ABO BLOOD GROUPS AND RACIAL CHARACTERISTICS IN RURAL WALES

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1. INTRODUCTION

PROOF of the inheritance of the *ABO* blood groups was followed by the studies of L. and H. Hirschfeld who showed that the frequencies of the groups varied in different peoples. Many investigations of these groups have since been published. For example, Vérzar and Weszeczky found that the *ABO* groups of Hungarian gypsies differed from those of the Hungarians among whom they lived but was almost identical with that of the natives of North-West India. This origin had already been ascribed to the gypsies on other grounds.

The blood group analysis in Wales of Boyd and Boyd in 1937 related to fewer than 200 persons whilst the survey of Fraser Roberts in 1942 was confined to the North Wales counties of Caernarvon, Denbigh and Flint. The campaign undertaken during the last war resulted in extensive bleeding and grouping. An analysis of these findings has been made to ascertain whether the Welsh people are an assembly of many racial stocks, each of which has intermingled relatively little with the other, as has been suggested by physical anthropologists, or whether, on the other hand, the population is now a genetically homogeneous whole. An attempt has also been made to correlate the results in Wales with those obtained elsewhere in the Old World in the hope that light may be thrown on the history of human settlement in the Principality. An account of the preliminary findings and their relation to language in particular was given by Mourant and Watkin in 1952.

A brief account of the ethnology of the Welsh people, based on the views of physical anthropologists and historians, is an essential pre-requisite to a study of the serological differences observed in Wales.

2. THE HUMAN HISTORY OF WALES

Stone Age Man. Remains of early man before he took to cave dwelling have not been discovered in Wales and Wheeler dates the first immigration between 15,000 and 10,000 B.C. Fleure and James in their study of anthropological types in Wales maintain that along moorlands such as the Black Mountain, Carmarthenshire and Mynydd Hiraethog, in West Denbighshire, human types closely resembling Palæolithic groups still persist.

The human type associated with the Neolithic immigrations commencing about 2500 B.C. was long-headed, of medium height and probably had dark hair. A similar type is found in considerable numbers in the coal-mining valleys of South Wales, along the moorlands of South Cardiganshire, North Pembrokeshire and North Carmarthenshire. This has led Fleure and James to state that the long-headed brunet is the fundamental type in Wales and that it dates back to early Neolithic times.

Beaker and Early Iron Age Folk. The general distribution of beakers in Wales is consistent with an eastern origin. Colonisation of South Wales occurred by land from the Upper Thames-Cotswold area and by sea from Somerset. North Wales was probably reached by sea from Westmorland whilst the Upper Severn Valley was the main gateway into Mid-Wales.

The physical form of the Beaker people varied, those found at Merthyr Mawr, Glamorgan, being of medium height and broad-headed. Their colouring was probably fair and Beddoe's observation that, of a substantial number of broad-headed men examined in the West of England and Wales most had hair that was lighter than that of the rest of the population, seems noteworthy.

In a series of migrations from Northern Gaul from 500-50 B.C., the Early Iron Age Folk reached Britain. The Belgæ, described by Strabo as fair in colour and six inches taller than the tallest men in Rome, were the last to arrive and did not reach Wales until the beginning of the first century A.D.

On the eve of the Roman conquest Wales appears to have been composed of four main tribal divisions :

(1) The modern counties of Monmouth, Brecknock and Glamorgan inhabited by the Silures, a dark-haired people ;

(2) Present-day Carmarthenshire, Pembrokeshire and Cardiganshire in the possession of the Demetae, a tribe apparently related to the Silures ;

(3) North-West Wales held by the Venedotae while the intervening area, comprising present-day Montgomeryshire and Radnorshire together with parts of Merionethshire and Denbighshire, was peopled by the Ordovices or " hammer men " who were among the very last to be subjugated by Rome ;

(4) The north-eastern corner of Wales inhabited by the Deceangli, regarded by some as related to the Venedotae.

The Romans. The line of demarcation between civil and military areas was usually formed by the base fortresses of the Roman legions. Thus it is only in the south-eastern corner of Wales, to the rear of the second legion at Caerleon-on-Usk that one can expect to find traces of a settled Romanised population on any extensive scale. The only walled Roman town found in Wales is at Caerwent, eight miles to the east of Caerleon. With the exception of South-West Wales, Lleyn and Anglesey, all of which appear to have lain even beyond what Haverfield terms the " military zone ", the remainder of Wales became a network of forts and outposts.

It is generally accepted that although the Romans left an impression on the laws and institutions, on the material civilisation and on the language of the country, their genetic contribution to the synthesis of modern Welshmen was insignificant.

The Déssi and the Men of the North. Contemporaneously with the Roman occupation, landings from Ireland on the Welsh coast assumed increasing proportions and culminated in the settlement in Pembrokeshire in the third century A.D. of an entire Irish tribe, the Déssi. The parts of Wales most affected by Irish settlements were those which project towards Ireland and which, in favourable weather, permit of visibility from coast to coast. These include the peninsula of Lleyn, the isle of Anglesey as well as Pembrokeshire.

Cunedda and his followers left the region around the Solway Firth and made landings from Anglesey to the mouth of the Dee. By the fifth century the " Men of the North " who were Brythons by language had become masters of that part of Wales which lies between the rivers Teifi and Dee.

The Anglo-Saxons. Following the battle of Deorham in A.D. 577, the Anglo-Saxons obtained access to the Bristol Channel and severed the connection between the Britons of Wales and those of the Dumnonian peninsula. Similarly, at the battle of Chester in A.D. 616, a wedge was driven between the Britons of North Wales and those of North-West Britain. From the middle of the seventh century onwards the Welsh people were marked off from the other inhabitants of Britain. The delineation of the frontier between England and Wales was left to Offa in the second half of the eighth century. That the Anglo-Saxons kept to the east of the dyke is shown by the distribution of their burial places and by the linguistic formation of place names ; those to the east being, in the main, English and those to the west being, in the main, Welsh.

Wales received no ethnic contributions of any import from across the dyke. The statements formerly made that the natives of South-Eastern Britain, when driven from their homes by the Saxon invader, found refuge in considerable numbers in the mountains of Wales and thus became the ancestors of the Welsh people, have no foundation in fact.

The Vikings, Normans and Flemings. While many parts of Wales felt the effect of Norse raids, the extent of permanent settlements is a matter of dispute. It is believed that, in Pembrokeshire, both sides of Milford Haven were occupied at an early date and that this settlement extended inland as far as Narberth.

Wales received the attention of almost the entire Norman army in Britain and by the end of the twelfth century most Welsh noble families were connected with the French by ties of blood. Unions between victor and vanquished were greatest in the garrison towns and least in the heart of the country where very few, if any, occurred.

The Flemings were transferred by Henry I from the North of

England to South Pembrokeshire where it was thought they would form a useful bridgehead against the Welsh. That part of Pembrokeshire which was occupied by the Flemings, on the one hand, and probably by Vikings, on the other, is known as " Little England beyond Wales ".

The Industrial Revolution. After the Norman Conquest, Wales escaped the advent of immigrants on a noteworthy scale until the establishment of the iron and coal industries in the latter part of the eighteenth and nineteenth centuries. Of the 1,120,910 persons enumerated in Glamorgan at the 1911 Census, 390,941 originated from outside the county. A large proportion came from Gloucestershire and Somerset. A similar state of affairs was found to exist in Monmouthshire.

3. TECHNIQUE

Owing to the large number of persons evacuated to Wales during the last war, the donor panel in rural areas contained a far from negligible proportion of non-Welsh persons. To overcome this difficulty the " surname technique "—a technique based on a separation of donors into those with Welsh and those with non-Welsh family names—was used. By this method Fisher and Vaughan (1939) had been able to demonstrate a significant difference in the *ABO* blood group frequencies of the English and Welsh elements at Slough. In the present survey only persons with Welsh surnames have been studied with the exception of Chester and Malpas where figures for English surnames are given.

(i) *Welsh surnames*

From the time of the Welsh Princes to the Tudor period it was a common custom for Welshmen of all walks of life to have their pedigrees, up to the ninth generation, embodied in their ordinary name for juridicial purposes. The following affords an example : Llewelyn ap Dafydd ap Ieuan ap Griffith ap Meredith ap Eynon ap Morgan ap Owen ap Llywarch. Such a cumbrous name was not adapted for a long life and would eventually become curtailed to Llewelyn ap David (or Dafydd). The father's Christian name thus became his son's surname and the abbreviations *ap* or *ab* (meaning " son of ") were either dropped or become absorbed in the parent's baptismal name to yield such forms as : Bevan, Bowen, Parry, Price, Pugh. " This system of changing surnames each generation flourished in certain parts of Wales until the middle of last century or later, when the then existing surname became permanent, with the result that the last paternal baptismal name now became, once and for all, the family name ". " Another feature about baptismal names used as surnames ", writes Morris, " is that the clergy and members of the official classes added the letter *s* (presumably meaning *son*, or marking the possessive case) to the baptismal name when it was

used as a surname ; thus John becomes Johns and Johnes and finally Jones ".

The late Canon C. W. Bardsley in his examination of surnames in Western Europe draws attention to the unusual conditions prevailing in Wales. He writes as follows : " Wales is the great exception. Here there is scarcely a trade name, only a few nicknames, no official surnames that I know of, just a sprinkling of local surnames, and the rest quite 95 per cent. are baptismal names. Hence the great difficulty of identification in the Principality ".

Appendix (f) shows a list of surnames which I have taken to be Welsh. Where a particular name is to be found both in England and Wales, and where there is no proof of its exclusively Welsh origin, the country in which it is the commoner will be regarded as its home. For this latter purpose H. B. Guppy's *The Homes of Family Names* has been used.

