THE NORTON HISTORY OF CANCER AND ITS INCIDENCE IN ANGLESEY, WITH SPECIAL REFERENCE TO THE SOUTH-EASTERN DIVISION OF THE COUNTY.

By WILLIAM HUGH WILLIAMS, M.B., C.M. (1894)

This disease has been recognised from very early times; it is mentioned in the Poruges and was believed to have been written about 1550 B.C. Malignant tumours are referred to in the works of Hippocrates, but as a caution of them is made in the "Aphorisms" — a list of diseases likely to attack men at various times of life — we may infer that Cancer was at that time very rare.

The information regarding this disease in the Middle Ages...
INTRODUCTION

The great increase in the number of deaths from Cancer during recent years, the mystery still attached to its causation and consequently to its cure, have stimulated men of science to exert to the utmost all their powers of thought and all their ingenuity in the endeavour to solve the problems attached to this dread disease. The literature on this subject has been accumulating from the earliest period of medicine up to our own time, and hypotheses have been advanced one after the other, each demolishing its predecessor. In spite of the new light thrown upon the constitution of the Neoplasm by microscopical examination, and the undeniable progress made in therapeutics, we have still to recognise that we are quite as ignorant of its pathogenesis as in the beginning.

This disease has been recognised from very early times; it is mentioned in the Papyrus Eber which is believed to have been written about 1550 B.C. Malignant tumours are referred to in the works of Hippocrates, but as no mention of them is made in the "Aphorisms" - a list of diseases likely to attack men at various times of life - we may infer that Cancer was at that time very rare.

The information regarding this disease in the Middle
Ages is very unreliable. From the beginning of the last century, however, we have an unbroken record in the documents of the Scottish Widows' Life Assurance Fund from 1815, and in the reports of the Registrar General from the year 1838, to give some account of them.

Not only is Cancer a disease that has been recognised from the early ages, it is also known in almost every part of the globe and is not confined to the human race. It is, however, more prevalent in some parts of the world, especially among civilised peoples, the highest mortality from this cause being among the well-to-do races of Western Europe and America. Similarly, it affects domestic to a greater degree than wild animals.

In recent years the death rate from Cancer in England and Wales has become second only to the death rate from Phthisis, the figures for the year 1910 being as follows:—

<table>
<thead>
<tr>
<th>Disease</th>
<th>Death Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phthisis</td>
<td>1,015 per million living</td>
</tr>
<tr>
<td>Cancer</td>
<td>967 &quot; &quot; &quot;</td>
</tr>
</tbody>
</table>

While in 1840 the deaths from Cancer amounted to only 177 per million living. This fact alone is sufficient to account for the intense interest taken in the Cancer problem not only by research students and pathologists, but also by general practitioners and the public at large.

Many medical men living in secluded country districts could doubtless bring to light interesting facts
regarding the disease, but their time is so fully occupied that their experience remains unrecorded. It has been my lot to witness a remarkable series of cases of malignant disease, hence my attempt, however faulty and incomplete, to give some account of them. "Anglesey does not impress the visitor as being so fertility."

First of all I must mention the fact that the death rate from Cancer for the County of Anglesey is abnormally high - 1.3 per 1,000 for the year 1910, while that for the district in which I practise was still higher - 1.6 per 1,000 for the same year. (England & Wales .963)

The fact of this high mortality in Anglesey has been the means of deterring several persons from other localities taking up good appointments in the County.

The Registration County of Anglesey comprises but a part of the island; the whole area bordering the Menai Straits - a strip several miles broad - being incorporated in the two Registration Districts of Bangor and Carnarvon. I have been fortunate enough, through the kindness of the Registrars, to obtain statistics for the whole county for the years 1901 to 1910.

The island of Anglesey is extremely flat, the highest point - Holyhead mountain - attaining only to the very modest height of about 700 feet; in consequence, the streams are sluggish and frequently overflow their
banks after heavy rains, and large areas are covered with water or are in a sodden condition during the greater part of the winter. The more prevalent soil is a stiffish loam which in several parts degenerates into clay.

"Anglesey does not impress the visitor as being so fertile as has been supposed, there are long stretches of morass and moor strewn with pools."


