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PRELIMINARY PALEOPALYNOLOGICAL ANALYSIS OF ALAMOSA FORMATION SEDIMENTS

by

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The gravels, sands, and clays of the San Luis Basin are divided into two groups: an older series of conglomerates with intercalated lava flows and a younger overlying series of blue clays with interstratified sand beds. The older conglomeratic series is the Santa Fe Formation, which has been shown farther south in the Rio Grande Valley to be Miocene in age (Siebenthal, 1910, p. 39). The younger, upper series of sediments of the San Luis Basin make up the Alamosa Formation (Siebenthal, 1910, p. 40).

In all places where the glaciers of the east range extended far enough, they deposited their moraines on top of the Alamosa Formation. The age of the Alamosa Formation is thus seen from its position above the Santa Fe Formation and below the glacial structures in the valley to be preglacial and post-Miocene. The evidence seems to indicate that sedimentation took place just previous to Wisconsin glaciation. The inference made is that the sediments are of Late Pliocene or Early Pleistocene age (Siebenthal, 1910, p. 46).

The sediments exposed at Hansen Bluff are in chronological order. Being thus deposited and having been mostly undisturbed, these sediments are suitable for paleopalynological analysis.

The purpose of the fossil pollen analysis project, which has been initiated this year, is to date the sediments more exactly. It is hoped that the pollen spectrograms and climatograms obtained by analysis will correlate with known changes in plant distribution or climate within the area. One such possible correlation, for example, would be the climate change and resultant ecosystem change caused by the glacial age.

The San Luis Basin is very flat and there are few natural exposures of the Alamosa Formation. Hansen Bluff, the best exposure, is located in the south-central part of the basin (E ½ sec. 10, T. 36 N., R. 11 E., Alamosa County), about six and one-half miles north of Las Sauses, Colorado. The bluff was created by the Rio Grande which has since moved its course away from the bluff. Approximately forty feet of Alamosa Formation sediments are exposed. They vary in size from fine gravel and sand to fine clay, and in color from pale red to yellowish brown.

Samples for the preliminary analysis were taken at each major change in sediment type. Nine samples were taken in the twenty-seven foot range from the upper Alamosa Formation sediment down to a hard sandy-clay layer which was chosen as a marker bed (fig. 1).

The potassium hydroxide-hydrofluoric acid-acetolysis



FIGURE 1.

Alamosa Formation exposed at Hansen Bluff.

process detailed below was used to extract the pollen from the sediment samples. The pollen is stained with saphranin "O" to make microscopic examination, identification, and counting easier. The pollen was mounted in glycerin for the preliminary analysis.

CHEMICAL TREATMENT FOR EXTRACTION OF POLLEN

1. Rub airdry sample through 1mm. mesh screen and discard all organic debris and rocks too large to pass through screen.
2. Soak sample in 10% KOH for 24 hours.
3. Strain through 1mm. mesh screen.
4. Decant back and forth to remove coarse sand.
5. Strain through 4 layers of gauze.
6. Centrifuge in polyethylene centrifuge tube at 1500 rpm for 45 seconds, decant supernatant.
7. Water wash, centrifuge and decant.
8. Hot 10% HCl, centrifuge and decant.
9. 48% HF, boiling water bath for 25 minutes, centrifuge and decant.
10. 2 hot HCl washes or more (wash until colloidal SiO₂ and silicofluorides are removed), centrifuge and decant.
11. Glacial acetic acid, transfer to glass centrifuge tube, centrifuge and decant.
12. 10cc. acetolysis mixture (9cc. acetic anhydride, 1cc. con. H₂SO₄), boiling water bath three minutes, centrifuge and decant.
13. Glacial acetic acid, centrifuge and decant.
14. 2 water washes, centrifuge and decant.
15. Strain with saphranin "O," centrifuge and decant.

16. Add glycerin mounting medium.
 17. Mount slide.
- Additional steps which will be used in future studies:
14. Divide sample into two equal parts, skip one part to step 18.
 15. Add 5cc. glacial acetic acid, add 2 drops con. HCl, stir, add 1 drop sat. NaClO₃ soln., stir one minute, centrifuge and decant.
 16. 2 water washes, centrifuge and decant.
 17. Glacial acetic acid, centrifuge and decant.
 18. 95% ethyl alcohol, centrifuge and decant.
 19. Absolute ethyl alcohol, centrifuge and decant.
 20. Acetone, stain part that went through 15-17 with safranin "O," centrifuge and decant.
 21. Benzene, allow to stand overnight, centrifuge and decant.
 22. Silicone oil, allow to stand for two days.
 23. Mount slides of each part of sample.

Many different processes use the potassium hydroxide, hydrofluoric acid, and acetolysis steps. This specific process was detailed by Dr. Hobart Dixon, Biology Department, Adams State College.

Three of the nine sediments yielded fossil pollen upon analysis. Two of these contained pollen in very low densities and the third, which also contained shells, contained a large amount of pollen. The pollen counts, however, did not include enough grains to be statistically accurate. The results, which can still be considered to indicate the fossil pollen content of the upper Alamosa Formation sediments, are shown in table 1.

Further work planned includes: complete analysis of all sediments exposed at Hansen Bluff and analysis of any subsurface samples of the Alamosa Formation which can be obtained. The same chemical processes will be used

TABLE 1.

Pollen counts from the Alamosa Formation at Hansen Bluff. Sediment levels measured upwards from marker bed.

POLLEN TYPE	GRAINS COUNTED		
	24 FT. LEVEL	1 FT. LEVEL	MARKER BED
<i>Chenopodiaceae</i>		1	
<i>Cyperaceae Carix</i>			1
<i>Cyperaceae Larix</i>		1	
<i>Gramineae</i>		1	7
<i>Gymnospermae</i> (unidentifiable further) . . .			4
<i>Juniperus</i>			50
<i>Pinus</i>	1	1	2
<i>Conifer</i> (unidentifiable further)			6
<i>Plantaginaceae</i>		3	
<i>Taxus</i>			5
<i>Urticaceae</i>		6	
Unidentified types (8 types total for simplicity)			13
Unidentified (generally because of damage to the grain)	9	4	1

with the added bleaching and dehydration steps noted previously. The pollen will be mounted in silicone oil which should produce permanent mounts.

REFERENCES

Siebenthal, C. E., 1910, Geology and Water Resources of the San Luis Valley, Colorado: U.S. Geol. Survey Water-Supply Paper 210, 128 p.