(ii) *Selection of areas*

A substantial part of the rural population in Wales lives in scattered homesteads—a state of affairs dissimilar to that found in England where the village movement is very strong. Furthermore, only one county in England, Westmorland, is as thinly populated as the rural counties of Mid and North Wales. The areas selected for study must, therefore, be sufficiently large to ensure statistically sound comparisons. The physical configuration of Wales permits of such divisions in the form of moorlands, broad valleys, coastal plains and peninsulæ.

(iii) *Blood group determination*

Every blood sample was grouped by the National Blood Transfusion Service on both cells and serum. The grouping was re-checked each time a person donated blood.

(iv) *Calculations*

Group frequencies, gene frequencies, the expected percentage of group *AB* and a Chi-square test for homogeneity have been calculated for the principal regions, for each individual area and for each township having a sample of not less than a hundred. Fisher's method has been used in calculating gene frequencies. A comprehensive list of towns and villages which make up each area, together with the numbers belonging to each *ABO* blood group, will be found in appendices (a-e).

4. *ABO* BLOOD GROUPS

(i) *General*

There is a tendency for blood group analyses, involving large numbers, to show a deficiency in group *AB*. As donors do not always resign in equal proportions from each of the four groups, it is important that investigations be based on the combined active and resigned

panels. If this is carried out, a deficiency in group *AB* may, with more confidence, be ascribed to errors in grouping. It is satisfactory to record, however, that the Welsh sample does not show a deficiency in group *AB*, *vide* table 1.

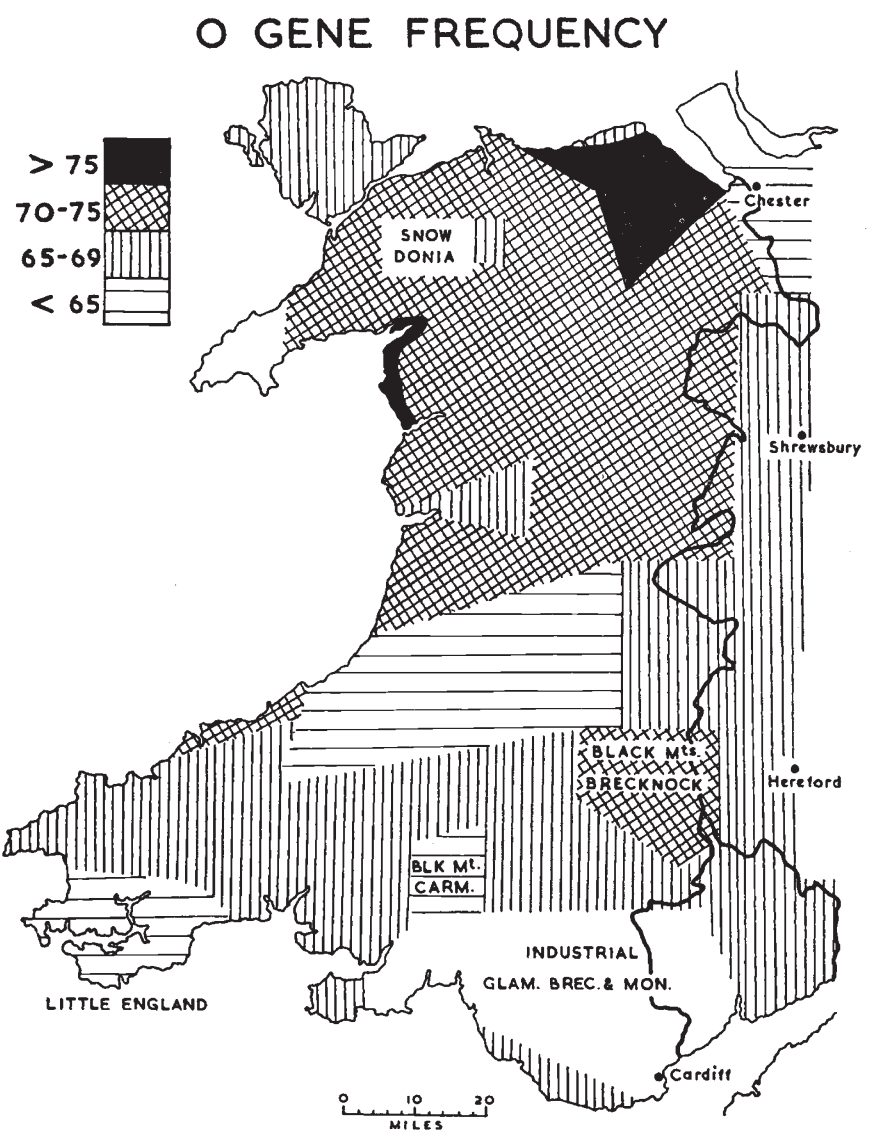

Fig. 1.

In this table Wales has been divided, for comparative purposes, into three regions, north, mid and south. The north consists of the counties of Anglesey, Caernarvon, Denbigh, Flint and Merioneth, whilst Mid-Wales is made up of Montgomeryshire, Radnorshire, North Cardiganshire and North Brecknock. The southern region

comprises the remainder of Wales other than the Glamorgan and Monmouthshire coalfields which, owing to their known heterogeneity, are a problem unto themselves.

The salient feature is the rise in *O* gene frequencies, ultimately reaching 72 per cent., as one proceeds northwards. There is a parallel fall in the *A* frequency. The rise is not gradual but takes place in abrupt steps, the principal one lying near the Upper Severn Valley

TABLE 1

The rise in O *gene frequencies as one proceeds northwards*

Region	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
North Wales .	4535	52·0	34·9	10·2	3·0	2·8	*0·29*	72·2	21·1	6·7
Mid-Wales .	5088	49·3	38·1	9·5	3·1	3·0	*0·15*	70·3	23·3	6·5
South Wales .	7137	45·6	40·4	10·3	3·6	3·7	*0·00* (4)	67·6	25·2	7·2
Total . .	16,760	48·5	38·2	10·0	3·3	3·2	0·22	69·6	23·5	6·9

in Montgomeryshire, *vide* fig. 1. A rise in *O* as one proceeds northwards is also found in England, but, at similar latitudes, *O* is higher in Wales than to the east of Offa's dyke. South Wales is higher in *O* than Gloucestershire, whilst North Wales has *O* frequencies at least as high as those found in Northumberland.

TABLE 2

The variation in the B *gene frequency*

Region	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Western Wales .	8632	47·0	38·4	10·9	3·7	3·6	*0·12*	68·5	23·9	7·6
Eastern Wales .	8128	50·1	37·9	9·1	2·9	2·8	*0·03*	70·8	23·1	6·2

Note.—A fourfold table for $B+AB$: $O+A$ in Western Wales versus $B+AB$: $O+A$ in Eastern Wales gives a $\chi^2 = 25{\cdot}42$. For one degree of freedom $P<0{\cdot}00001$. The difference is highly significant.

If Wales is divided into eastern and western halves, the latter being made up of Anglesey, Caernarvonshire, Merionethshire, the Dyfi Basin of Montgomeryshire, Cardiganshire, Pembrokeshire and Carmarthenshire, one observes that *B* is significantly higher in Western than in Eastern Wales, *vide* table 2. This is the reverse of that found in Europe generally where *B* is highest in the east and falls as one proceeds westwards.

This general picture, however, conceals a number of significant local variations which will be discussed later.

(ii) *Areas of high O frequency*

North Wales. Fig. 1 reveals that most of North and Mid-Wales have *O* gene frequencies exceeding 70 per cent. In some parts of North Wales frequencies as high as 75 per cent. were noted—an observation similar to that made by Fraser Roberts. Inspection of table 3 reveals that the Ruabon-Ruthin moorlands and the Middle Dee Valley, the Bala Cleft and its branches, Ardudwy Mountain and the South Caernarvonshire coastal plain have lower *O* frequencies

TABLE 3

The areas of high O *gene frequency*

Area	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
North Caernarvonshire coastal plain	459	54·7	34·9	8·1	2·4	2·2	*0·08*	74·0	20·7	5·3
South Caernarvonshire coastal plain	350	50·0	36·3	10·6	3·1	3·2	*0·00(02)*	70·7	22·2	7·1
Coastal plain of Ardudwy	550	55·8	29·8	10·7	3·6	2·4	*2·43*	75·2	17·9	6·9
Ardudwy Mountain	277	49·8	35·0	12·3	2·9	3·5	*0·23*	70·4	21·5	8·2
Denbighshire coastal plain, Clwyd valley and Eastern Flintshire	797	56·8	32·9	8·4	1·9	2·1	*0·12*	75·3	19·3	5·4
Ruabon-Ruthin moorlands and Middle Dee Valley	897	49·3	37·8	10·0	2·9	3·2	*0·13*	70·1	23·1	6·8
Mynydd Hiraethog . . .	181	55·2	28·7	13·8	2·2	3·0	*0·31*	74·0	17·2	8·7
Bala Cleft and its branches .	552	50·9	33·5	11·6	4·0	3·2	*0·86*	71·6	20·6	7·7
North Montgomeryshire . .	636	52·5	35·7	8·0	3·8	2·3	*4·54*	73·0	21·6	5·4
Upper Severn System . .	2157	51·9	36·1	8·9	3·1	2·6	*1·40*	72·2	21·8	5·9
Aberystwyth-Plynlymon area .	487	52·6	35·3	8·6	3·5	2·4	*1·67*	72·9	21·4	5·8
Coastal South Cardiganshire .	273	49·8	37·0	9·2	4·0	2·8	*1·05*	71·0	22·7	6·3
Epynt, Black Mountains of Brecknock, Upper Wye and Upper Usk area	1049	51·0	37·1	9·0	3·0	2·7	*0·18*	71·5	22·5	6·0

than the remainder. These four areas form a continuous wedge of territory passing westwards from the English border to Cardigan Bay. It seems as though the very high *O* population had, in these parts, been diluted by another stock appreciably lower in *O* which entered either from England or from the Irish Sea.

