In any event, if it is equally legitimate to read a sand-clock by counting grains and by weighing them, it must also be equally legitimate to read a measuring rod by counting its divisions or weighing a piece of it, so that any difficulties on this score about clocks will be paralleled by difficulties about rods. The problems of a logical theory of measurement appear to be symmetrical with respect to space and time.

M. H. A. NEWMAN.

St. John's College,
Cambridge. Nov. 27.

[1] NATURE, 144, 888 (1939).

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I CANNOT agree with Mr. Newman that an instrument which measures time in terms of the mass of fallen sand is not a clock. If such an instrument is passed by a recognized observatory, I should be glad to know on what authority Mr. Newman would reject it. If it is accepted, then the mass must be measured, directly or indirectly, whenever it is used, whether moving or at rest. A consideration of what an observer would see on a dial is not sufficient to determine such a measurement, as perhaps the following example will show most convincingly. Suppose we wish to find how mass varies with velocity. Insert a body in an apparatus which indicates its mass by a pointer reading on a dial. Now recede from the apparatus with velocity, $v$. So long as the dial can be seen its reading will, clearly, appear the same. Hence if Mr. Newman is right, mass is invariant. It is not "equally legitimate to read a measuring rod by counting its divisions or weighing a piece of it", because the standard of space measurement in physics is defined as the length, and not the weight, between two fixed marks.

I should add that I did not say that "it is correct to deduce the 'Fitzgerald contraction' of moving bodies from the Restricted Principle of Relativity". The Restricted Principle of Relativity is an expression of the Fitzgerald contraction.

HERBERT DINGLE.

Imperial College of Science and Technology,
London, S.W.7.

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## Flame Method of Spectrochemical Analysis

UNDER the present troubled conditions there is no prospect of Dr. F. Majewsky's publishing in the near future his six months' work here ending August 1938. I therefore wish to place his main results on record.

His main work consisted in improving and adapting for routine use Ramage's flame method of spectrochemical analysis. Ramage[1,2] burnt a small quantity (usually 50 mgm.) of powdered plant material rolled in filter paper in an oxy-coal-gas flame in front of a spectrograph. Reproducibility of results depended on the uniformity of feeding the roll into the flame. This was made difficult by the roll bursting into flame just outside the oxy-coal-gas flame.

The difficulty was overcome by raising the roll to a sufficiently high temperature to drive off inflammable gases and carbonize it before burning it in the oxy-coal-gas flame. This improvement alone resulted in increased reproducibility of results and increased sensitivity of the method.

We affected a further improvement by combining with the heat treatment immersion in ammonium chloride vapour to convert the minerals into their chlorides. This resulted in an increased sensitivity which varied from thirty-fold for calcium, the chloride of which is much more volatile than the carbonate, to nil for potassium, the chloride and carbonate of which are about equally volatile.

Dr. Majewsky was able to burn a roll treated in this way always in 75 seconds, whereas untreated ones were consumed in about 50 seconds, but the actual time varied by some seconds from roll to roll.

Quantitative results were obtained by comparing the unknown spectra with those given by rolls impregnated with known mixtures of salts. A statistical analysis of the results obtained with strawberry leaves showed that the means of two determinations each done in triplicate must differ by 12–18 per cent to have a twenty to one degree of significance. This degree of accuracy is sufficient for many horticultural purposes.

Differences between replicate determinations were much less for solutions than for leaf material, and the apparent amounts of most of the minerals showed parallel variation in the spectra of solutions but less so in those of leaf material. These results suggested that the comparatively small variation between replicates of determinations on solutions was due to faulty standardization of burning, and that the increased variation between replicate results on leaf material was due to lack of homogeneity of the leaf sample. These and other facts raise the hope of a further considerable increase in sensitivity and accuracy.

The comparatively simple and inexpensive method worked out by Majewsky was then used by S. G. Thompson for examining leaf samples sent to East Malling by me from South Africa, and proved adequate for a preliminary survey of the mineral status of fruit trees. The results obtained showed some remarkable agreements with horticultural performances and with diagnosis by plant injection.

As there is unfortunately no prospect of Majewsky's paper being published in the near future, it seems desirable to report briefly his contributions before their importance is masked by the superstructure which we hope to build on them.

W. A. ROACH.

East Malling Research Station,
Kent. Nov. 30.

[1] Ramage, H., NATURE, 123, 601 (1929).
[2] Ramage, H., NATURE, 126, 279 (1930).

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## Surnames and Blood-Groups

As is generally known, very large series of blood-groupings have been made in recent months in connexion with the emergency blood transfusion service. Among these depots, one has about 12,000 cases on record.

As the district is one of recent industrial development associated with immigration, it occurred to us to examine whether the blood-group frequencies are associated with surnames. A group of characteristically Welsh surnames was chosen centred on the eight types, Davis, Edwards, Harris, Jones, Lewis, Morgan, Phillips and Roberts, a selection for which we are indebted to Mr. B. S. Bramwell of the Society of Genealogists. This accounted for 5·2 per cent of our sample.

The percentages of the four blood-groups and the two sexes are shown in the accompanying table.

PERCENTAGES CONTRIBUTED BY THE SELECTED WELSH SURNAMES TO DIFFERENT GROUPS.

| | *O* | *A* | *B* | *AB* |
|---|---|---|---|---|
| Women | 5·4 | 4·3 | 5·7 | 3·8 |
| Men | 5·7 | 5·1 | 5·9 | 4·5 |