

## Yellow rain

# Fresh support for apian origin

YELLOW rain may not be a chemical warfare agent after all. According to four scientists in the geology section of China's Nanjing University, it is a natural phenomenon. In a recently discovered paper published in a Chinese journal, *Kexue Tongbao*, in September 1977, the scientists describe "yellow rain" in the central province of Northern Jiangsu and say that it was probably bee excrement released by the insects on cleansing flights.

The same theory has been put forward by Professor Matthew Meselson of the Department of Biochemistry and Molecular Biology of Harvard University to explain the presence of yellow rain in the South-East Asian countries of Laos and Kampuchea (see *Nature* 303, 3; 1983).

According to the United States State Department, yellow rain is a chemical warfare agent being used by Soviet-backed forces in Laos and Kampuchea to harass and kill refugees and enemy soldiers. The Soviets have consistently denied these allegations.

It is far from clear why the Chinese paper, "A study of the origins and the pollen analysis of 'yellow rain' in Northern Jiangsu" (*Kexue Tongbao* 22, 409-412; 1977) has taken so long to surface. Britain's Chemical Defence Establishment at Porton Down has been aware of its existence for some time but has made no public comment about its contents.

Writing in language used during China's cultural revolution, the scientists, Zhang Zhongying, Chen Yuming, Zhou Shu and Li Min, describe their investigation in Jiangsu in September 1976. According to the authors, the "masses" were concerned about the "yellow rains" which were falling over the countryside and, true to the spirit of the times, scientists were sent to investigate.

The yellow rain is described as being glutinous and falling in showers lasting sometimes as long as ten minutes. On the ground, circular or oval spots were yellow or brownish-yellow in colour, slightly raised and looked like half a soya bean. The spots varied in size from 2 to 6 mm and covered areas varying in size from a few acres to more than 100 acres.

Analysis of 500 spots confirmed that they were composed primarily of pollen grains. Most of the pollen (83 per cent) was from a species of elm, *Ulmus parvifolia*, which flowers in September. Some 11.8 per cent of the pollen was from Gramineae and 3 per cent from Compositae. There were no spores from fern. Yellow rain collected from two districts, Hai'an and Xinfeng, had a similar composition.

Zhang Zhongying and his colleagues say that the pollen present in the yellow rain reflected the types of plants flowering at the time. They say that bees harvest pollen from *Ulmus*, Gramineae and Compositae

in the autumn. Some yellow rain spots collected from the surface of ponds contained pollen from the water weed *Nymphoides* and a plant seen on river banks, *Chlamydomonas*. Bees require a good deal of water when they are at work. The scientists say that it would be difficult to explain the presence of the pollen of these last two species in yellow rain specimens if it were not related to the activities of bees.

Comparing pollen grains in excrement removed from the bees with that present in yellow rain showed that both had a similar percentage of damaged grains. Of 190 grains removed from the gut, some 12.1 per cent were damaged whereas 12.6 per cent of the 213 grains taken from yellow rain spots were damaged. Some 99 per cent of the pollen on the body surface of the bees was undamaged. Bees lack the intestinal enzymes capable of digesting pollen grains and extract the necessary protein, starch and fat from cracks in the wall of the grain.

Examination of the yellow rain spots is said also to have revealed the presence of other substances. The scientists say that some of these were filamentous. Algae and bacteria were also present. Finally, the scientists note that there were a large number of bees in the areas where yellow rain occurred.

It would appear from the contents of the Chinese paper that the phenomenon described in Northern Jiangsu is remarkably similar to that which occurs in

Laos and Kampuchea. Yellow rain, it seems, does exist and seems to be a natural phenomenon.

Meselson put forward this theory when he spoke at the annual meeting of the American Association for the Advancement of Science this summer. Following his address, the State Department countered by dismissing Meselson's theory as "the great bee caper", claiming that government scientists had rejected the suggestion that yellow rain was a "natural phenomenon".

None of this has worried Meselson unduly. He is all the more convinced that yellow rain is a natural phenomenon following the discovery of the Chinese paper. He believes that there could still be a problem of fungal toxin poisoning among the population of South-East Asia, but that this is probably due to the consumption of mouldy food.

Analysis of the mycotoxins in tissue samples removed during an autopsy carried out in Kampuchea on a Khmer soldier — allegedly exposed to a yellow rain chemical warfare agent five weeks previously — revealed higher concentrations of the toxin T-2 in the stomach and intestine than in other organs. Given the fact that the toxins have a relatively short half-life in animals, Meselson and three colleagues, in a letter in last week's *Science* (28 October, p.366) argue that the autopsy data would suggest that the soldier had eaten mouldy food a day or two before he died. The State Department has yet to react to this latest evidence and to Meselson's interpretation of events. **Alastair Hay**

## Polish science

# Travel still a problem

THE Polish Government's period of amnesty for Solidarity activists who had continued their activities during the period of martial law expired last Monday. According to Polish Government spokesmen, life in Poland is now virtually back to normal. For scholars employed by the Polish Academy of Sciences who wish to travel abroad, however, one innovation of the martial law period is still much in evidence — the special form which the intending traveller is obliged to sign.

The early clauses of this document are innocuous: name and academic qualifications, place of employment and so on. Point 7, however, demands an extremely detailed account of "purpose of travel and scientific aims", including, for example, the exact title of the paper to be read at a conference or the exact topics to be discussed during a visit to a laboratory.

By point 8, unreality creeps in. The applicant's boss has to authorize him or her to deliver the invited paper and conduct conversations on the approved topic. In point 9, the traveller's duties are further spelled out; the traveller is obliged, if something arises not covered by point 8, to

get in touch with the academy or the nearest Polish embassy or consulate before making any decision. The traveller, moreover, is bound to present a viewpoint in accordance with the *raison d'état* of the Polish People's Republic and to report in person or (if this is impossible) by telephone to the Polish embassy or consulate of any country visited. Finally, the document notes somewhat sinisterly that "the duties of the traveller after returning from abroad are governed by special regulations".

The traveller submitting this document deals as following with the ethical contradiction in his action: "You may ask how, by sending this letter, did I abide by the duties imposed on me by the document I signed. Well, I kept my word exactly to the extent that the Polish Government kept its word — signed in August 1980 — in December 1981. He who breaks his promises has no right to expect others to keep theirs. And I believe that informing my fellow scientists abroad that the persecution of free thought continues in Poland is in the best interests of Poland — even if not in the interests of the "Polish People's Republic". **Vera Rich**