Physical anthropologists have shown that the Bala Cleft and the side valley, leading to Trawsfynydd, harbour a proportion of tall men. An appreciable admixture of people must have occurred in these areas for the Cleft was one of the principal gateways from England into Wales. As early as Bronze Age times trade routes from the Western Midlands passed through the Cleft and across Ardudwy Mountain to reach the North-West Wales bays and estuaries.

The Upper Severn System. To the north of the Severn Valley, in Montgomeryshire, the *O* frequency is high, whereas to the south it is significantly lower—an indication of the existence of two rather different peoples. The historical geography of the area offers an explanation of this observation.

The ancient centres of population, as Fleure and Whitehouse have pointed out, were the lightly-wooded or treeless moorlands. The valley sides and valley floors, on the other hand, were woodland or malaria-ridden swamps harbouring ferocious animals against the hazards of which man, with primitive stone tools, was able to achieve

TABLE 4

The frequencies in the towns named in table 3

Town	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Caernarvon	161	57·8	32·3	8·7	1·2	2·1	*0·42*	75·7	18·8	5·5
Bangor	110	45·5	44·5	8·2	1·8	3·2	*0·45*	67·0	27·3	5·8
Llandudno	130	55·4	33·8	7·7	3·1	2·0	*0·57*	74·8	20·2	5·0
Pwllheli	101	48·5	31·7	14·9	5·0	4·0	*0·18*	70·0	20·0	10·0
Portmadoc	128	47·7	39·1	9·4	3·9	3·1	*0·18*	69·3	24·2	6·5
Penrhyndeudraeth	223	57·4	29·6	9·0	4·0	2·0	*3·60*	76·5	17·7	5·8
Trawsfynydd	166	48·8	35·5	13·3	2·4	3·9	*0·69*	69·3	21·8	8·9
Colwyn Bay	139	54·7	35·3	6·5	3·6	1·8	*1·96*	74·6	21·1	4·3
Ruthin	118	52·5	37·3	9·3	0·8	2·8	*1·14*	71·8	22·1	6·1
Wrexham	416	47·4	38·7	12·0	1·9	3·9	*3·03*	68·1	23·7	8·2
Ruabon	108	48·1	39·8	10·2	1·9	3·4	*0·54*	68·9	24·2	6·9
Corwen	128	56·3	29·7	11·7	2·3	2·6	*0·03*	74·9	17·7	7·4
Dolgelley	149	51·0	35·6	10·1	3·4	2·9	*0·07*	71·6	21·7	6·7
Llanfyllin	105	53·3	31·4	9·5	5·7	2·4	*3·70*	74·3	19·4	6·4
Llanfair Caereinion	107	54·2	33·6	9·3	2·8	2·5	*0·04*	73·8	20·1	6·1
Oswestry	397	52·9	36·8	8·1	2·3	2·4	*0·01*	72·7	22·0	5·3
Welshpool	378	54·5	32·5	10·1	2·9	2·5	*0·15*	74·0	19·5	6·5
Newtown	273	48·0	43·2	5·9	2·9	2·2	*0·54*	69·5	26·3	4·1
Caersws	109	53·2	28·4	14·7	3·7	3·3	*0·04*	73·1	17·4	9·5
Llanidloes	249	50·6	32·5	12·4	4·4	3·3	*0·70*	71·5	20·2	8·3
Machynlleth	180	48·9	36·1	10·6	4·4	3·2	*0·63*	70·4	22·4	7·2
Aberystwyth	194	53·6	32·0	9·3	5·2	2·3	*4·96*	74·3	19·6	6·2
Kington	104	51·0	31·7	11·5	5·8	3·0	*1·97*	72·4	19·8	7·8
Hay	167	52·7	37·1	6·0	4·2	1·8	*4·06*	73·5	22·5	4·1
Builth	100	52·0	36·0	8·0	4·0	2·3	*0·90*	72·7	21·9	5·4
Cardigan	186	48·9	39·2	9·7	2·2	3·2	*0·43*	69·6	23·8	6·6

but little. The Upper Severn Valley must, in ancient times, have formed a vast swamp separating north from south. Place names such as Trewern (the town in the morass) or Pengwern (the end of the morass)—the latter is an old Welsh name for Shrewsbury—confirm this view. When the valley was eventually colonised, people from both north and south joined in the valleyward movement but, except in the Newtown area, the colonists from the north appear to have been numerically superior. The hill folk to the north and south who did not take part in this valley settlement retained their separate identities.

The Black Mountain, Brecknock Region. The Wye, according to Fox, was impassable even in Bronze Age times. The eventual colonisation of the valley at the foot of the Black Mountain and Epynt Mountain is thought to have occurred by a valleyward movement of mountain folk. The existence of a high *O* frequency both in the valley and on the Black Mountain seems to confirm this. No figures are available for Northern Epynt as the scattered farmsteads were acquired by the War Office and their occupants evacuated. The Herefordshire plain—the only other likely portal of entry of later migrants—does not harbour a high *O* population. In Roman times the Black Mountain and Epynt were occupied by a dark-haired people termed the Silures who regarded themselves as the aboriginal inhabitants. The name Silures has, so far, defied an explanation from Celtic sources. It would, therefore, appear that the high *O* population of the area is largely a survival from pre-Celtic times. The inhabitants are serologically more akin to the North Welsh than to their South Welsh neighbours.

The European and Mediterranean picture. Almost identical *O* frequencies with *A* and *B* frequencies very similar to those observed in North Wales are rarely found in Europe or along the Mediterranean. They occur in Ireland, in Scotland and in Iceland (no figures are available for the Isle of Man). They are not found in Cornwall—another Celtic area. Very similar frequencies have been discovered in the Ille et Vilaine and the Côtes du Nord " departements " of Brittany as well as in the Manche region. The *O* frequencies of the island of Ré bear a resemblance to those of North Wales. The Basques possess very high *O* frequencies but their *B* frequencies are the lowest recorded in Europe. Many of the Berber tribes from the Rif to the High Atlas have *ABO* frequencies very similar to those of the North Welsh. Some Tunisian Berbers and Touareg nobles have *B* gene frequencies as low as 6 per cent. whilst their *O* and *A* frequencies are hardly distinguishable from those found in North Wales. The inhabitants of Sassari in Sardinia represent an almost identical *ABO* type. (No results are available for the Balearic Isles and Corsica.) In *O* frequencies the district around Spezia and the northern hinterland of Bergamo and Brescia bear a closer resemblance to North Wales than to the remainder of Italy. In the upper Alpine valleys, among the Walser, *O* attains an exceptionally high figure. In parts of Greece, in Crete and among the Greeks of Asia Minor very high *O* frequencies have been observed. The Yürük, a nomadic people of the Taurus Mountains and the inhabitants of the Western Caucasus also display the North Welsh type of *ABO* frequencies.

With the exception of the Walser, a common factor in the distribution of peoples having *ABO* frequencies very similar to the North Welsh is their predominance on islands or on land in fairly close proximity to the sea. Archæology offers support for the theory of a human migration from the Eastern Mediterranean to Britain in

Neolithic times. It is also known that the fundamental physical type in Wales is the long-headed brunet, universally recognised as belonging to the Mediterranean race of Sergi. It has been noted that the children of certain Berber tribes, if attired in European dress, would be indistinguishable in a class of North Welsh children. There is evidence that the language spoken in Wales and Ireland, prior to the advent of Celtic, belonged to the Hamitic family. One wonders, therefore, whether the peoples having the North Welsh type of *ABO* frequencies, who are scattered from the Atlantic seaboard to the Eastern Mediterranean and the Caucasus, are all remnants of a related human stock. If so, the distribution of these frequencies would seem to offer a clue to the route taken by some of the earliest colonists of Wales. A more detailed study of this problem has been made by Mourant and Watkin (1952).

It is not possible in the present state of our knowledge to compare the *Rh* frequencies of the very high *O* population found along the Mediterranean with those of the very high *O* people of North Wales. The existing *Rh* data for Wales consist only of a mixed sample of English and Welsh elements drawn from all over the Principality but predominantly from the south. Information regarding the frequencies of the other blood group systems is even more restricted and, as a consequence, comparisons with Mediterranean observations are not possible.

(iii) *Areas of high* A *frequency*

South-East Pembrokeshire. Only one region of exceptionally high *A* gene frequency has been found in Wales, *vide* fig. 2. It lies on the south-eastern side of the Milford Haven ria in a part of the area known as "Little England beyond Wales" and extends inland as far as Narberth. Historians disagree as to the origin of the population of this region. Fleure, however, has commented upon the prevalence of Nordic types in the area. The Royal Commission on Ancient and Historical Monuments in Wales, basing its views on the prevalence of Scandinavian place names and on archæological remains, postulated the existence of a Viking settlement in this part of Pembrokeshire. Charles, on the other hand, claims that the evidence suggests no more than Norse raids. The Flemings who were transferred from the north of England to South Pembrokeshire by Henry I settled farther north-west, principally in the Hundred of Rhos. The Normans were established in strength in the area as numerous castles testify. The Irish had, for a long period, been making incursions on to the Pembrokeshire coast. The inhabitants of Devon and Cornwall or Brittany could be considered potential colonists of the area whilst an emigration from other parts of South Wales was an ever-present possibility.

