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A PRELIMINARY REPORT ON THE POLLEN FROM LLOYD'S BANK SITE, YORK, AND IT'S POSSIBLE ORIGINS.

James Greig

Samples of material from the various layers were collected from the bulk samples by J. Rackham, and submitted to this laboratory for pollen analysis. The pollen spectra have been presented in the form of a "pollen diagram" to facilitate comparison of the results from the various layers, but this is not a pollen diagram in the true sense since the samples do not come from a stratigraphic succession, but rather from a series of archaeologically recognisable layers.

The pollen spectra are basically similar to one another, with low tree pollen values and high values of herb pollen, especially thatof grasses and cereals. This general type of pollen spectrum is commonly obtained from archaeological deposits, and can be interpreted as partly natural pollen rain from the atmosphere and partly pollen derived from decayed plant material, the latter usually being predominant. The atmospheric pollen should provide information about the vegetation of the immediate surroundings of the site in question, but the derived pollen comes from plants that have been deposited (but not necessarily having grown) in situ, the pollen coming from their flowering parts which even though they could have been withered, would have contained significant amounts of pollen.

Tree Pollen

The amounts of forest tree pollen are rather small, with only a few percent oak and mere traces of elm and lime. Scrub tree pollen is more abundant, with alder hazel and birch bringing the tree pollen percentage up to 15-20%. This tree pollen appears to have been deposited from the natural atmospheric pollen rain since there is no archaeological evidence to suggest that brushwood was present which could have brought pollen in at the appropriate time of the year, mainly very early spring. The other reason to suspect this as natural pollen rain is that pollen diagrams that are thought to be more nearly "natural" than the Lloyds Bank material, such as those from the Ebor Deep Trench in York, and from Askham Bog, a few miles outside the present city limits, have broadly simila percentages of these pollen types:

	LBII (8)	LBII (14)	Ebor 160 cm.	Askham 30 cm	% total pollen sum
Almus	6	22	10	5	
Betula	1	6	5	3	
Corylus	4	13	5	16	
Quercus	3	9	3	16	
A.P.	15%	55%	27%	43%	

All pollen diagrams show the presence of the four pollen types used in the exampl and the LBII sample 8 has a reasonable total pollen percentage, although

sample 14 is exceptional in the amount of tree pollen. Sites like rubbish pits, which are assumed to have been either filled quickly or not open to the atmosphe usually have 1-2% tree pollen to judge from examples like a pit at Hen Domen and a cess pit at Worcester which are considered to be virtually entirely derived pollen. Places which were more open like an enclosure ditch at Fisherwick, Staffs, have more than 30% tree pollen, and the results from the Ebor Deep Trench show that what was probably a similar open site in a town might show a little under 30%.

The tree pollen record from this part of the Lloyds Bank site appears to demonstrate that the site may have been partly open to the weather there, Sample 14 does seem to be exceptionally rich in tree pollen, perhaps a sign of completely open conditions when it was deposited.

