

Fig. 1: *Haplophyllum tuberculatum*

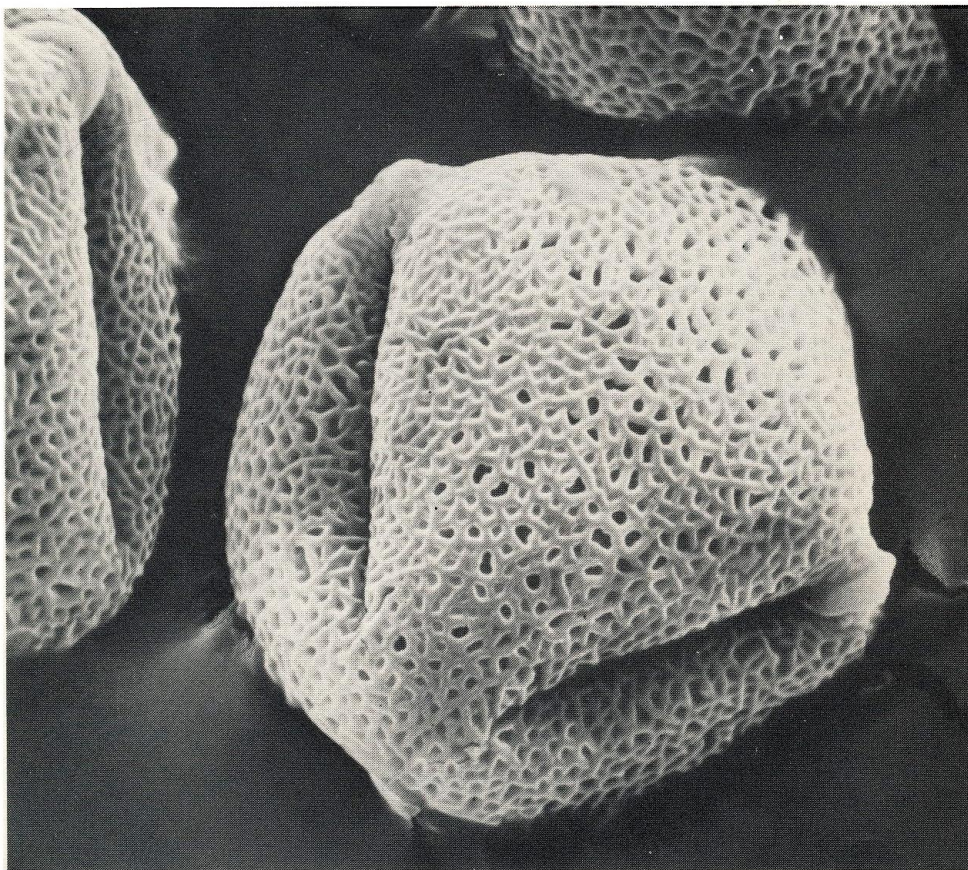


Fig. 2: *Cistus creticus*



## NINE YEARS OF PALINOLOGICAL STUDIES ON THE SHROUD

MAX FREI

In 1973, together with two other experts, I was invited by the Archbishop of Turin to compare the structure of the Shroud's tissue, as seen on the photographs taken in 1969, with the original structure of the weave itself. I then discovered under my microscope a certain amount of dust between the linen threads.

### **The Sampling**

I requested and was given the permission to take samples of this dust by means of adhesive tape. In the following years I was able to distinguish in this dust, amongst fibers and mineral particles, a total of 48 different varieties of pollen-grains. Later, in 1978, I had another opportunity of taking more dust-samples directly from the Shroud, and Prof. Baima Bollone gave me other samples from the silver shrine in which the relic has been kept. Furthermore, I tried to complete my list of plants studying photographs of the dust extracted in 1978 by Giovanni Riggi in the zone between the Shroud and the backing added in 1534 by the nuns who mended the burn-marks of 1532.

### **The Identification**

It was a very difficult task to identify the different pollen-grains in the dust collected. First I had to extract them from the sticking-tape and after cleansing they were embedded in glycerine jelly as permanent mountings, so that they could be studied from all sides under the light-microscope. The only true scientific method for identification of pollen-grains is the direct comparison with a mounting in the same medium of ripe pollen collected from a species to which the unknown pollen might belong.