The blood group findings indicate that the people of this district are different both from their Welsh-speaking neighbours to the north and east and from the remainder of Little England. They also differ

from the Dutch and Belgians who are, presumably, the modern representatives of the Flemings and from the inhabitants of Western Normandy. (No figures are available for Eastern Normandy.) Identical frequencies have not been found in Brittany but the Bigoudens

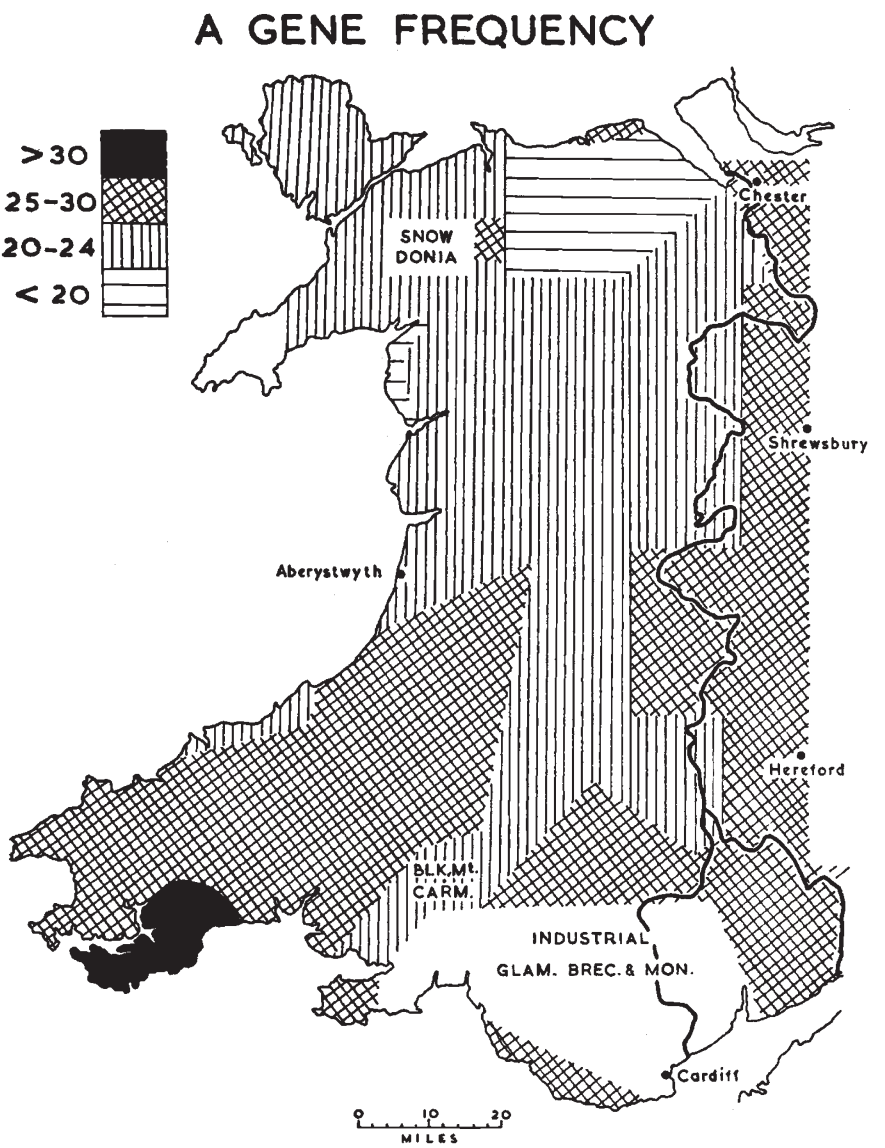

Fig. 2.

of Finisterre with an *A* gene frequency of 30 per cent. approach this South Pembrokeshire figure rather closely. Devon and Cornwall display no such high *A* frequencies whilst Ireland appears to be a nest of exceptionally low *A*. Southern Norway and the area around Stockholm, on the other hand, possess identical *ABO* frequencies. It

seems, therefore, that there was a Viking settlement in this part of Little England and that it has, to this day, maintained its genetic isolation, *vide* tables 5 and 6.

TABLE 5

High A gene frequency areas in Wales and the Marches

Area	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Little England beyond Wales (South and East of Cleddau)	431	33·9	50·1	9·7	6·3	5·3	*0·52*	58·5	33·6	7·9
Little England beyond Wales (North and West of Cleddau)	505	41·4	44·4	10·7	3·6	4·4	*0·56*	64·1	28·1	7·8
Middle Teifi Basin . . .	259	39·4	45·2	12·4	3·1	5·4	*1·61*	62·1	28·9	9·1
Mid-Cardiganshire . . .	117	40·2	46·2	9·4	4·3	4·1	*0·00(5)*	63·4	29·5	7·0
West Cheshire Plain (English surnames)	1211	41·9	46·9	8·8	2·3	3·8	*4·83*	64·3	29·3	6·4

One of the interesting features is that persons bearing Welsh surnames display a high *A* frequency, for this district is known not to have been Welsh-speaking for over eight centuries—long before the assumption of Welsh surnames. It would seem, therefore, that a substantial proportion of the inhabitants of this area assumed the Welsh type of surname despite the presumed existence of an Iron Curtain separating them from the Welsh-speaking people to the north. The contention that the majority of these people are relatively recent immigrants from Welsh North Pembrokeshire seems incorrect for no such high *A* frequency is found in the north of the county.

TABLE 6

The frequencies in the towns situated in the areas named in table 5

Town	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Tenby . . .	117	32·5	45·3	9·4	12·8	4·8	*9·64*	59·4	32·5	8·1
Pembroke Dock .	107	31·8	56·1	8·4	3·7	5·2	*0·27*	55·9	37·1	7·0
Haverfordwest . .	243	42·4	43·6	10·7	3·3	4·3	*0·38*	64·8	27·5	7·7
Milford Haven .	159	42·8	43·4	10·1	3·8	4·0	*0·01*	65·3	27·4	7·3
Lampeter . .	183	41·0	42·6	13·1	3·3	5·2	*0·88*	63·4	27·2	9·4
Chester (English surnames)	1091	42·0	46·9	8·9	2·2	3·9	*5·12*	64·3	29·3	6·5
Malpas (*ibid.*) . .	120	41·7	46·7	8·3	3·3	3·6	*0·02*	64·5	29·4	6·2

The Middle Teifi Basin and Mid-Cardiganshire. In the Middle Teifi Basin, from Lampeter downstream to a point beyond Llandyssul, one finds a population of higher *A* frequency than in adjoining North

Carmarthenshire. There is also an increased frequency of the *B* gene. The area, according to Fleure, is a nest of dark dolicocephals and hatters in the market town of Llandyssul are obliged to order special shapes to meet their customers' requirements. A rather similar serological type, although somewhat lower in *B*, is found in the Vale of Aeron in Mid-Cardiganshire.

Fleure, in his analysis of Cardiganshire, divided the county into three distinct regions, each with its own proportions of the various stocks. The blood group investigation confirms that North Cardiganshire differs from the middle of the county and that the south possesses characteristics of its own.

Chester and District. On the periphery of Wales lie the western portion of the Cheshire plain and the Wirral peninsula. The *A* gene frequency of 29 per cent. found among persons with English surnames at Chester contrasts markedly with the frequency of 19 per cent. found among the Welsh in the neighbouring Flintshire hills. The English town closest in latitude to Chester for which reliable figures are available appears to be Sheffield. (The calculations of Jones and Glynn for Liverpool are unfortunately based on only 40 persons.) Fisher's $A/O : A$ ratio for Sheffield $= 48{\cdot}1$ per cent. This ratio calculated for Chester $= 52{\cdot}8$ per cent.—an appreciable difference. It is to be hoped, however, that data for more English towns will be made available so that the place of Chester in the blood group map of Britain may be more accurately assessed.

The Wirral peninsula, the city of Chester and a portion of Southern Cheshire are depicted as Viking settlements in Fox's *Personality of Britain*. It is not impossible, therefore, that the increased contribution of *A* genes among the present-day inhabitants of the city is derived from a Scandinavian ancestry.

(iv) *Areas of medium* A *frequency*

General. With the exception of a part of Little England beyond Wales referred to earlier, rural South and South-West Wales have *A* frequencies ranging from 23 to 27 per cent. In the Vale of Glamorgan, the peninsula of Gower and the lower Towy valley, the *A* gene frequency exceeds 26 per cent. and approaches closely the values observed on the opposite coast of the Bristol Channel. Much of Mid-Wales also displays medium *A* frequencies. In North Wales, where very low *A* frequencies are normally found, three areas higher in *A* than the average exist. They are the island of Anglesey, the Conway Valley around Llanrwst and the Clwyd Estuary in and around Rhyl, *vide* tables 7 and 8.

South Wales. It seems that a medium *A* wave similar to that which overran Southern England penetrated most of South Wales. Intermixing with an earlier-established very low *A* population would explain the lower *A* values observed in South Wales as compared with South-Western England. Beddoe mentions that the diagram of

head-breadth indices " points towards the presence in force of at least two races in South Wales, not yet thoroughly amalgamated ". The medium *A* wave in South Wales is not of Anglo-Saxon origin for the Anglo-Saxons did not settle on the north side of the Bristol Channel. It is possible that Brittonic-speaking people whom archæologists tend to link with the Early Iron Age movement were responsible for the entry of the medium *A* frequency into South Wales.