Herb Pollen

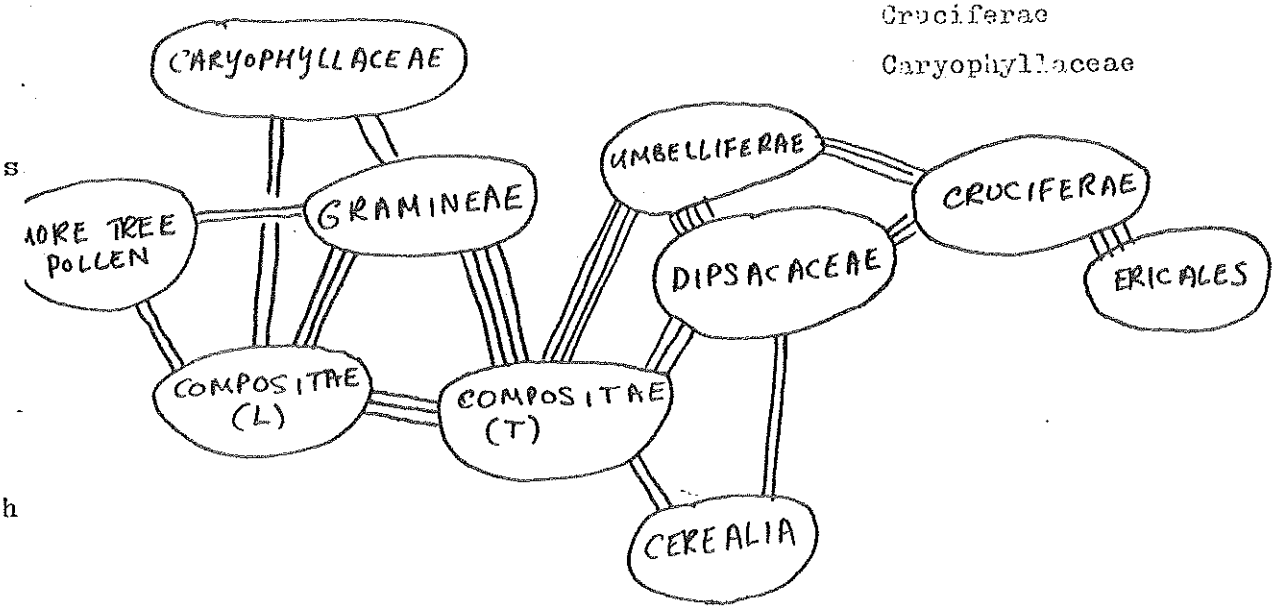
Most of the herb and aquatic pollen seems to have been derived from actual vegetation, although it is not possible to tell how much of it could be atmospheric. On the basis of interpretations made on results from some of the other sites already mentioned, both the pollen and the seeds, it would appear that the Lloyds Bank material represents the products of the decay of a) hay and meadow plants, B) straw and cornfield weeds, c) perhaps the remains of other crops, such as members of the Cruciferae, and d) waterside vegetation. Grasses and cereals show up exceptionally well in pollen results although they are not often found as seeds. However there is little indication from the polle results what proportion of the various plants identified from their pollen was.

Similarity Coefficients

The more detailed interpretation of the pollen results from these floor layers poses some unusual problems when seeking the maximum information from the results Single pollen samples can only be interpreted to a limited degree for lack of anything to compare them with. Pollen cores, on the other hand, provide results that can be interpreted very finely because the series of pollen spectra that make up a conventional pollen diagram can be compared to neighbouring spectra and changes defined on that basis. The Lloyds Bank material, coming from archaeologically defined layers apparently consisting mainly of derived pollen, should provide more information than single samples from various places, although there is not the order of a pollen diagram. The results have been drawn up to try to see whether the changes of pollen frequency that occur from sample to sample do so at random, or whether there is some pattern of change where a group of pollen frequency changes are found to take place in unison. From this it might be possible to obtain clues as to the groups of vegetation that made up the floor layers.

A list of "pollen characters" has been drawn up, together with the samples considered to have these characters ---- for example Ericales pollen greater than 2%, which occurs in six samples, or Centaurea nigra type pollen, which occurs in three samples. Although some of these characters can be seen on the pollen diagram, others are rather insignificant to look at. They have been selected only for the fact that they can be used to separate the samples ---- characters which occurred in all samples or none would be of little use. These changes would not by themselves be very significant in interpreting the results, but used together they become more important. Statistical tests on the significance of the results have not been made, and indeed they would not provide any further information; the table that has been drawn up of the occurrence of characters in the same sample presents the basic data unchanged. The characters that occur in many samples get the highest scores, and those that are rather restricted get the lowest. What is important is an extremely high score judged against the usual score for that character ---- like B and D, thus linking the samples with high Compositae (T) with those with more Gramineae than Cerealia. The most significant characteristics of the various samples seem to be the relative amounts of grass and cereal pollen, and on this basis the correlation of characteristics is as follows:

more Cerealia	more Gramineae
low tree pollen	Compositae (T)
	Compositae (L)
	Plantago (L)
	Ericales
	Cruciferae
	Caryophyllaceae

