

19th May, 1956.

Dear Tony,

I do not know whether you have seen a paper in the current Genetics, vol. 41, page 179, by Laidlaw, Gomes and Kerr, the latter two being of your University at São Paulo.

They discuss a problem arising from the interesting fact that the honeybee has a series of a-alleles analogous to those of many self-sterile plants, probably in the sex chromosome, and discuss the obvious problem, though really rather a trivial one, of estimating the number of these alleles on the crude supposition that they are all equally numerous.

Now I have worked somewhat at the theory of multiple alleles of this kind on the supposition that all homozygotes are lethal, and, of course, the distribution of gene frequency is not very closely concentrated except for enormous cross-fertilizing populations, which a population of a few hundred beehives is not.

If  $p$  stands for the gene frequency of any particular allele and  $a$  for the sum  $\sum p^2$ , then it will be possible to estimate  $a$  without the crudeness of equating the estimate with  $\frac{1}{n}$ , where  $n$  is the hypothetical number of alleles.

The data of these authors is that 9 out of 61 queens tested were found to contain a particular allele. The proportion of such queens expected is not quite obvious, but a good approximation is supplied by  $2 \frac{p-p^2}{1-a}$ . One would like to have data for other alleles, but the expected fraction observed, if these had been tested, would certainly be near to  $2a$ . As the data consist of nothing but this single observed fraction distributed in samples as a binomial, the mathematical appendix citing Kendall, Cramer, etc., is quite preposterous. I suppose this must be Laidlaw's doing, he being a visitor to the University of São Paulo, no doubt invited there to enlighten your backward people!

You may be interested to know that Dover Publications are bringing out a reprint with additions, though scarcely a new edition, of The Genetical Theory, and that I do there discuss what I have not previously published, this case of the distribution of multiple <sup>self-sterility</sup> alleles. However, I expect you would like to contact your colleagues in bee work if you do not know them already. Wright's discussion, which they cite, is very erroneous.

Sincerely yours,