South-Western England. Fraser Roberts' observation that Celtic Cornwall is not significantly different from the remainder of Southern England is of considerable interest. Unless the Brittonic population of Cornwall was wiped out by the Saxons, it appears that both were very similar in *ABO* blood group composition. Had the pre-Saxon

TABLE 7

The areas of medium A *frequency*

Area	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Anglesey	119	47·1	39·5	8·4	5·0	2·9	*1·39*	69·4	24·7	5·9
Conway Valley	135	43·7	40·7	13·3	2·2	4·9	*1·30*	65·3	25·5	9·3
Clwyd Estuary	218	43·6	42·7	9·6	4·1	3·7	*0·07*	66·2	26·9	6·9
Dyfi Basin	573	44·7	38·2	14·3	2·8	4·8	*3·36*	66·2	24·0	9·9
Teifi Basin (*a*) Lower	116	45·7	40·5	10·3	3·4	3·7	*0·01*	67·5	25·2	7·3
Teifi Basin (*b*) Upper	135	37·8	42·2	17·0	3·0	7·0	*2·03*	60·2	27·4	12·3
North Pembrokeshire	501	45·5	39·9	10·6	4·0	3·7	*0·07*	67·6	25·0	7·4
Mynydd Bach, Carmarthenshire	784	44·1	39·2	10·5	6·3	3·7	*9·58*	67·3	25·2	7·6
Lower Towy Valley and Estuary	599	47·1	42·9	7·8	2·2	2·9	*0·74*	68·4	26·2	5·5
South-Eastern Carmarthenshire	1249	48·8	37·1	11·1	3·0	3·4	*0·60*	69·7	22·7	7·5
Gower and Vale of Glamorgan	157	45·9	43·3	8·3	2·5	3·1	*0·12*	67·5	26·6	5·8
South-Eastern Monmouthshire	517	46·4	41·6	9·7	2·3	3·4	*1·37*	67·7	25·5	6·7
Archenfield	284	47·9	42·6	7·0	2·5	2·6	*0·01*	69·2	25·9	4·9

population of Cornwall been annihilated, it is unlikely that the Cornish language would have survived until the eighteenth century. That the emigrations from the Dumnonian peninsula to Brittany in the fifth to seventh centuries involved but a part of the populace seems, for the same reason, equally certain. It must, however, be remembered that even in counties such as Somerset and Dorset it is probable, according to Jackson, that the Saxon occupation was little more than a scattered settlement of Saxon masters among a subjected population. In Kent and Sussex, which lie in the zone of greatly increased frequency of Saxon place names and river names, the Saxon ethnic contribution is deemed to have been correspondingly greater. Yet Southern and South-Eastern England show no rise in *A* frequencies.

Archenfield. The " Men of Archenfield " are described as a separate entity in Domesday Book. They inhabited an area bounded by Ross, Skenfrith, Pontrilas and Aconbury. At various times in history they slew English and Welsh invaders with equal gusto. Possessing laws and customs of their own, *e.g.* " marriage and wardship are not had within the liberty of Archenfield ", these men were exempted from taxes on the condition that when the army marched into Wales they formed the vanguard and, on return, the rearguard. Eventually, most of the district was acquired as Royal property and shortly afterwards largely disafforested.

ABO blood groups suggest that Archenfield is linked with the low *B* population of the Welsh Marches rather than with South Wales.

The Dyfi Basin. The sub-division of the Dyfi Basin into two separate regions on phonological and physical anthropological grounds was undertaken by Peate. The two regions " impinge upon one

TABLE 8

The frequencies in the towns situated in table 7

Town	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Rhyl	139	42·4	42·4	10·8	4·3	4·2	*0·00(3)*	65·2	27·0	7·8
Fishguard	199	43·2	39·2	11·6	6·0	4·1	*1·17*	66·4	25·3	8·3
Carmarthen	169	44·4	45·0	9·5	1·2	3·8	*2·03*	65·8	27·6	6·7
Llandilo	146	48·6	43·2	6·8	1·4	2·5	*0·51*	69·4	25·9	4·7
Ammanford	140	44·3	38·6	14·3	2·9	4·9	*0·81*	65·9	24·2	9·9
Burry Port	139	49·6	36·0	11·5	2·9	3·4	*0·09*	70·3	22·0	7·7
Llanelly	551	48·1	39·2	10·0	2·7	3·3	*0·40*	69·2	24·0	6·8
Abergavenny	180	44·4	45·0	10·0	0·6	4·0	*3·57*	65·6	27·4	7·0
Monmouth	121	47·1	37·2	12·4	3·3	3·9	*0·09*	68·4	23·1	8·5

another along a line which runs parallel to the river on its northern side, from the direction of Aber Gynolwyn to Esgair-geiliog, and thence it follows the watershed of Ffridd Bwlch Eluan, Ffridd Cae'r Felin and Mynydd Du to the watershed between Cwm Tafolog and Cwm Nantcarfan. This boundary divides the districts of Corris-Aberllefenni and Mawddwy from those of Llanbryn Mair, Cemmaes, Machynlleth and the North Plynlymon moorland villages ", and the two districts are referred to, in brief, as " north " and " south " respectively.

Whilst the sample from the south numbers nearly 500, the one from the north is only 75. The marked excess of group *A* over group *O* in the north is in contrast to that found in the south. A larger northern sample is desirable for statistical comparison, but the available evidence suggests that Peate's differentiation of the Basin is also mirrored in the *ABO* blood group frequencies.

North Wales. Anglesey, owing to its exposed nature and its agricultural wealth,—it was for a long period the granary of all Wales—is known to have attracted the sea rovers. The Clwyd estuary faces the Wirral peninsula where Viking colonies existed. The increased number of *A* genes in these two areas may, therefore, be partly Scandinavian in origin. The recent remarkable find at Llyn Cerrig Bach, however, testifies to the activities of the Early Iron Age people in Anglesey—a people probably responsible for the introduction of the medium *A* wave into South Wales.

Llanrwst was found by Beddoe to have an index of nigrescence very considerably lower than townships in Snowdonia. Scandinavian place names are to be found at the mouth of the Conway and the river is navigable for small craft for a distance of several miles. The possibility of a sea-borne settlement at Llanrwst cannot, therefore, be excluded. On the other hand, mention has been made of a belt of lower *O* and higher *A* extending from east to west across North Wales. Corwen lies within the belt but little is known of the *ABO* blood groups in the area separating Corwen from Llanrwst. The very small samples from Pentre Foelas and Cerrig y Druidion, however, show an excess of group *A* over group *O*. It is, therefore, possible that Llanrwst is merely an extension of a bloc of raised *A* frequencies of which the Bala Cleft and the intervening area form part.

(v) *Subgroups of* A

The A_2 gene appears to be confined to populations originating in Europe, Africa and Western Asia, including India. According to Ikin, Prior, Race and Taylor, 22 per cent. of group *A* individuals from Southern England belong to subgroup A_2. From the limited data available it seems that a similar proportion of A_2 is found among Danes, Finns, Germans and Russians. In a sample of 190 from North Welsh towns, Boyd and Boyd found 35 per cent. of group *A* persons to be of subgroup A_2. Of 32 natives of the low *B* area in the Kerry Hills, whose blood was collected by the writer and tested by Mourant, 8 of the 17 group *A* persons proved to be of subgroup A_2 —a high proportion. It is clearly of interest to extend the study of the *A* subgroups in Wales and in the Mediterranean peoples having *ABO* frequencies similar to the North Welsh, for the Sardinians, who have the North Welsh type of *ABO* frequencies, also possess a high proportion of A_2.

(vi) *Areas of high* B *frequency*

The *B* gene frequency is significantly higher in Western than in Eastern Wales, *vide* table 2. It reaches its highest values in isolated moorlands as may be seen from table 9. The distribution of the *B* gene frequency is depicted in fig. 3.

The elevation at which the early colonists of Britain effected their settlements increases as one proceeds southwards. In the north,

from Megalithic times until the Christian era, the high moorlands and mountains were largely uninhabited. Dartmoor, owing to its more southerly latitude, was permanently occupied even in Bronze Age times and, as a consequence, witnessed a far greater intermixing of peoples than the more northerly Welsh moorlands—a fact which may account for the absence of the more extreme frequencies of *B* and *O* found in Wales. The areas selected for habitation in Wales were the slopes between the densely-wooded valley floors and the open moors. Bronze Age finds, for example, are almost all below the 1000 ft. contour line. The distribution of hill forts which were erected from about 300 B.C. to A.D. 700 also conforms to this settlement pattern. "The old Welsh villages", as William Rees points out, "still line the hillsides at heights ranging from 500-900 ft., a fact

TABLE 9

The high B *incidence in moorland areas*

Area	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Ardudwy Mountain .	277	49·8	35·0	12·3	2·9	3·5	*0·23*	70·4	21·5	8·2
Mynydd Hiraethog .	181	55·2	28·7	13·8	2·2	3·0	*0·31*	74·0	17·2	8·7
Upper Dee Valley (Corwen)	128	56·3	29·7	11·7	2·3	2·6	*0·03*	74·9	17·7	7·4
Dyfi Basin . .	573	44·7	38·2	14·3	2·8	4·8	*3·36*	66·2	24·0	9·9
Plynlymon fringe (Llanidloes)	249	50·6	32·5	12·4	4·4	3·3	*0·70*	71·5	20·2	8·3
Plynlymon fringe (Caersws)	109	53·2	28·4	14·7	3·7	3·3	*0·04*	73·1	17·4	9·5
Plynlymon fringe (Rhayader)	120	40·8	44·2	11·7	3·3	4·8	*0·37*	63·4	28·1	8·5
Upper Teifi Basin .	135	37·8	42·2	17·0	3·0	7·0	*2·03*	60·2	27·4	12·3
Middle Teifi Basin .	259	39·4	45·2	12·4	3·1	5·4	*1·61*	62·1	28·9	9·1
North Brecknock and N.E. Radnor Moors	477	42·1	38·8	14·9	4·2	5·3	*0·75*	64·6	24·9	10·5
Black Mountain, Carmarthenshire	161	39·8	29·8	24·2	6·2	6·9	*0·07*	62·8	20·3	16·9

which bears out the statement of Giraldus that the Welsh were a hill people. Hence the importance in early Wales of rivers as boundaries between upland units. The occupation of the valleys would result in hill boundaries."

An invading people usually expels those whom it finds in possession of the most desirable areas of settlement and there is no reason to believe that the Bronze Age invaders of Wales were an exception to this rule. The Neolithic people who were neither killed nor enslaved were compelled to seek refuge in the high moorlands and mountains. Subsequent waves of immigrants repeated the process so that the high moors became, in time, the home of several earlier-arrived stocks. The moorland population, however, retained a nucleus derived from the very earliest arrived stock—a nucleus whose presence

Fleure was able to detect on physical anthropological grounds. In the areas mentioned by Fleure, *viz.* the Black Mountain, Carmarthenshire, the North Carmarthenshire and adjacent Cardiganshire moors and Mynydd Hiraethog, the frequencies of *O* and *A* are found to vary appreciably but a raised *B* frequency is a feature common to them all.