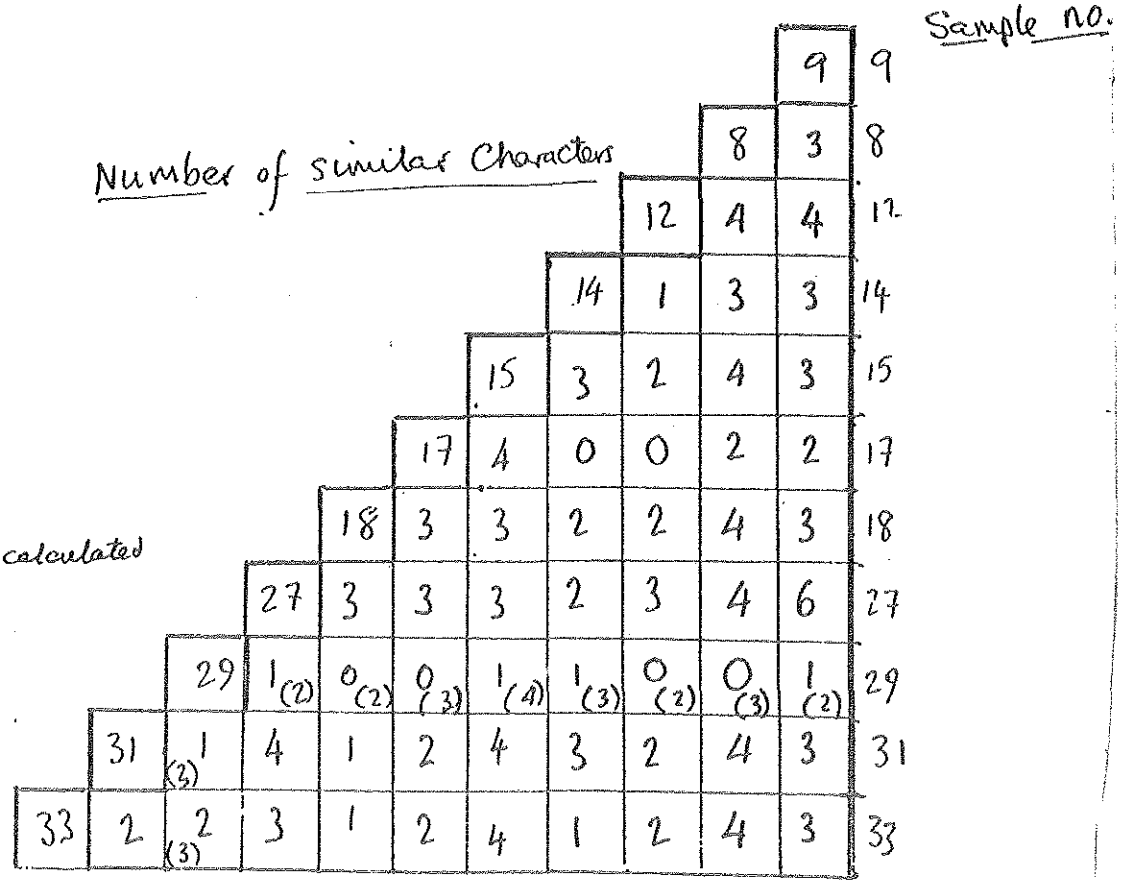


The grouping of the pollen characteristics is not very clear, and what correlation there is is somewhat unexpected. Normally pollen types are classified according to the most likely habitat, even though the identification may only be to genus or family, and the interpretation made on that basis:

Meddow plants	Cornfield and weeds	Aquatics	Other Habitats
Campanulaceae	Artemisia	? Filipendula	Ericales
Centaurea (n)	Caryophyllaceae	Polygonum amph.	Rosaceae
Compositae (T)	Centaurea (cy)	? Ranunculaceae	Umbelliferae
Compositae (L)	Chenopodiaceae	Cyperaceae	Urtica
Dipsacaaceae	Cruciferae		
Leguminosae	Cerealia		
Plantago (L)	Polygonum (av)		
	Rumex		

The point about the results of the correlation study is that it appears to include the Cruciferae, Caryophyllaceae and Ericales together with a suite of more meadow plants like the Compositae. Hopefully the seed results will shed some light on this problem.

