The Influence of Pollen on Different Aspects of our Cultural Heritage

Direct influence

In its role as one type of airborne particle pollen seems to have a relatively insignificant effect on our cultural heritage. Pollen may be responsible for some slight damage, in acting as a transport medium for adherent air contaminants, but scarcely ever is a large amount of pollen found as a deposit on the ground, except on water surfaces such as those of puddles or lakes. The only direct negative effects on stone and metal which can be envisaged are in terms of congestion of the surface.

Indirect influence

In nature, pollen is essential for the process of fertilization in plants, which leads ultimately to the production of seed. Once the seed is dispersed the resulting plants can cause damage to the cultural heritage by pushing their roots into cracks or even growing epilithically or endolithically. It is not pollen, however, which is the agent of destruction but the plant itself. Pollen does not cause damage directly.

The negative effects of pollen on man

In contrast, pollen is very definitely responsible for negative effects on man. Pollen protein causes reactions in the skin and mucos of sensitized people which can sometimes even be dangerous. The classical symptoms in the beginning are watery, itching eyes and a runny nose with frequent and heavy sneezing. At a later stage, bronchitis and allergic asthma, in particular, can affect the prosperity of allergic individuals. In Europe there are just a few pollen types which cause more than 90 % of the pollen allergies. In order of flowering these are : *Betula* (birch) and its near relatives such as *Alnus* (alder) and *Corylus* (hazel), *Poaceae* (both wild and cultivated grasses e.g. rye), *Oleaceae* (olive and ash), *Artemisia* (mugwort) and *Ambrosia* (ragweed). In the Mediterranean pollen of *Parietaria judaica* also frequently appears in the winter causing severe symptoms.

Pollen as an indicator of changes in climate and agricultural practice

Pollen may also be used as an indirect indicator of changes in regional climate and as a mirror of cultivation. Variations in land use can be followed over the past 5000 years or so by means of pollen analysis of peat deposits and lake sediments. In this respect there is a connection between pollen as airborne particles and the cultural heritage in terms of agriculture.

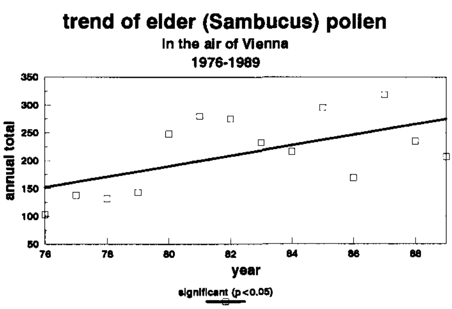
During the last few decades accelerated forest decline has become a problem which is also being monitored by aerobiologists. Since monitoring the pollen content of the air is a relatively young science which, in most European countries, has only been undertaken on an organized scale for about twenty years, the series available are not yet long enough to give reliable trends in the pollen content of the air.

Nevertheless, preliminary trends with respect to aeroallergens can be published. In the meantime, summaries of the occurrence of allergenic pollen across the whole of Europe are in preparation and will be presented at 4th International Conference on Aerobiology in Stockholm, 27-31 August, 1990.

The European Aeroallergen Network (EAN)

Primarily in order to provide hayfever forecasts, a European Aeroallergen Network has been developed (co-ordinator S. Nilsson, Sweden) with a central data bank in Vienna. The installation of the European Network Server marks the establishment, at long last, of a central and readily accessible data bank for all participating countries. The data bank is designed as a tool for stimulating research into, as well as the routine prediction of, airborne pollen and spores. One aim has been to set up a more comprehensive documentation of European pollen data based on volumetric sampling than has previously been attempted.

Access to the data bank has been made as simple as is compatible with safeguarding individual author's copyright. The time has now come for a systematic exploitation of the available facilities in order to obtain new perspectives which may be of practical value by rigorously analysing the data which has been collected. Trend analyses for the Vienna region show that a



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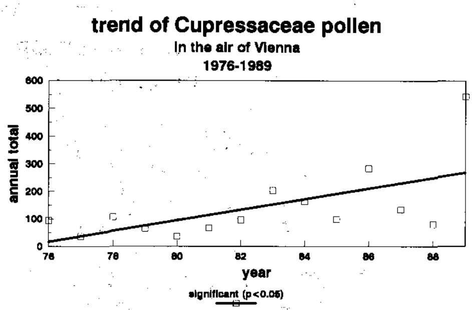

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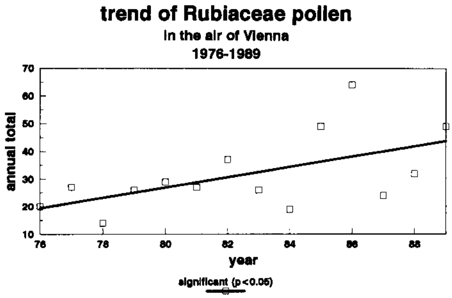

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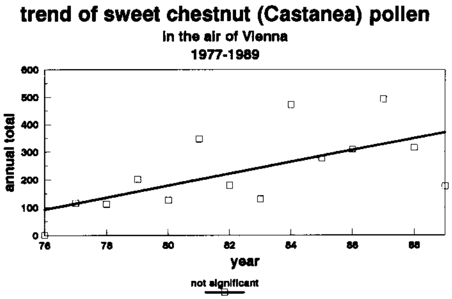

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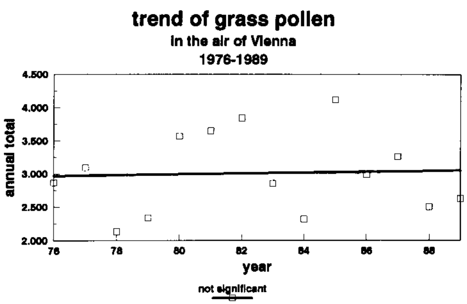

