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CREATION RESEARCH SOCIETY STUDIES ON PRECAMBRIAN POLLEN—PART II: EXPERIMENTS ON ATMOSPHERIC POLLEN CONTAMINATION OF MICROSCOPE SLIDES

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Abstract

In criticizing studies of fossil pollen extracted from rock samples, positive results have been questioned or even discredited with the claim that various grains on the slides are merely the result of atmospheric, non-fossil pollen which contaminated the sample in the field or laboratory. Here we have undertaken to assess the rate at which pollen grains will actually contaminate exposed slides-with the goal of determining just how valid are the claims that pollen contamination might routinely occur in the laboratory or during field work.

Introduction

A. V. Chadwick (1981) attempted to repeat C. L. Burdick's discovery of pollen in Precambrian Hakatai shale samples from The Grand Canyon (1966 and 1972). Chadwick asserted that Burdick's apparent success probably had resulted from contamination:

> The simplest hypothesis to explain Burdick's data is that the pollen grains he reported in 1966 and 1972 were modern contamination picked up either during collection and transportation or infiltrated into the sample itself prior to collection (Chadwick 1981, p. 9)

Here Chadwick did not directly attribute Burdick's pollen grains to actual contamination during laboratory processing, but he implied as much and he did assert that the samples probably got contaminated from the atmosphere/during collection or transportation.

In reporting on his own failure to recover pollen grains or spores from similar Precambrian rock samples (1981), Chadwick notes that he had used filtered air maintained at positive pressure in his palynological laboratory. Upon reading the Chadwick paper, one is left with the impression that air is normally loaded with spores and that unless the sample preparation room is supplied with filtered air under positive pressure, any slides examined are likely to show contaminant pollen from the atmosphere of the laboratory room itself.

In their letter to the editor of Geotimes (1973) Solomon and Morgan made the following comment concerning the claim that pollen grains in Burdick's 1966 paper were fossil pollen and not the same as those of modern pines or Douglas fir trees now growing along Grand Canyon walls:

> The point is important, for if the pine was modern, then Burdick's palynology instructor at that time was more likely correct when he initially identified the pollen as contaminating modern pine pollen (G. O. W. Kremp, personal comment). Coincidentally the pine populations some 1,000-4,000 ft. above Burdick's head were pollinating at the time he was collecting samples. (Solomon and Morgan, 1973, p. 10)

Thus by implication and direct statement these workers have also expressed the opinion that the pollen grains found in Hakatai Precambrian shale by Burdick had entered the sample from the atmosphere during the time the sample was being extracted from the strata.

While we believe that reasonable steps should be taken to avoid atmospheric contamination while gathering samples in the field and when processing them in the lab, we have wondered how much care is really necessary. We were curious regarding just what must be done to insure that spores seen in preparations from rock samples actually represent pollen from that rock and not contaminants from laboratory air or from pollen present in the air while samples were being chipped from strata and put into plastic bags. It is this problem which we address in this paper.

Methods and Materials

In our experiments ordinary glass microscope slides were exposed to the atmosphere under various environmental conditions to determine the likelihood of pollen contamination. Sometimes the particular slide was greased with Vaseline to enhance pollen capture (Table I, Experiments 3-7) and on some occasions a slide was exposed without Vaseline (Experiments 1-6, and 9). In Experiment 8 double-coated scotch tape was placed on a glass slide instead of the Vaseline. On another occasion drops of water were added to the same spot on a slide at different times and were allowed to evaporate while the slide was exposed in a laboratory room for a total of 86 hours (Experiment 10). After

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Table I. Pollen Grains Found on Exposed Slides.

Experiment Number	Date	Location	Conditions of Exposure	Exposure Time	Number Pollen Grains
1	Summer 1983	Freedom, CA	20 feet from sunflower patch; slight breeze; one slide without Vaseline	20 minutes	0
2	Summer 1983	Freedom	Near pollinating corn plants; slight breeze; one slide without Vaseline	20 minutes	0
3	2-20-84	Freedom	Seven feet from pollinating branch of *Pinus radiata* (Monterey pine) and 20 feet from shrub of *Lepto-spermum sp.* in bloom; almost no breeze; two slides— one with, one without Vaseline	20 minutes	0— plain slide 3— Vaseline
4	2-22-84	Freedom	As in Experiment 3 but a very breezy day	10 minutes	12— plain slide 0— Vaseline
5	2-22-84	Freedom	Same day and situation as with Experiment 4	10 minutes	15— plain slide 12— Vaseline
6	2-23-84	Freedom	20 feet from pollinating pine branches; almost no breeze; two slides— one with, one without Vaseline	20 minutes	0— plain slide 0— Vaseline
7	9-23-70	Newhall, CA	On small table under oak trees; one slide— Vaseline coated	48 hours	23— pollen grains and spores
8	12-1-70 12-4-70	Newhall	On small table under oak trees; slide with double-coated scotch tape attached	3 days	3
9	2-25-84	Freedom	Overnight exposure in office; near nine trees: slide without Vaseline	15 hours	0
10	9-12-85 to 9-16-85	Newhall	On laboratory table. Drop of water added and allowed to evaporate five times during interval	86 hours	0

each experiment acetocarmine stain was added and the slides were examined for pollen grains.