The main problem in this procedure is to find out the right varieties for comparison. Fruitful ideas for comparison often originate from the study of books and articles with clear pollen pictures. A good help is the microscopical examination of all pollens available from private collections or public herbariums. In the case of the Shroud, all these sources gave only very few positive results. So I was obliged to make systematic studies of pollen-producing plants growing in such countries where the Shroud—supposing it was authentic—might have been contaminated. A positive identification of such pollens would be a confirmation of the Shroud's stay in that particular botanical region, while negative results concerning the whole flora of a country would allow the exclusion of the geographical area in question as source of contamination.

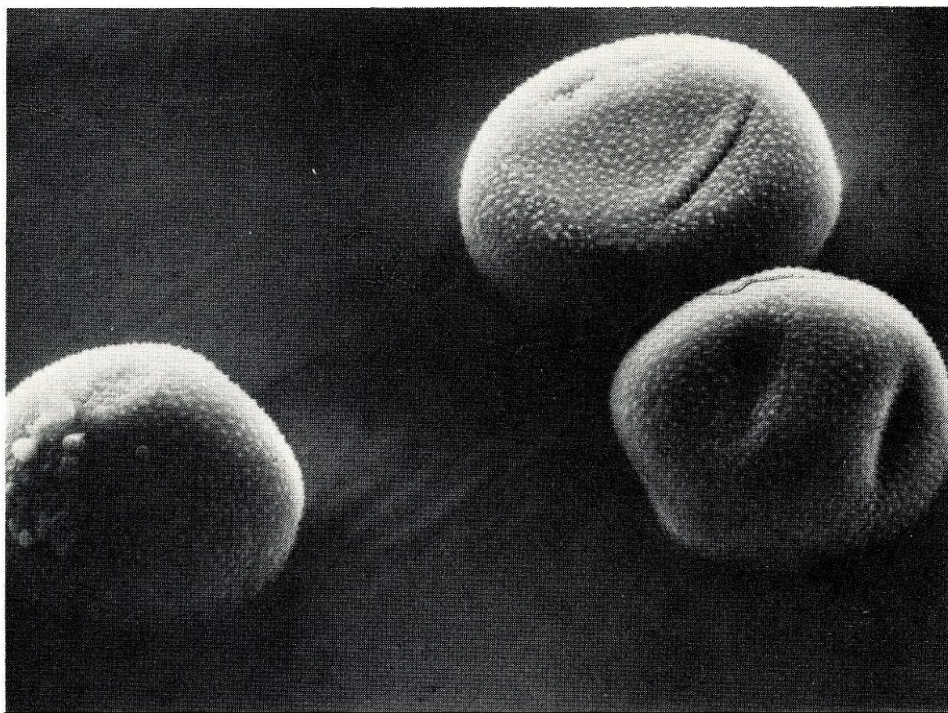


Fig. 3: *Roemeria hybrida*

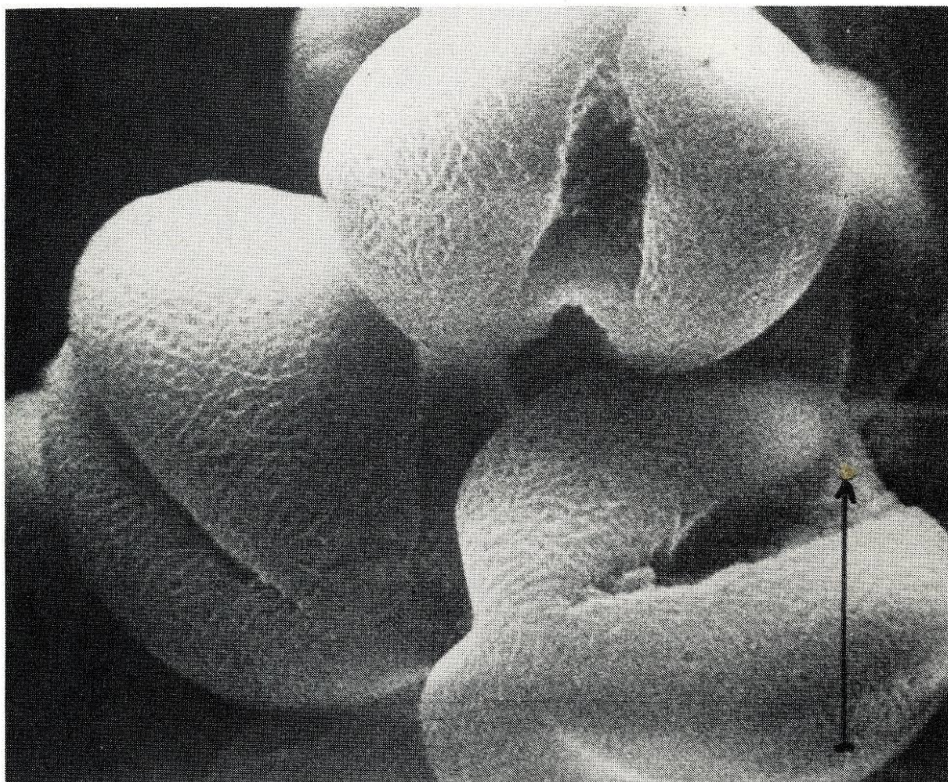


Fig. 4: *Epimedium pubigerum*

## The Collection of Reference Specimens

From 1974 to 1978, I traveled several times (in different floreal seasons) through Palestine, Turkey (especially Anatolia and the region around Constantinople), through Cyprus, France and Italy, collecting pollens for direct comparison under the microscope. I devoted all my spare time to these journeys and the consequent laboratory work.

My patience was crowned with success. The number of unidentified pollens diminished slowly but steadily. During this research I realized that it was not sufficient to study the pollens under the normal optical microscope. In order to confirm the correct identification, it was necessary to analyse the tiniest details of the pollen-structure under the scanning electron microscope (SEM). I wish to thank Prof. Morano (Vercelli) and the REM Laboratory of the Zurich Laboratory of Plant Biology for their most precious help.

## Summary of the Results Obtained in Three Years of Study

1) I succeeded in identifying 57 different plants which have left microscopical evidence on the Shroud (56 in the form of pollen, one in the form of typical multicellular hairs). Every identification has been controlled not only under the optical microscope at magnifications ranging from 60x to 1200x, but also under the scanning electron microscope (see illustrations). I chose for this article one plant from the deserts of Palestine (*Haplophyllum tuberculatum*), one from the Eastern Mediterranean (*Cistus creticus*), one plant from Anatolia (*Roemeria hybrida*) and one from Constantinople (*Epimedium pubigerum*). \*

