

the same as the one Miyake identified with FeCr_2O_4 .

In interpreting the experimental results summarized above, it is natural to consider the oxide formed at lower temperatures as the naturally occurring film, which in the case of stainless steels has now been shown to be $\alpha\text{-(Fe,Cr)}_2\text{O}_3$.

I wish to express my thanks to Dr. Iitaka for his guidance and encouragement.

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¹ Miyake, S., *Sci. Pap. Inst. Phys. Chem. Res. Tokyo*, **31**, 161 (1937).

² Thomson, G. P., Unpublished observation cited by Thomson and Cochrane in "Theory and Practice of Electron Diffraction", 179 (London: Macmillan, 1939).

Scandinavian Influence in Scottish Ethnology

A FEW months ago¹ we appealed to centres of the emergency blood transfusion service, and in particular to those which we were supplying with testing serum, to allow us to assemble the extensive data on blood group frequencies in Great Britain, then for the first time becoming available. We were confident that such a collection would throw light on the precision with which such extensive groupings can be relied on to determine the gene-ratios in our population, and we hoped further that this precision might be sufficient to detect with certainty any such small variations of ethnographic significance as might exist within our island.

In a preliminary survey, exhibited at the meeting (January 12, 1940) of the Pathological Society at Cambridge, it was shown that a consistent gradient in the frequency of the antigen *A* is found as we pass from southern England to Scotland. Further data since accumulated bring our totals to 10,969 for Scotland and 8,716 for northern England, which show clearly intermediate frequencies. For southern England our compilation amounts to 106,477.

The values we present are not entirely unselected. A few returns have had to be set aside as apparently anomalous, and only in some cases has the cause of disturbance been ascertained. Systematic errors, not all of which are yet understood, do undoubtedly affect the frequency of the rarest of the four blood-groups (*AB*). As a further precaution, we have calculated the gene-ratios from the other three groups only, as in this way the effect of grouping errors is diminished.

The contrast between our three main areas, Scotland, England north of the Humber, and southern England, may be shown either in the relative frequencies of the four distinguishable phenotypes, or in those of the three allelomorphous genes:

TABLE 1
PHENOTYPIC FREQUENCIES

	<i>O</i>	<i>A</i>	<i>B</i>	<i>AB</i>
Scotland ..	52.019	34.233	10.429	3.318
N. England ..	48.600	40.340	8.536	2.524
S. England ..	45.232	43.162	8.508	3.097

The change in the ratio *A* : *O* is not, apparently, influenced by the traditional and political Border,

but is apparently continuous, and doubtless a cause of heterogeneity, too slight to be detected on the numbers yet available, within the three chosen regions. The corresponding gene-frequencies are as follows:

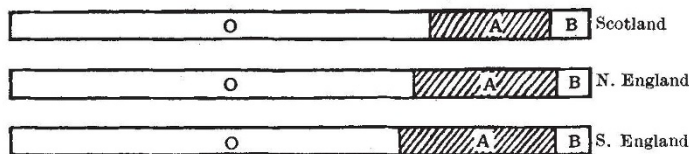
TABLE 2
GENE FREQUENCIES

	<i>O</i>	<i>A</i>	<i>B</i>
Scotland ..	72.247	20.783	6.970
N. England ..	69.587	24.549	5.864
S. England ..	67.207	26.744	6.048

as shown in the diagram below.

It has been customary for ethnologists to suppose that the northern inhabitants of Britain differ from their southern neighbours by reason of a greater infiltration of Scandinavian blood. The modern Scandinavians, however, differ from the English in having not a lower but a higher frequency of *A*. Thus if, setting aside the small fraction of these populations carrying the gene *B*, we compare the phenotypic ratios $A/(A + O)$, we find, using the best available series, Norway 58.0, Sweden 58.6, Denmark 50.0, against S. England 48.8, N. England 45.4, Scotland 39.7.

English contact with neighbouring Europe has been extensive since the Roman period; the values for Holland 48.6, Belgium 46.6, France 50.1, and Spain 53.4 are fully in accordance with the view that the English province has been influenced by settlement or intermixture with neighbouring Continental peoples. No Continental population, however, in the north or in the south, comes near to the Scottish ratio.



The only foreign sample we know of comparable to the new Scottish data is from Iceland. A sample of 800 in Wiener's collection gives the ratio $A/(A + O)$ as low as 36.6, slightly more extreme than the Scottish value. Now, Iceland was undoubtedly colonized from Norway, and, though men and women from Scotland and Ireland occur frequently in the Icelandic Sagas, it is not believed to have been extensively colonized from the British Isles. The stock from which the Icelanders sprang would seem to have just the blood-group constitution needed to harmonize with the gradient found in Great Britain, but in recognizing this stock as genuinely Scandinavian, we must distinguish it sharply from the modern Scandinavian peoples, which have evidently changed greatly, by infiltration from central or eastern Europe, since the Viking period. The Scottish and N. English blood-groups show, certainly not modern Scandinavian, but it may well be a proto-Scandinavian influence.

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¹ *Brit. Med. J.*, Oct. 21, 1939.