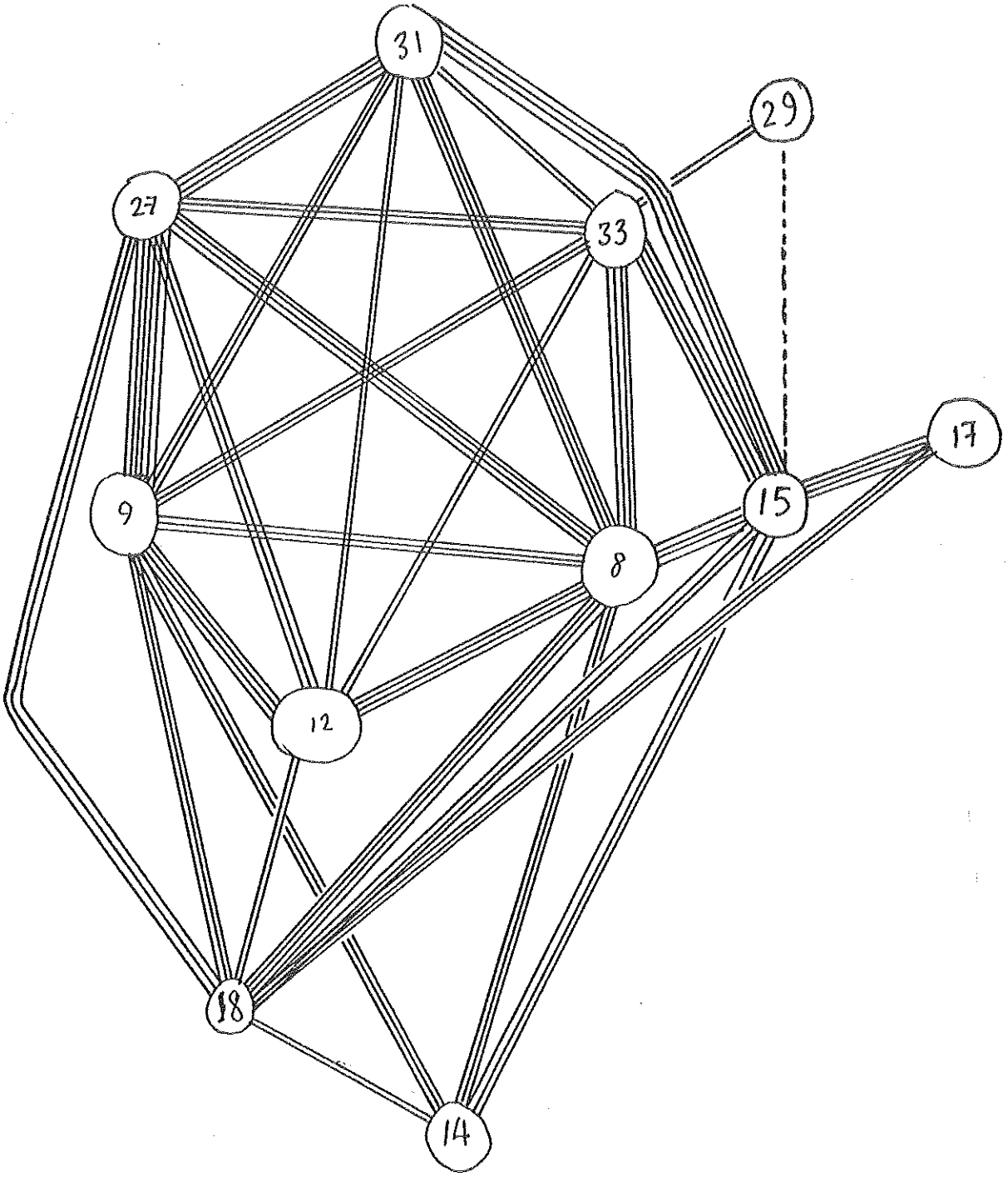
A similar correlation study has been made on the samples, to see which ones have common characteristics, and to put these similarities and differences on a numeric basis.



29. Bracketed numbers = % calculated without Sambucus

LB II Similarities between Samples

no. of lines = no. of common characteristics



CHARACTERS AND SAMPLES WITH THEM

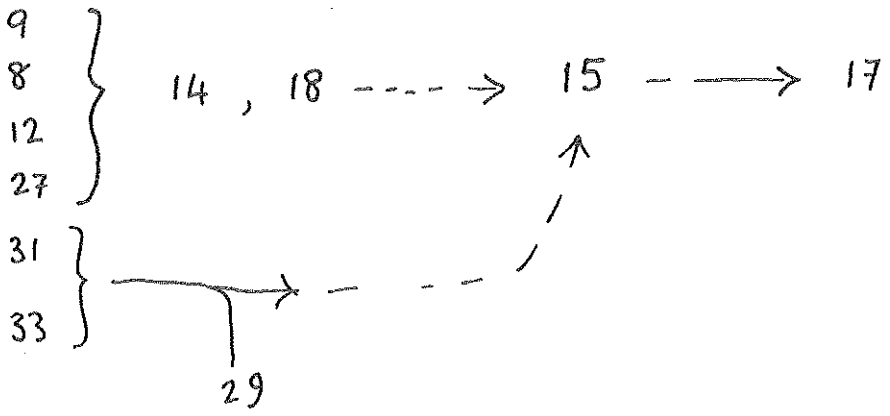
A	Compositae (L) over 7%	9, 8, 12, 27, 31.
B	Compositae (T) over 3%	9, 8, 17, 18, 27, 33.
C	more Cerealia than Gramineae	15, 17, 29, 33
D	more Gramineae than Cerealia	9, 8, 14, 18, 27
E	Tree pollen more than 20%	9, 12, 14.
F	Sambucus more than 2%	12, 27, 29
G	Plantago (L) more than 2%	9, 15, 17, 18, 27. (29) → when % calculated without Sambucus
H	Ericales more than 2%	8, 14, 15, 17, 18, 31. (29)
I	Centaurea (n) more than 2%	8, 12, 33. (29)
J	Cruciferae more than 3%	8, 14, 15, 31 (29)
K	Filipendula more than 1%	15, 17, 27, 31 (29)
L	Cyperaceae more than 3%	9, 12.
M	Dipsaceeae	8, 15, 33.
N	Umbelliferae more than 1%	9, 8, 12, 15, 27, 31, 33.
O	Urtica more than 1%	12, 15, 18.
P	Polygonum (av) more than 1%	29, 31, 33.
Q	Chenopodiaceae	9, 14, 15, 27, 29, 31, 33.
R	Caryophyllaceae	8, 12, 18