2) None of the pollens was glued to the cloth with tempera or covered with tempera. This is strong evidence against the possibility of the Shroud's being a painted fake.

3) So far I have not tried to identify the spores of fungi because, for example, spores of mildew are of cosmopolitical distribution and cannot give any clues as to the country of origin.

4) As a by-product of my microscopical studies, I could identify hairs of *Platanus orientalis* and epidermis cells of *Aloe socotrina*. Probably aloes and myrrh were used as spices in the provisional burial of the Crucified.

5) With regard to their geographical area and their ecological properties, the plants belong to a few very characteristic groups:

A. DESERT PLANTS, either from sand deserts or halophytes, i.e., plants growing in soils with a very high concentration of salt. In the lands of the Bible, many of these plants grow around the Dead Sea and are completely missing in Italy and France. They could not have contaminated the Shroud during the last six centuries of its known

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\* SEM photos of all the pollens represented on the Shroud can be found in the picture-book: MAX FREI: *The Pollens of the Shroud of Turin*, C. C. Pollen Company, Scottsdale, Arizona; in press.

history. To this group belong the following 16 species:

Anabasis aphylla L.	Oligomeris subulata Boiss.
Acacia albida Del.	Peganum Harmala L.*
Artemisia Herba-alba L.*	Prosopis farcta Macbr.*
Bassia muricata Asch.	Pteranthus dichotomus Forsk.*
Echinops glaberimus DC	Reaumurea hirtella J. +Sp.
Fagonia mollis Del.	Suaeda aegyptiaca Zoh.
Haloxylon persicum Bg.	Tamarix nilotica Bunge
Haplophyllum tuberculatum Juss.*	Zygophyllum dumosum Boiss.

B. PLANTS OF ROCKY HILLS AND STONY PLACES (RUINS) in Palestine and neighboring countries (7 species).

Capparis spec.*	Hyoscyamus reticulatus L.*
Gundelia turnefortii L. *	Onosma syriacum Labill.
Helianthemum vesicarium Boiss.	Scabiosa prolifera L.*
Hyoscyamus aureus L.	