In another series of experiments (Table II) a whirling sample collector called a "fly-shield rotobar" was used. Two glass slides with a strip of double sticky tape attached along the long, narrow, leading edge (1 X 75 mm) of each were spun rapidly by the rotobar arm attached to an electric motor for one out of every five minutes during the particular sample interval. The total area of tape thus exposed by both slides being whirled was 1.5 cm^2. This sampling device was mounted on the roof of the dining hall at The Master's College, Newhall, CA.

Results and Discussion

One feature emerging from these experiments is the relatively low number of pollen grains (sometimes no grains at all— Experiments 1, 2, 3, and 6) found on slides exposed to the air outside. Likewise in these observations the role of wind became obvious. In 10 minutes on a very breezy day (Experiment 5) 27 pollen grains were deposited on two slides near a pine tree. But a set of slides exposed at the same location on a day with little or no breeze yielded no grains on either slide (Experiment 6).

It thus appears that an increase in air movement increases the level of pollen contamination on exposed slides. Evidently on quiet days pine and other pollens generally remain in their cones or inflorescences, as the case may be, and are shaken into the air infrequently.

This breeze factor (or the lack of it) likewise appeared when slides were exposed to the relatively still air in an office and a laboratory (Experiments 9 and 10 respectively). No pollen grains were recovered on two slides in a total of 101 hours exposure— taking Experiments 9 and 10 together. In the same laboratory that Experiment 10 was conducted during the same days, numerous spores were being discovered on the Hakatai Precambrian slides. The data will be presented in Part III of the series and has been mentioned in a Panorama note (Howe *et al.*, 1986).

We also found that pine pollen is quite sticky so that covering the slide with Vaseline evidently gives no advantage (see Experiments 4 and 5). In fact, when Lammerts shook pine pollen onto a glass slide and then inverted the slide, practically all of the pollen stuck to the slide.

Using the rotobar sampling machine (Experiment 11, Table II) only two pollen grains were picked up during a six hour sampling period from 11 p.m. to 5 a.m. In Experiments 11 and 12 together (Table 11)

Table II. Pollen Grains Collected using The Fly-Shield Rotobar Apparatus.

Experiment Number	Date	Elapsed Time in Hours	Number of Pollen Grains per 1.5 cm^2 of Tape
11	November, 1970	6	2
12	11-16-70 to 11-18-70	40	3
13	2-13-71 to 2-14-71	23.5	318

only five pollen grains total were collected in a period of 46 hours. It can be properly argued here that November in Southern California is a relatively pollen-free period. It was decided thereafter to sample during daylight hours and to add laboratory grease to the strips of sticky tape.

Using this modified sampling procedure (Experiment 13, Table II) 318 pollen grains appeared on both tapes after a 23.5-hour period in February. Thus the fly-shield rotobar data are similar to the gravity data in that both the cloudy, non-breezy days of Autumn (Experiments 11 and 12, Table II) and the non-breezy days of Summer (Experiments 1 - 3 and 6) showed very low numbers of pollen grains contaminating exposed slides. During breezy days, however (Table I, Experiments 4 and 5), as well as during the breezy days of Spring when oak trees were pollinating (Table 11, Experiment 13), larger numbers of pollen grains were collected.

Conclusions

The pollen grains of the Monterey pine in this present study were quite unlike those shown in Plate IV of Burdick's 1966 paper illustrating the spores found in Precambrian Hakatai shale. Thus whatever they may be, these later spores are certainly not due to contamination from modern pine plants. Although Burdick portrayed 31 different pollen grains in his two papers (1966 and 1972), Chadwick (1981, p. 10) matched only five of these with modern representative pollen grains.

In these experiments we do not deal with the possibility that the Hakatai shale rocks somehow became contaminated with modern pollen grains during the long time interval after the rocks formed (lithification) and before our samples were extracted. We will discuss that in a future paper.

The present results do not prove that all the grains found on recent slides (Howe *et al.*, 1986) or Burdick's slides (1966 and 1972) were deposited during the formation of Precambrian rock: but they do demonstrate that the chance of contamination by airborne pollen during the slide preparation stage and during periods of field work is extremely low. It would seem, as well, that Chadwick's overwhelming concern (1981) with contamination when preparing and examining slides is unjustified. Evidently whatever pollen might blow into a laboratory on a windy day quickly settles to a desk top or floor where it sticks. It would seem, as well, that reasonable care in cleaning the table, the slides, and the cover slips would make positive pressure and filtered air supplies an unnecessary precaution during the processing of the rocks and analysis of slides.

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COMETS AND CREATION

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Abstract

It is well known that comets are fragile objects and cannot exist in the inner solar system for more than a few hundred revolutions around the sun. Naturalistic theories for their creation and maintenance are shown to be inadequate to explain their continued existence if the solar system were really old. Evidences for a young age for comets are presented.

Introduction

Comets have long been a weapon in the creationist arsenal. They are by nature short-lived objects; their lifetimes while in the inner solar system are measured in the thousands of years. Their continued existence, therefore, is evidence for the youth of the solar system. Of course, astronomers are aware of the problem and have devised a number of models of cometary origin in an effort to explain how we can continue to observe comets in a solar system which is supposed to be about

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