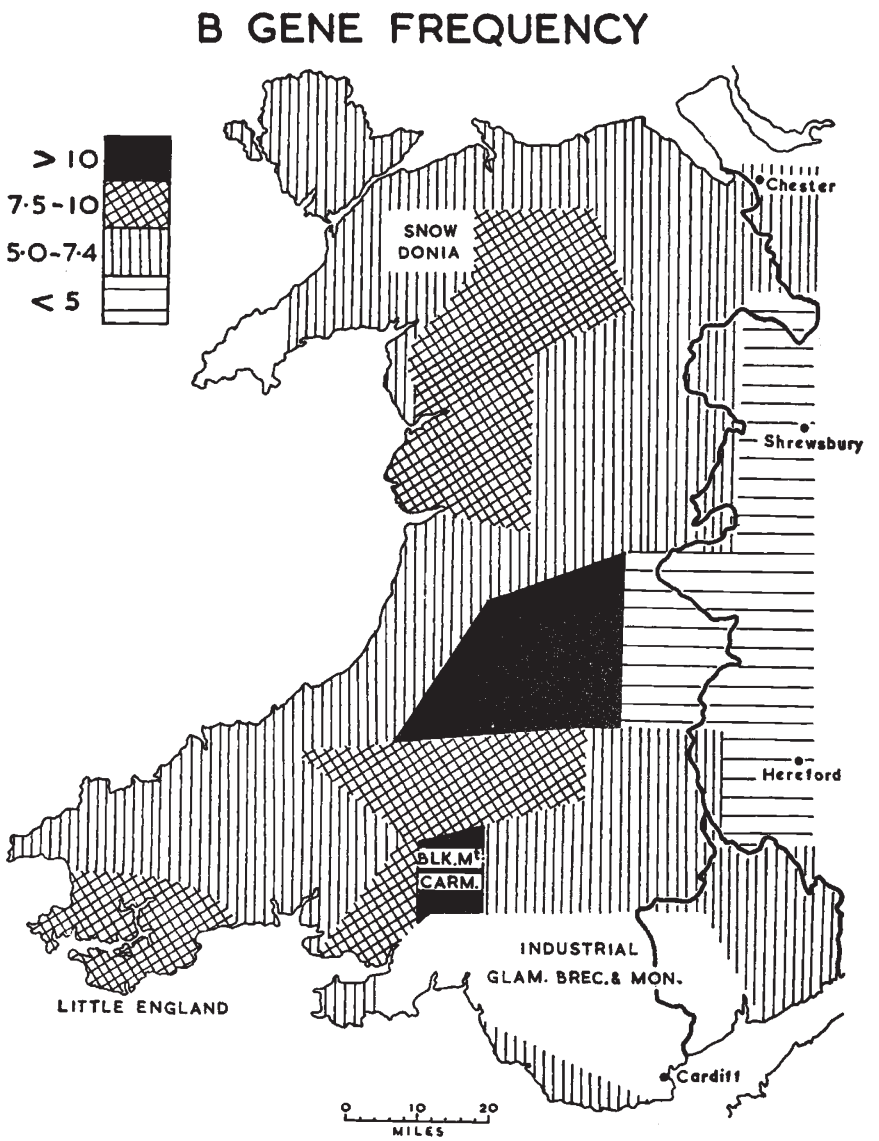

Fig. 3.

By correlating the findings of physical and blood group anthropology one is led to conclude that *B* is an ancient phenomenon in Wales and not merely a late importation from the east. The view held at present is summarised by Haldane (1940) : " Neolithic Europe was occupied

by peoples of a blood group distribution not unlike that of the American tribes, that is to say with *B* rare or absent whilst the frequencies of *O* and *A* were variable". Just as physical anthropology has shown that there was more than one variety of both Palæolithic and Neolithic Man, blood group anthropology evinces evidence that two European peoples who can lay claim to an ancient lineage, the Basques and the Moorland Folk of North Carmarthenshire, possess opposing characteristics in relation to *B*, the former having the lowest-recorded *B* in Western Europe and the latter the highest.

(vii) *An area of low* B *frequency*

A community low in *B* inhabits the Radnor Forest, the Clun Forest and the Kerry Hills, *vide* table 10. A similar *B* frequency is found among persons bearing English surnames in the neighbouring district of Ludlow, in part of the Clee Hills and in the town of Shrewsbury. The low *B* area extends southwards into Archenfield but its eastern boundary is not known.

TABLE 10

The low B *area in Wales*

Area	Total	Group frequencies				Expected *AB* per cent.	χ^2 for homogeneity	Gene frequencies		
		O	*A*	*B*	*AB*			*O*	*A*	*B*
Kerry Hills, Clun and Radnor Forests	758	45·3	46·7	5·9	2·1	2·4	*0·24*	67·2	28·6	4·3

The Basques have a very low *B* frequency and an exceptionally high proportion of *Rh* negatives. The sample of Kerry Hill folk tested by Mourant, however, showed no excess of *Rh* negatives, but the proportion of A_2, as mentioned earlier, proved to be very high.

5. SUMMARY

1. Owing to its peripheral position in relation to the Old World and the nature of its terrain, Wales is one of the few regions of Europe where traces of early human stocks still remain. Although subjected to a series of immigrations from Neolithic until Norman times, Wales escaped the full force of most of those which affected England. Even the Anglo-Saxons did not settle to the west of Offa's dyke.

2. A survey based on the *ABO* blood group results of 16,760 donors, bearing Welsh surnames, drawn from all parts of Wales other than the Glamorgan and Monmouthshire coalfield, has shown wide fluctuations in the frequencies of *O*, *A* and *B* genes. The frequencies of *circa* 3000 donors from the borderland of Cheshire, Shropshire and Herefordshire have been studied in relation to the Welsh material.

3. The *O* frequency rises as one proceeds northwards—a feature common to England. For similar latitudes, however, the *O* frequency is higher in Wales. Abrupt changes in the *O* frequency are a feature, as both sides of the Upper Severn Valley, for example, bear witness. Parts of North Wales have an *O* gene frequency of 75 per cent. whilst in a localised area in the south it falls as low as 59 per cent. There is, as expected, a marked difference between the North and South Welsh.

4. The *A* gene frequency in rural South and South-West Wales and in much of Mid-Wales ranges from 23-27 per cent. In the high *O* areas of the north it falls under 20 per cent. An extreme *A* gene frequency of 34 per cent. is found in a part of Little England beyond Wales where historians suspect a Viking settlement. A_2 appears to be unusually prevalent in Mid-Wales.

5. The *B* gene frequency is significantly higher in Western than in Eastern Wales. It reaches its peak of over 10 per cent. in isolated moorlands where physical anthropologists suggest the survival of early human stocks. This leads one to believe that *B* is an ancient phenomenon in Europe and not merely a late importation from the east.

6. The occurrence of very high *O* frequencies, together with *A* and *B* frequencies very similar to those of the North Welsh, seems confined in Western Europe and the Mediterranean to islands or to land in close proximity to the sea. From Iceland and Ireland, via islands on the French Atlantic seaboard, to the Mediterranean and white North Africa and as far east as the Aegean and Asia Minor, the North Welsh type of *ABO* frequencies is to be found. One wonders if all represent remnants of a related human stock who might be described as the " ancient mariners ".

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6. APPENDIX

(a) *Numbers observed in the high O areas (cf. table 3)*

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
North Caernarvonshire Coastal Plain	Llandudno	72	44	10	4
	Deganwy and Conway	23	2	1	...
	Bangor	50	49	9	2
	Port Dinorwic, Llanrug and Bethel	6	7	1	1
	Caernarvon, Waunfawr and Groeslon	93	52	14	2
	Clynnog, Llanllyfni and Llanaelhaiarn	7	6	2	2
	Totals	251	160	37	11
South Caernarvonshire Coastal Plain	Pwllheli and Abererch	49	32	15	5
	Afonwen, Chwilog and Llanystumdwy	7	7	2	...
	Criccieth	37	31	2	1
	Treflys and Borth-y-Gest	12	3	3	...
	Portmadoc	61	50	12	5
	Tremadoc, Penmorfa and Pentrefelin	9	4	3	...
	Totals	175	127	37	11
Coastal Plain of Ardudwy	Minffordd	25	13	7	4
	Penrhyndeudraeth	128	66	20	9
	Llanfrothen	18	11	2	...
	Maentwrog and Tanybwlch	17	13	5	...
	Talsarnau	51	25	16	4
	Harlech and Llanbedr	25	19	2	2
	Llanenddwyn and Dyffryn	16	6	1	...
	Talybont and Llanaber	7	6	3	...
	Barmouth	20	5	3	1
	Totals	307	164	59	20
Ardudwy Mountain	Croesor and Tanygrisiau	16	5	2	1
	Blaenau Ffestiniog	31	17	7	3
	Bethania, Manod and Ffestiniog	10	16	3	...
	Trawsfynydd and Cwm Prysor	81	59	22	4
	Totals	138	97	34	8
Denbighshire Coastal Plain, Clwyd Valley and Eastern Flintshire	Colwyn Bay and Old Colwyn	76	49	9	5
	Abergele	34	24	7	2
	Rhuddlan and Dyserth	11	6	3	...
	Bodelwyddan	12	3	2	...
	St Asaph, Tremeirchion and Trefnant	22	12	4	...
	Denbigh	16	12	2	2
	Llandyrnog and Rhewl	11	8	1	...
	Ruthin	62	44	11	1
	Llanbedr and Llanfair D.C.	11	3	2	...
	Mostyn, Holywell, Halkyn and Flint	71	30	11	1
	Northhop and Mold	46	24	9	1
	Connah's Quay, Shotton, Hawarden and Buckley	81	47	6	3
	Totals	453	262	67	15