NUMBER OF OCCURRENCES OF CHARACTERS IN THE SAME SAMPLE

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
A		III	II	III	II	I	II	II	I	II	II	II	II	IIII	I	I	III	II
B	III		II	IIII	I	J	III	III	I	II	II	I	III	IIII	I	I	III	I
C	II	II		I	I	I	II	I	I	II	I	I	II	II	I	I	II	I
D	III	IIII	I		I	I	III	I	I	II	I	I	II	III	I	I	III	II
E	II	I	I	I		I	I	I	I	II	I	I	I	II	I	I	II	I
F	I	J	I	I	I		I	I	I	I	I	I	I	II	I	I	II	I
G	II	III	II	III	I	I		I	I	I	III	I	II	III	I	I	III	II
H	II	III	I	I	I	I	I		I	II	II	I	II	III	I	I	III	II
I	I	I	I	I	I	I	I	I		I	I	I	I	II	I	I	II	I
J	II	II	II	II	II	I	I	II	I		II	I	II	III	I	I	III	II
K	II	II	I	I	I	I	III	II	I	II		I	II	III	I	I	III	II
L	II	I	I	I	I	I	II	I	I	I	I		II	III	I	I	III	II
M	II	III	II	II	I	I	II	II	I	II	II	II		III	I	I	III	II
N	IIII	IIII	II	III	II	II	III	III	II	III	III	III	III		I	I	III	II
O	I	I	I	I	I	I	I	I	I	I	I	I	I	I		I	II	I
P	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I		II	I
Q	III	III	II	III	II	II	III	III	II	III	III	II	III	III	II	II		II
R	II	I	I	II	I	I	II	II	I	II	II	I	II	II	I	I	II	

The results can be arranged in various ways, such as the arrangement with different numbers of lines indicating points of similarity drawn between circles which denote the samples. A simplified version of this scheme appears below:

SIMPLIFIED CORRELATION BETWEEN SAMPLES



There is a group of very consistent samples (9, 8, 12, 27, 31, 33.) which are all similar to one another. Sample 14 is set somewhat aside from this group and set apart from this in turn are samples 15 and finally 17 which is very unlike any of the others. Sample 29 is another oddity which is vaguely related to 33 and 15. The very large amount of Sambucus pollen in this sample (45%) has had to be left out of the calculations because this alone would be sufficient to set 29 apart from the rest.

Conclusion

The samples of material are mainly consistent with conditions of deposition having been partly exposed to the atmosphere and collecting a certain amount of pollen from local scrub vegetation and weeds. The majority of the pollen record concerns the actual material deposited, and in the first series of consistent samples (9, 8, 12, and 27) the large amounts of grass and Compositae pollen suggests the use of hay, probably used as flooring. Sign of straw are also in evidence, in the second main group of samples (29, 31 and 33) more so than the ha Sample 14 seems to have been deposited in completely open conditions, while the very high level of Sambucus pollen in sample 29 probably means that some elder flowers were brought in. It seems unlikely that this Sambucus record equates with any find of seeds because the flowers are all gone by the time that fruit has been set. Elder could become incorporated in hay, but this is not usual practise, and if it is fresh elder that is represented, that part of the deposit must have been laid down around midsummer. Samples 15 and 17 stand out as unusual simply because they do not fit into the main groups.