

suggestion fits in well so far as the first part 'san' is concerned. But how a syllable like 'tra' came to be affixed is not at all explained. It seems therefore possible

(1) that these words *santra* and *narangi* were non-existing before the fruit was known to the Aryans. The Chinese and the Khasi languages have their own distinct vernacular names for these fruits;

(2) the fruit was existing in the north-eastern parts of India before the Aryans came there;

(3) the fruit must either be indigenous in the north-eastern parts of India, or it must have been introduced there from the neighbouring countries on the East, in prehistoric times.

Letters to the Editor.

Elimination of Bias due to Selection.

As correlation methods are being used now-a-days to a much greater extent than before for forecasting, say, the rainfall or temperature at any place or even the amount of wheat grown in any particular area, a problem, which is often overlooked by forecasters, has become somewhat important. The problem arises in the following manner.

When we want to select some factors for forecasting a quantity, we often take a number of factors, correlate each of them with our forecasted quantity and select out of these factors two or more factors which give the highest C.C. (written in short for correlation coefficient) with our forecasted quantity. In testing these selected C.C.'s for significance, some forecasters apply the usual tests for significance, overlooking the fact that these tests are meant only for C.C.'s selected at random and not for C.C.'s so deliberately chosen as these. In these latter cases Walker's test¹ has to be applied.

Now, all that Walker's test tells us is whether our selected C.C.'s could have been obtained by mere random chance from populations of which the C.C. ρ is zero. By "random chance" is meant here either Walker's level of significance, *viz.*, 50%, or the 5% level of significance suggested by R. A. Fisher. If the selected C.C.'s could not have been obtained by random chance from populations in which $\rho=0$, the C.C.'s are considered significant, and the selected factors are used to give a forecasting formula in the usual manner.

The forecaster is also very much interested to find out the approximate value of the C.C.'s of the various populations from which our selected C.C.'s are samples, in order to determine, at least qualitatively, the amount

of reliance that he can place in his factors. For this purpose he will have to apply Normand's Performance Test.² Unfortunately he will have to wait for a number of years for the accumulation of data before he can use the Performance Test. As this Test is thus not of immediate use, a method has been discovered by which it is possible to eliminate the bias due to selection from each of the selected C.C.'s and thus get values which are the least values of the corresponding ρ 's of the populations either on Walker's or Fisher's level of significance. Full details of the method are given in a paper which will be published elsewhere. Only a gist will be given here.

Let ρ be the C.C. of the population from which m random samples of n values each are drawn and let the C.C.'s be worked out for each sample. Suppose we select $(l+1)$ highest C.C.'s of which let the lowest value be r_1 . Let p be the chance of obtaining a C.C. numerically less than r_1 in a random sample of n from the population. Then the chance of getting in the selected $(l+1)$ C.C.'s no C.C. which is numerically less than r_1 , out of m random C.C.'s is given by

$$P = 1 - (p^m + {}_m C_1 p^{m-1} q + {}_m C_2 p^{m-2} q^2 + \dots + {}_m C_l p^{m-l} q^l) \dots \quad \text{I}$$

where $q = 1 - p$.

Although equation I is of the m th degree, in p it has only one real positive fractional root, which may be called the probability root. We can obtain the probability roots after putting $P = 0.5$ and 0.05 in I. Let these roots be denoted by $p(0.5)$ and $p(0.05)$ respectively. We can now find the value of ρ corresponding to $p(0.5)$, r_1 and n . Let this value be denoted by $\rho(0.5)$. Similarly we can find $\rho(0.05)$. $\rho(0.5)$ and $\rho(0.05)$ are the *least* values of ρ 's of the

¹ G. T. Walker, *Mem. Ind. Met. Dept.*, 1914, 21, 13-15; S. R. Savur and S. Gopal Rau, *Ind. Met. Dept., Sci. Notes*, 5, No. 49.

² C. W. B. Normand, *Q. J. R. Met. Soc.*, 1932, 58, 3-10; S. R. Savur, *Ind. Jour. Phy.*, 7, Part 1, pp. 27-34.

populations on the 50% and 5% level of significance respectively, which gave us $(l+1)$ C.C.'s which are not numerically less than r_1 in m random C.C.'s. These values will help the forecaster in forming a rough estimate of the amount of reliability he can place in his forecasts. As already mentioned above, more details will be given elsewhere.