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
Ruabon-Ruthin Moorlands and Middle Dee Valley	Llanferres, Llanarmon and Llandegla	10	10	1	...
	Coedpoeth	25	18	8	2
	Wrexham	197	161	50	8
	Marchwiel	11	4	1	2
	Rhostyllen	12	3	...	1
	Rhosllanerchrugog	10	6	...	...
	Penycae	8	10	3	...
	Ruabon and Rhosymedre	52	43	11	2
	Acrefair	14	11	2	2
	Cefn Mawr	19	14	...	...
	Froncysyllte	13	12	2	1
	Trevor	12	5	1	5
	Llangollen	46	30	8	2
	Glyndyfyrdwy and Carrog	13	12	3	1
	Totals	442	339	90	26
Mynydd Hiraethog	Llanefydd and Llanfair Talhaiarn	8	5	...	1
	Llangerniew and Pandy Tudor	18	5	5	...
	Gwytherin and Nebo	17	8	4	...
	Llansannan, Bylchau and Nantglyn	13	6	2	...
	Pentre Foelas and Cerrig y Druidion	7	9	1	...
	Cyffylliog	8	5	1	...
	Clawddnewydd	10	4	5	2
	Gwyddelwern	11	4	3	1
	Bettws Gwerfil Goch	8	6	4	...
	Totals	100	52	25	4
Bala Cleft and its Branches	Corwen	72	38	15	3
	Cynwyd	13	7	2	...
	Llandrillo	11	10	2	...
	Llandderfel	6	8	2	...
	Llanfor and Bala	38	26	9	6
	Llangower and Llanuwchllyn	7	7	2	...
	Rhydymain and Bontnewydd	10	3	10	3
	Brithdir	7	7	2	1
	Dolgelley and Llanelltyd	76	53	15	5
	Bontddu and Arthog	12	10	4	1
	Abergynolwyn and Bryn Crug	8	4	...	1
	Llanegryn	8	6	...	1
	Towyn	13	6	1	1
	Totals	281	185	64	22
North Montgomeryshire and fringes of adjacent Denbighshire and Shropshire	Chirk	36	23	4	3
	Llansantffraid D.C. and Tregeiriog	30	30	7	4
	Llanarmon D.C.	13	6	4	...
	Selattyn, Rhyd y Croesau and Llansilin	7	6	2	1
	Trefonen	9	4	...	...
	Llangedwyn and Pentre'r Felin	7	6	...	...
	Llanrhaiadr ym Mochnant	9	5	3	1
	Penybont Fawr	5	8	...	...
	Llangynog	10	3	1	...
	Llanwddyn	14	9	1	1
	Llanfyllin	56	33	10	6
	Meifod	18	11	2	2
	Llanfihangel yng Ngwynfa and Pontrobert	7	9	2	...

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
North Montgomeryshire —*contd.*	Dolanog	11	6	...	1
	Llanerfyl and Foel	7	7	2	...
	Llanfair Caereinion and Melin-y-ddol	58	36	10	3
	Castle Caereinion and Cyfronydd	8	6	1	...
	Llanwyddelan and Tregynon	22	13	2	2
	Bettws Cedewain	7	6	...	...
	Totals	334	227	51	24
Upper Severn System	Oswestry	210	146	32	9
	Llanymynech	25	12	2	2
	Llansantffraid ym Mechain	27	33	4	...
	Llanfechain	10	5	2	...
	Four Crosses and Llandysilio	11	6	1	1
	Llandrinio and Criggion	22	11	5	1
	Sarnau and Arddleen	8	5	...	1
	Pool Quay	8	12	...	...
	Guilsfield	8	7	...	...
	Buttington and Trewern	14	9	3	1
	Welshpool	206	123	38	11
	Leighton	8	11	6	1
	Forden	12	15	1	1
	Chirbury	30	7	5	2
	Churchstoke	36	22	4	2
	Berriew and Garthmyl	19	26	9	3
	Abermule and Llanmerewig	13	9	1	1
	Llanllwchaiarn and Aberbechan	5	10	...	...
	Newtown	131	118	16	8
	Aberhafesp	11	10	1	...
	Caersws	58	31	16	4
	Llanwnog, Pontdolgoch and Clatter	18	6	2	2
	Llandinam	53	28	7	...
	Llanidloes	126	81	31	11
	Trefeglwys	13	9	1	1
	Carno and Talerddig	38	27	5	4
	Totals	1120	779	192	66
Dyfi Basin	Llanbrynmair	20	27	5	3
	Aberhosan, Dylife and Pennant	4	9	5	...
	Comins Coch, Tafolwern and Talywern	6	12	...	...
	Cemmaes and Abercegir	27	13	5	...
	Cwmllinau	8	12	4	1
	Aberangell, Mallwyd and Dinas Mawddwy	9	10	3	...
	Llanwrin	14	5	2	...
	Penegoes and Forge	14	9	4	...
	Pantperthog and Ceinws	5	10	3	1
	Corris and Aberllefenni	11	17	4	2
	Machynlleth	88	65	19	8
	Pennal and Derwenlas	21	5	13	1
	Ynyslas and Llancynfelin	17	14	9	...
	Aberdyfi	12	11	6	...
	Totals	256	219	82	16
Aberystwyth-Plynlymon Area	Van (Llanidloes)	7	9	1	2
	Llawr-y-Glyn	5	9	2	...
	Staylittle	12	2	...	...

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
Aberystwyth-Plynlymon Area—*contd.*	Cwmbellan and Llangurig	13	6	2	1
	Ponterwyd and Goginan	17	8	1	...
	Capel Bangor	18	7	5	1
	Penrhyncoch, Penybont Rhyd-y-Beddau and Cwmsymlog	15	12	5	2
	Pontgoch and Talybont	10	16	2	1
	Talicsin and Tre'rddol	11	10	1	...
	Penygarn and Bow Street	33	26	3	...
	Aberystwyth	104	62	18	10
	Llanrhystyd and Llanon	11	5	2	...
	Totals	256	172	42	17
Coastal South Cardiganshire	New Quay	21	13	4	3
	Llangranog, Tresaith and Aberporth	7	6	...	2
	Blaenporth and Beulah	7	6	1	1
	Cardigan	91	73	18	4
	St Dogmaels	10	3	2	1
	Totals	136	101	25	11
Upper Wye, Epynt, Black Mountains of Brecknock and Upper Usk Area	Builth	52	36	8	4
	Aberedw and Erwood	26	17	3	1
	Llanstephan	6	7	3	...
	Hay	88	62	10	7
	Kington	53	33	12	6
	Lyonshall	18	18	4	1
	Eardisley	14	13	1	1
	Whitney and Willersley	15	8	3	1
	Bredwardine	9	5	1	...
	Tyberton and Madle	11	9	2	...
	Kingstone	9	8	1	...
	Upper Chapel	9	4	...	...
	Llangorse and Bwlch	6	8	4	...
	Cwmdu	8	5	...	...
	Llanbedr, Patrishow and Cwmyoy	8	6	...	1
	Capel-y-Ffin, Llanthony and Longtown	11	3	2	...
	Dorstone	9	12	2	...
	Peterchurch	10	4	2	...
	Vowchurch	14	7	...	1
	Abbeydore and Ewyas Harold	12	8	3	...
	Pontrilas	9	10	4	1
	Pandy and Llanfihangel Crucorney	6	10	4	...
	Gilwern and Llangrwyney	16	13	3	1
	Llangenau	10	7	3	...
	Crickhowell	31	28	7	4
	Llangattock	20	10	...	1
	Ffawyddog	9	4	1	...
	Llangynidr	12	7	2	...
	Brecon	34	27	9	1
	Totals	535	389	94	31

(b) *Numbers observed in the high* A *areas* (*cf. table* 5)

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
Little England beyond Wales (North and East of Cleddau)	Llawhaden and Robeston Wathen	5	8	3	...
	Narberth and Templeton	28	46	7	2
	Cold Blow, Ludchurch, Tavernspite	5	8	3	1
	Tenby	38	53	11	15
	Cosheston, Milton and Carew	5	8	1	1
	Lamphey, Manorbier, St Florence and Penally	9	7	2	...
	Pembroke Dock	34	60	9	4
	Pembroke, Monkton, Castlemartin and Stackpole	22	26	6	4
	Totals	146	216	42	27
Little England beyond Wales (South and West of Cleddau)	Roch, Camrose, Prendergast and Withybush	6	10	2	1
	Haverfordwest	103	106	26	8
	Merlin's Bridge, Lower Freystop, Tiers Cross, Johnston and Llangwm	6	7	1	1
	Llanstadwell and Neyland	7	10	4	...
	Milford Haven	68	69	16	6
	Hakin	14	12	4	2
	Talbenny, Hasguard, Marloes and Dale	5	10	1	...
	Totals	209	224	54	18
West Cheshire Plain	Chester (English Surnames)	458	512	97	24
	Malpas (English Surnames)	50	56	10	4
	Totals	508	568	107	28
Mid-Cardiganshire	Aberaeron	30	30	6	4
	Ciliau Aeron, Ystrad, Talsarn and Llangeitho	8	6	2	...
	Llanarth, Mydroilyn and Dihewid	7	7	2	1
	Cribyn and Cwrtnewydd	2	11	1	...
	Totals	47	54	11	5
Teifi Basin (*b*) Middle	Velindre, Llangeler and Pentrecwrt	8	11	3	...
	Pont Tyweli and Llandyssul	5	8	2	2
	Llanfihangel ar Arth, Maes y Crugiau and Llanwenog	6	7	1	...
	Llanybyther, Pencarreg and Llanwnen	8	13	2	...
	Lampeter	75	78	24	6
	Totals	102	117	32	8

(c) *Numbers observed in the medium* A *areas* (*cf. table* 7)

Anglesey	Holyhead	48	40	7	3
	Llangefni, Llanfair P.G. and Beaumaris	8	7	3	3
	Totals	56	47	10	6
Conway Valley	Llanrwst . . . . . Total	59	55	18	3

