THE SPATIAL DISTRIBUTION OF TRACE ELEMENTS

IN PRETORIA

Many studies have been undertaken in the past using various species of vegetation as a bio-sampling medium to enable an examination of the distribution of various trace elements in the environment. The studies have normally been confined to either areas surrounding known pollution sources or industrial complexes. However, the technique has also been extensively used in mineral exploration.

The unique widespread distribution of Jacaranda trees (**Jacaranda mimosaefolia**) throughout Pretoria, provided an opportunity to study extensively the distribution of certain trace elements within the urban area. After a number of small pilot studies it was decided to concentrate on the trace elements : iron, manganese, zinc, copper and lead.

Four hundred samples of leaves were collected on a five hundred square metre grid in June this year. Each of the samples were oven dried, weighed and then cold digested with 3,5N nitric acid prior to analysis by atomic absorption spectrometry. Both collection and analysis were completed within two weeks.
In parallel to the collection of data a computer program had to be adapted to accept the results and produce plotted contours which can be interpolated across small areas of missing data.

To date the data have been entered into the computer and maps have been produced giving the distribution of the studied trace elements. The maps show the comparative distribution of 'low' and 'high' areas of concentration within Pretoria.

By studying the distribution of a number of different contours for each trace element, it is possible to determine a 'background' concentration in the Jacaranda leaves. This information will help to direct further studies into the high anomalous areas in future.

The study of the various 'high' areas is now under way and data are being collected on the geology, soil types, traffic flow and local pollution studies. The wind data, as collected by the Weather Bureau for the season November, to May have already been analysed.

There are a number of observations which can be made with regard to the results to date :

a) The maps produced clearly show 'high' and 'low' areas of concentrations for the elements under study.

b) The contour pattern produced from a sample collection grid of 500 m^2 is more detailed than that produced by a 1 km^2 grid. However the latter still illustrates the overall spatial distribution in Pretoria.

c) If samples are taken very close together (every 40 metres) then a micro-picture can be built up of a small area. For example, levels of lead can be illustrated to be elevated at points of local traffic congestion in the adjacent tree's leaves.

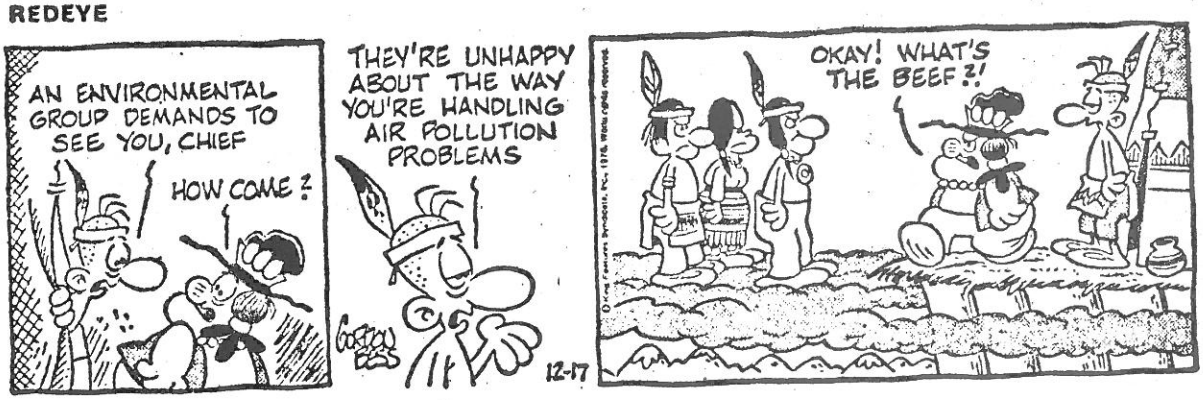
d) In general, the major area of elevated levels of zinc, copper and lead lie on a east - west orientation through the city and also in the northwest region. The concentration of manganese is the highest in the very south of the region. The distribution of iron is concentrated in the northwest of the city, which becomes significant when the influence of the predominant wind directions are taken into account, thus revealing the influence of the major steel works in the west of the city.

e) Finally it has been demonstrated that a large number of samples can be collected and analysed, the results processed and maps of the spatial distribution of the studied trace elements produced within a short period of time (in this case four weeks). In this manner this type of survey could be extensively used prior to any large-scale monitoring exercise which would employ expensive and sophisticated equipment, thus ensuring the most effective use of the equipment.

N WALKER Atmospheric Sciences Division National Physical Research Laboratory CSIR

August 1983

REDEYE **by Gordon Bess**



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