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Rectification Phenomenon in Pyrolusite Crystal.

In the course of our investigations on the crystal-and-point rectification, we found that when ordinary mineral pyrolusite (MnO_2) crystal was dipped into mercury, alternating current was rectified to a great extent. The source of the alternating current was a 1000 cycle alternator (microphone hummer). When tested with steady voltages, the current-voltage characteristic curve showed a marked asymmetry. A typical characteristic curve is shown in Fig 1. The resistances as calculated from the curve for different positive and negative voltages are also illustrated in the same figure. The rectification ratio which is taken as the ratio of the difference of the currents in the two opposite directions to the larger value of the current is also shown. The ratio decreased in this particular experiment with the applied voltage. The value was 50% for 2 volts.

The mercury used was cleaned after shaking it with dilute nitric acid in a mechanically shaking machine for eight hours. After subsequently washing it in running distilled water, the pyrolusite crystal on drying was mounted so as to dip into the clean mercury. The crystals such as galena (PbS), iron pyrites (FeS_2), bornite (Cu_2S , CuS , FeS), magnetite (Fe_3O_4), molybdenite (MoS_2) did not, however, show any such rectification effect, when similar experiments were performed under similar conditions.

It should be made clear that the rectification generally observed with these crystals in combination with a pointed metal is reduced to zero, when the contact area is large. The pyrolusite crystal dipped into mercury had, in our experiments, a very large contact area so that the effect observed could not be attributed to the ordinary crystal-and-point rectification. When the

same pyrolusite crystal was held between two electrodes of large area, there was no such rectification effect.

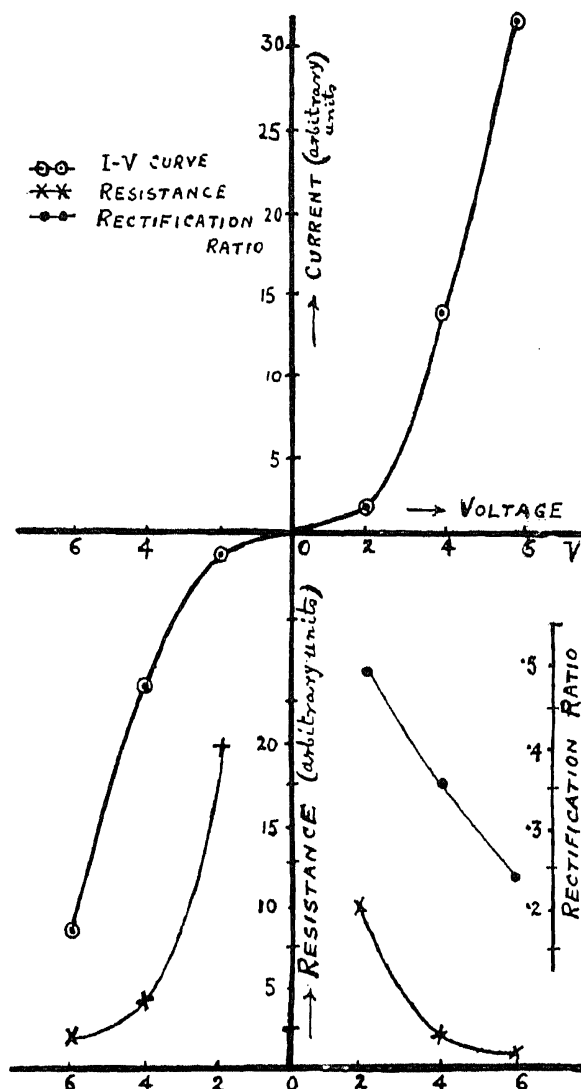


Fig. 1.

The cause of this rectification seems to be associated with the layer of air between the surface of the crystal and mercury. This is yet a subject of further investigation. Whatever be the cause, this promises to be of great practical use.

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The Band Systems of $CaCl_2$.

THE spectrum of the carbon arc fed with $CaCl_2$ has been measured on plates taken in the first order of a 21 ft. grating. These data together with those of Hedfeld* are utilised in analysing the bands. While

* *Zeit. für. Phys.*, 1931, 68, 610.