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
Clwyd Estuary	Towyn on Sea	9	7	2	1
	Rhyl	59	59	15	6
	Prestatyn	27	27	4	2
	Totals	95	93	21	9
Teifi Basin (*a*) Lower	Llangoedmor and Cilgerran	8	10	2	...
	Llechryd, Llandygwydd, Abercych, Cenarth and Cwmcoy	11	8	4	1
	Newcastle Emlyn	28	21	6	1
	Adpar, Llandyfriog and Henllan	6	8	...	2
	Totals	53	47	12	4
Teifi Basin (*c*) Upper	Silian, Derry Ormond and Cellan	6	7	3	...
	Llangybi and Llanfair Clydogau	3	10	1	...
	Pont Llanio and Llanddewi Brefi	13	4	5	1
	Tregaron	24	28	12	2
	Pontrhydfendigaid, Ystrad Meurig and Ffair Rhos	5	8	2	1
	Totals	51	57	23	4
North Pembrokeshire	Llantood, Newport, Nevern and Eglwyswrw	17	15	5	...
	Boncath and Blaenffos	12	3	1	...
	Crymmych, Hermon, Llanfyrnach and Pentre Galar	9	4	1	...
	Dinas Cross and Llanychaer	6	8	1	...
	Rosebush, Mynachlogddu and Maenclochog	9	5	...	...
	Llandissilio and Clynderwen	11	4	...	...
	Fishguard	86	78	23	12
	Llanwnda and Goodwick	27	27	5	...
	Letterston	19	27	5	2
	Little Newcastle and Puncheston	9	6	2	...
	Wolf's Castle	9	9	4	3
	Ambleston and Trefgarn	6	8	4	2
	Mathry, Groesgoch, St David's and Solva	8	6	2	1
	Totals	228	200	53	20
North Carmarthenshire	Trelech	10	9	3	3
	Talog, Blaenycoed and Conwil Elvet	15	8	4	5
	Pencader	3	15	2	1
	Llanpumpsaint, Alltwalis and Rhydargaeau	12	8	3	1
	Llanfihangel Rhos y Corn, Gwernogle, Brechfa and Abergorlech	7	7	...	...
	Llanfynydd and Capel Isaac	12	15	1	1
	Salem	20	7	3	...
	Taliaris and Talley	32	23	5	6
	Llansawel	20	22	5	3
	Crugybar	12	14	6	1
	Pumpsaint	33	22	11	6
	Ffaldybrenin and Farmers	14	14	1	1
	Caio	12	21	10	1
	Rhandirmwyn	19	17	1	1
	Cilycwm	12	12	4	3
	Cynhordy	16	11	2	4

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
North Carmarthenshire —*contd.*	Llandovery	34	27	8	4
	Llanwrda	14	10	3	3
	Llansadwrn	13	6	4	2
	Llangadog	36	39	6	3
	Totals	346	307	82	49
Lower Towy Valley and Estuary	Llandilo and Ffairfach	71	63	10	2
	Broadoak ond Llangathen	9	5	2	...
	Golden Grove	8	6	1	...
	Dryslwyn	24	9	2	2
	Llanarthney, Llanegwad and Pont ar Gothi	7	6	3	1
	Nantgaredig, Felinwen, Abergwili and Llangunnor	24	24	3	2
	Carmarthen	75	76	16	2
	Llanllwch, Llangain and Llanstephan	9	7	1	1
	Ferryside	9	11	1	...
	Llanybri, Llangynog and Bancyfelin	12	7	2	1
	St Clears and Llangynin	15	21	3	1
	Laugharne	4	9	2	...
	Whitland	15	13	1	1
	Totals	282	257	47	13
South-Eastern Carmarthenshire	Cwmllynfell	45	20	8	2
	Brynamman, Garnant and Glanamman	16	17	4	...
	Llandybie	24	15	5	...
	Ammanford	62	54	20	4
	Penybank	19	9	5	2
	Saron	13	17	4	2
	Capel Hendre	12	9	2	...
	Penygroes, Gorslas and Cross Hands	12	7	2	...
	Tumble	15	17	5	3
	Trimsaran	20	10	4	3
	Burry Port	69	50	16	4
	Llanelly	265	216	55	15
	Felinfoel and Llwynhendy	29	15	5	1
	Llangennech	9	7	4	1
	Totals	610	463	139	37
Gower and Vale of Glamorgan	Llanmadoc, Llangennith and Rhossily	12	15	5	1
	Llanrhidian, Llanmorlais and Penclawdd	15	7	1	2
	Penard and Bishopston	6	8	1	...
	Llangan, Colwinston and Llysworney	6	7	...	...
	Aberthin, Cowbridge and Llanblethian	9	5	2	1
	Llantwit Major, Boverton and Flemingston	8	11	...	...
	Gileston and Penmark	8	5	1	...
	Llanilltern, Bonvilston and Llancarfan	8	10	3	...
	Totals	72	68	13	4
Eastern Monmouthshire	Abergavenny	80	81	18	1
	Llanvetherine and Cross Ash	10	4	1	...
	Llandeilo Croeseny, Llanfihangel Y.L. and Penrhos	7	7	1	...

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
Eastern Monmouthshire —*contd.*	Llangattock V.A., St Maughan's Rockfield and Hendre	9	7	...	1
	Llanfoist, Llanelen, Llanover and Usk	13	5	1	1
	Raglan, Dingestow and Mitchel Troy	5	8	2	1
	Monmouth	57	45	15	4
	Dixton, Penallt and the Kymin	6	7	1	...
	Redbrook, Whitebrook and Llandogo	6	17	2	1
	Trelleck	11	13	3	1
	Llanishen and Devauden	7	6	3	...
	Tintern	13	1	2	...
	St Arvan's	7	6	...	...
	Chepstow	9	8	1	2
	Totals	240	215	50	12
Archenfield	Garway, Orcop and Much Birch	22	17	...	2
	Skenfrith and Kentchurch	8	8	3	...
	Llangarren	15	12	2	...
	Llangrove	7	7	1	...
	Peterstow and Goodrich	15	11	1	1
	Broad Oak and Welsh Newtown	17	11	2	2
	Hoarwithy	8	7	...	...
	Little Dewchurch	15	13	4	1
	Ross	29	35	7	1
	Totals	136	121	20	7

(d) *Numbers observed in the high* B *areas* (*cf. table* 9)

North Brecknock and North Radnor Moors	Llanwrtyd, Llanddulas and Llangammarch	35	27	11	3
	Abergwessin and Beulah	10	5	5	1
	Newbridge and Llanyre	12	12	...	...
	Llandrindod and Llanbadarn Fawr	20	18	11	2
	Penybont, Llandegley and Llanbister	5	10	1	3
	Nantmel and Llanwrthwl	12	6	11	...
	Rhayader	49	53	14	4
	Cwmdauddwr and Elan Valley	5	13	2	...
	St Harmon	6	7	7	...
	Pantydwr and Tylwch	14	5	4	3
	Abbeycwmhir	13	13	1	...
	Dolfor, Mochdre, Llanbadarn Fynydd	20	16	4	4
	Totals	201	185	71	20
Black Mountain, Carmarthenshire	Bethlehem	27	17	15	3
	Gwynfe	12	6	7	1
	Llanddeusant	9	11	5	3
	Myddfai	12	4	4	1
	Cwmwysg	4	10	8	2
	Totals	64	48	39	10

(e) *Numbers observed in the low* B *area (cf. table* 10)

Area	Name of town or village	Numbers			
		O	*A*	*B*	*AB*
Radnor Forest, Clun Forest, Cefn Coed and Kerry Hills	New Radnor, Kinnerton and Evanjobb	7	7	...	...
	Titley and Kinsham	31	31	5	2
	Presteign	28	25	1	1
	Lingen	6	8	...	...
	Stapleton, Norton, Whitton, Discoyd and Cascob	7	6	...	...
	Knighton	23	28	4	1
	Knucklas, Skyborry, Gwernafal and Rhos-y-meirch	6	10	...	...
	Llanfair Waterdine, Beguildy and Bettws-y-crwyn	4	15	...	...
	Bucknell	48	33	5	3
	Leintwardine	12	9	1	1
	Clun, Clunton, Clunbury, Aston on Clun, and Clungunford	44	34	8	1
	Lydbury North	3	11	1	...
	Bishop's Castle	38	42	5	2
	Montgomery	42	45	9	2
	Hyssington and Lydham	7	6	...	1
	Sarn and Llandyssil	5	19	2	...
	Kerry	20	14	4	...
	Cefn Coed	12	11	...	2
	Totals	343	354	45	16

* Grand Total for Wales	16,760	8124	6401	1681	554
Total for North Wales	4535	2351	1581	462	135
Total for Mid-Wales	5088	2510	1936	483	159
Total for South Wales	7137	3257	2884	736	260
Total for Western Wales	8632	4053	3317	942	320
Total for Eastern Wales	8128	4071	3084	739	234

* *N.B.*—The figures for Chester and Malpas are not included in the Welsh totals.

(f) *List of Welsh surnames* †

Adda	Dilwyn	Gwyn	Kyffin	Phillips	Rogers
Anwyl	Edwards	Gwyther	Lewis	Powell	Rowlands
Bevan	Elias	Harries	Leyshon	Powis	Thomas
Beddoe	Evans	Hopkin	Llewellyn	Preece	Treharne
Bellis	Eynon	Howell	Lloyd	Price	Trevethan
Bithel	Francis	Hughes	Loughor	Pritchard	Trevor
Blythin	Gethin	Humphreys	Machen	Probert	Tudor
Bowen	Glyn	Idris	Maddock	Probyn	Vaughan
Breese	Gough	Ithell	Meredith	Prothero	Walters
Cadarn	Griffith	James	Meyrick	Prytherch	Watkin
Caddell	Gronow	Jenkins	Morgan	Pugh	Welsh
Cadwallader	Gwatkin	John	Morris	Rees	Williams
Craddock	Gwilt	Jones	Owen	Richards	Wynn
Davies	Gwilym	Kenwyn	Parry	Roberts	Yorath

† Many names have variant spellings which may also be considered Welsh.

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