollen. On the other hand it would not appear that the tape itself would have affected it for there are two other nearly identical pollen grains which do transmit light. We suggest that a possible line of investigation might profitably look into the possibility that this singular grain might be coated with blood. Experiments with such blood coated pollen might demonstrate what such grains look like under the microscope. If it is argued that a genuine corpse of a crucified victim was wrapped in this Shroud, then we should not be surprised to find blood coated pollen. And if blood costed pollen were to be found they would likely be most intimately linked with the victim wrapped in the Shroud and such pollen would have come from the victim's geographic environment. But at this stage we can only suggest that this must become a line of investigation.

The discussion with Prof. Gonella and Dr. Riggi has now expanded the original list of possible sources for the pollen found on the Shroud:

1. Wind blown deposition.

2. Trace contamination from the garments of pilgrims from the Middle East.

3. A floral salve applied to the corpse and transfered to the Shroud.

4. Emulsified mummy used as a paint to create the image imprint.

5. Fraudulence (pollen placed on Shroud or tapes in modern times.)

6. Flowers actually physically touching the Shroud.

a. Flowers thrown onto the Shroud during processions.

b. Flowers placed on the Shroud during liturgical ceremonies (Eastern Rite?).

c. Flowers placed on the Shroud during an actual burial.

Unly further collection of pollen data from the Shroud can address the above questions. Certainly, the comparative data from the STURP, Frei, and Riggi sampling has demonstrated that there is a vertical stratification. Is there also a significant difference horizontally between the various parts of the Shroud. We believe that initial data suggests this also to be the case: On 6 B/d, near the face, we have counted between 275-300 pollen/spore grains but only 7 on the corner patch (12 A/a). This is a very wide difference! We suggest that the 1534 patches be sampled to see what the pollen presence is there. This might 6.a. above; at least it would provide us with aiso address no. information about the hypothesis which suggests that flowers were thrown on the Shroud during processions. If the ratio of pollen is considerably lower on the patches than on the Shroud it would indicate that the bulk of the currently existing pollen distribution originated prior to 1534.

Related to the question that some of the pollen may have come from the desert environs of North Africa, we are seeking evidence for sand types-namely the reddish-yellow grains which have been identified as far north as Nuremburg, West Germany. It seems reasonable to believe that if North African pollen types are on the Shroud, then North African sand will also be found there. The Max Frei sticky tape collection would be an excellent resource for resolving this question. Research is continuing in this direction.

One final note: Since all the material in the photoinventory of 4 B/d were taken at 200x, Dr. Riggi believes that all of the grains are pollen, not spores from fungal sources.

Respectfully submitted: Paul C. Maloney General Projects Director ASSIST Feb. 15, 1988

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Note: The first edition of this report was prepared on Nov. 18. It was discussed with Prof. Luigi Gonella and Dr. Giovanni Riggi on the evening of Nov. 21. The second edition was prepared on Nov. 29, 1987 as a result of the information obtained during the meeting. This third edition is the culmination of the overall analysis of all previous data plus information kindly provided by Herr Oswald Scheuermann, physicist, Behringersdorf/ Nbg., West Germany regarding

the reddish-yellow sand from North Africa which fell in Nuremburg, W. Germany.