Two of these groups still grow nowadays on the walls of the ancient city of Jerusalem: *Hyoscyamus aureus* L. and *Onosma syriacum* Labill.

C. MEDITERRANEAN PLANTS (16 species).

These grow in biblical Palestine as well as in France and Italy. The contamination of the Shroud with these plants might have occurred in any country with Mediterranean vegetation, except for those varieties which grow only in the Eastern Basin.

Althaea officinalis L.	Phyllirea angustifolia L.
Anemone coronaria L.	Pinus halepensis L.
Cedrus libanotica LK.	Pistacia lentiscus L.
Cistus creticus L.	Pistacia vera L.
Cupressus sempervirens L.	Poterium spinosum L.
Juniperus oxycedrus L.	Ricinus communis L.
Laurus nobilis L.	Ridolfia segetum Moris
Paliurus spina-christi Mill.	Silene conoidea L.

D. PLANTS FROM ANATOLIA, mostly steppic plants (16 species). To this group of plants from the Near East, partly with areas from Iran to the Eastern Mediterranean, belong the following species from the Shroud:

Atraphaxis spinosa L.	Linum mucronatum Bert.
Glaucium grandiflorum B. +H.	Prunus spartioides Spach.
Ixolirium montanum Herb.	Roemeria hybrida DC.

The contamination of the Shroud with these pollens could not have happened in Europe. Therefore these plants must be considered as strong evidence in favor of the Shroud's stay in Edessa as stipulated by Ian Wilson and other historians.

Nine more plants marked with \* in groups A and B from Palestine also grow in Anatolia and might therefore have contaminated the

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\* Plants growing also in Anatolia; see group D.



Shroud there, although they are less abundant than in Palestine.

#### E. PLANTS GROWING NEAR CONSTANTINOPLE

A few plants mentioned in groups B, C and D can be found on both sides of the Bosphorus. Furthermore, on the Shroud I identified a species of more local distribution: *Epimedium pubigerum* DC. This finding might confirm the Shroud's stay at Constantinople, as testified by the Crusaders.

#### F. PLANTS WIDELY DISTRIBUTED IN CENTRAL EUROPE OR COSMOPOLITANS (12 species).

<i>Alnus glutinosa</i> Vill.	<i>Lythrum Salicaria</i> L.
<i>Amaranthus lividus</i> DC.	<i>Oryza sativa</i> L.
<i>Carduus personata</i> Jacq.	<i>Platanus orientalis</i> L.
<i>Carpinus betulus</i> L.	<i>Scirpus triquedrus</i> L.
<i>Corylus avellana</i> L.	<i>Secale spec.</i>
<i>Fagus silvatica</i> L.	<i>Taxus baccata</i> L.

These 12 species do not give any special information concerning Shroud history, as they all grow in France and Italy where the relic is known to have been for over six centuries, and has been exposed to public veneration without particular protection against pollen contamination.

6) So far I have not found any evidence for the Shroud's presence in Cyprus or other regions touched during the transfer from Constantinople to France and Italy.

7) Groups A, B and C of plants on the Shroud from Palestine and Anatolia are so numerous, compared to the species from Europe, that a casual contamination or a pollen-transport from the Near East by storms in different seasons cannot be responsible for their presence, as I have explained in several conferences\* and publications. The predominance of these pollens must be the result of the Shroud's stay in such countries where these plants form part of the normal vegetation. A transport by migrating birds or a contamination with desert plants by pilgrims can be excluded because they had no possibility of a direct contact with the Shroud.

8) None of the pollens so far detected on the Shroud has been produced by plants which nowadays are extinct. Many of the varieties represented on the Shroud have been found by Israeli scientists, embedded as microfossils in the mud at the bottom of the Dead Sea and Lake Gennesareth.

9) The pollen-spectrum as described leaves no room for the hypothesis of a medieval fake painted in France. On the contrary, the pollen-deposits are a most valuable confirmation of the theory that the Shroud traveled from Palestine through Anatolia to Constantinople, France and Italy.

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\* On this point, see Dr. Frei's reply to Rev. Charles Foley, as reported by Fr. Foley in his account of the Bologna Congress; in SPECTRUM # 2, pg. 36 + 37. Ed.