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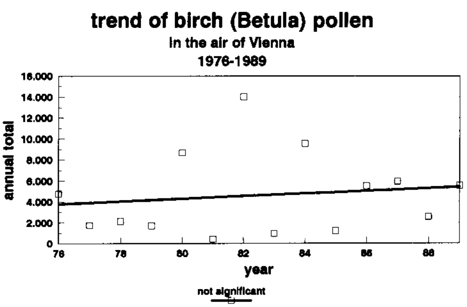

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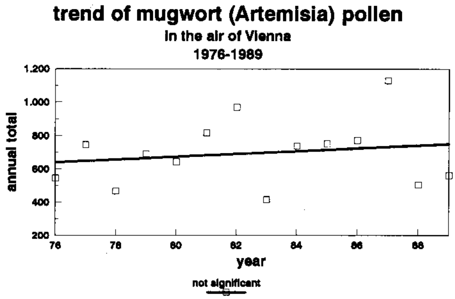

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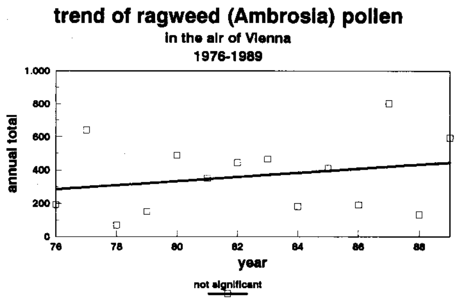

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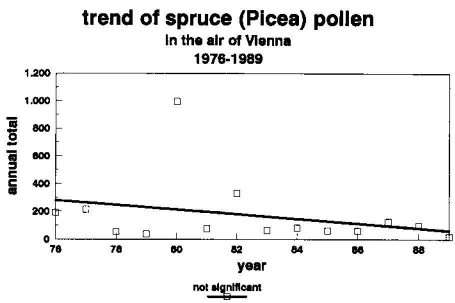

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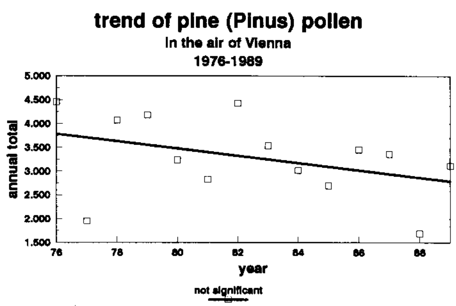

fig. 10

number of pollen types have more or less significant trends for the last 14 years for which they have been observed. It is of practical interest to see whether these same trends can also be seen in other parts of Europe, both with regard to changes in the amount of allergic pollen present in the air and with regard to the disappearance of the pollen of those trees most endangered by air pollution. To obtain long-term evaluations, as, for example, with trend analyses, the last two years of data storage is by no means enough. Therefore, we are adding more data from the past.

The setting up of the data bank makes it possible to attempt the solution of a whole range of problems which have previously been quite intractable because of the lack of comprehensive data.

These problems can be divided roughly into two groups :

* problems related mainly to short-term pollen prediction, and
* retrospective analysis of those factors affecting the distribution and spread of pollen.

This second group also includes questions of regional and supra-regional changes in climate and flora and aspects of the multi-facetted problem of forest decline.

Trends in the occurrence of pollen during the past 14 years in the Vienna region (Austria)

As an example of floral shifts, a trend analysis of several pollen types in Vienna over the past 14 years are presented (Fig. 1-10). Four of the 58 pollen types examined show a significant increase in their annual total during the past 14 years.

Varia, *Sambucus*, Cupressaceae and Rubiaceae. « Varia » is the total of those clearly determined grains which are not listed in a previously fixed computer list of 58 types. There is no doubt that the significant upward trend is correlated to a high degree with the increase in knowledge of the person doing the analysis.

Sambucus (elder, Fig. 1) is a widespread plant which follows human settlement. It is mostly found on soils which are enriched with nitrates.

The extension of the suburbs may account for the increase in this pollen type. Similarly, Cupressaceae (juniper, *Thuja, Chamaecyperis* and others, Fig. 2) are increasingly cultivated in urban and suburban areas. In the case of Rubiaceae (Fig. 3), the species of which are mostly meadow weeds but which also includes several species which grow in woods, we are unable to find an explanation for the significant upward trend, unless we include the possible misidentification of some of the grains.

The upward trend in *Castanea* (chestnut, Fig. 4) is very close to significant. Its pollen cross-reacts in skin tests with that of birch. Therefore, *Castanea* may become a relevant pollen allergen in the Vienna region if this trend continues over the following years. With this in view we have prepared both test solutions and immunological tests as well as therapeutic solutions in order to be prepared should *Castanea* prove to become a potent allergen.

The most important allergenic pollen, Poaceae (grasses), *Betula* (birch), *Artemisia* (mugwort) and *Ambrosia* (ragweed) show no significant trends in their annual totals (Fig. 5-8). With respect to forest decline the pollen of *Picea* (spruce, Fig. 9) and *Pinus* (pine, Fig. 10) are of some interest since it is the gymnosperms which first, of all the trees, have shown growth damage. A downward trend is observable in both cases but these trends are not yet statistically significant.

Conclusions

European pollen experts should cooperate in analysing the available data for significant indicators relevant to the development of the European flora. This will provide a basis for the discussion of current trends. A joint effort should be made to increase public awareness of these trends and to present them in a suitably clear form. Post-glacial forest history provides us with sufficient models to detect climatic changes and those changes in the flora which result from human activities. They also enable us to assess the possible effects of these changes on man and his environment, not simply from the allergological point of view.

Siegfried JÄGER
HNO Klinik 1
Lazarettgasse, 14
A - 1090 WIEN, Austria

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