Limestone ranges traverse the island, while marble, both white and variegated, is procured. The land on the sea coast, especially the southern and part of the western side, is sandy, and the northern rocky.

The sea breezes render the climate milder than that of the adjoining part of Wales, but the air is from the same cause loaded with frequent mists in the Autumn. Snow seldom lies long even in the depth of winter, and the prevailing wind is South West.

Anglesey has but one real town - Holyhead - and the rural inhabitants are almost wholly Welsh, it is an agricultural county, but a fair number of the men obtain employment in the slate quarries of Carnarvonshire; owing to the fact that of late years, the land is mainly used for grazing, and that in consequence the demand for farm labourers is decreasing, the number
I was much struck by the frequent occurrence of malignant disease in certain areas while other parts at no great distance appeared to be exempt; this fact was so patent that it engrossed my thoughts, and I endeavoured to collect data as to the soil, water, habits and family of life when Cancer is most prevalent - is above the normal. Similarly, in the case of the women, a large number of young girls leave the villages every year, and enter domestic service in the large towns.

I shall endeavour to show by means of statistics obtained from the Registrar General that the death-rate from Cancer in the Registration County of Anglesey has increased year by year from 1901 to 1910, and that in the other two sub-districts making up the whole county, the deaths from this disease have been maintained at a uniformly high level during the same period.

I shall also contrast the death-rates from Cancer and Phthisis in this district during the decennial period 1851-60 with those of 1901-10.

The mortality rate from malignant disease in the portion shaded in the accompanying map is higher than that of the whole county. It will be my aim in this dissertation to give an account of the occurrence, incidence and mortality from Cancer in Anglesey in general and in this district in particular.

After I had been in practice here for a few years,
I was much struck by the frequent occurrence of malignant disease in certain areas while other parts at no great distance appeared to be exempt; this fact was so patent that it engrossed my thoughts, and I endeavoured to collect data as to the soil, water, habits and family history of the residents. I shall attempt to solve the question why this disease is so prevalent in some parts, while other areas enjoy comparative immunity. I shall also make an effort to draw certain conclusions from the cases set down which seem to me to be inevitable on weighing the results of my own experience.

<table>
<thead>
<tr>
<th>Country</th>
<th>Aver. 1901-05</th>
<th>Year 1909</th>
</tr>
</thead>
<tbody>
<tr>
<td>England &amp; Wales</td>
<td>0.86</td>
<td>0.95</td>
</tr>
<tr>
<td>Scotland</td>
<td>0.83</td>
<td>0.94 (1908)</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.61 (1900)</td>
<td>-</td>
</tr>
<tr>
<td>North Wales</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.10</td>
<td>1.11</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.95</td>
<td>0.99</td>
</tr>
<tr>
<td>Prussia</td>
<td>0.64</td>
<td>0.74</td>
</tr>
<tr>
<td>Austria</td>
<td>0.69</td>
<td>0.72 (1908)</td>
</tr>
</tbody>
</table>
The study of a disease surrounded with the apparently impenetrable mystery which enshrouds Cancer can not exclude any method of examination, and a very important method is the information supplied by statistics.

It is known that Cancer affects all races of mankind in all climates and under all conditions of living; but statistics show that it does not affect them all equally, and the study of this inequality so as to ascertain the causes underlying it might assist in throwing light on the nature of the disease and thus give a clue to what it is that produces personal liability to it.

I shall endeavour in the following pages to give the calculated death-rates from Cancer in various parts of the world which I have brought together from different sources.

Table showing the death-rate from Cancer throughout the World.

Calculated per 1,000 of the population.

<table>
<thead>
<tr>
<th>Country</th>
<th>Aver. 1901-05</th>
<th>Year 1909</th>
</tr>
</thead>
<tbody>
<tr>
<td>England &amp; Wales</td>
<td>0.86</td>
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<tr>
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<td>0.83</td>
<td>0.94 (1908)</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.61 (1900)</td>
<td></td>
</tr>
<tr>
<td>North Wales</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>1.10</td>
<td>1.11</td>
</tr>
<tr>
<td>Netherlands</td>
<td>0.85</td>
<td>0.90</td>
</tr>
<tr>
<td>Prussia</td>
<td>0.64</td>
<td>0.74</td>
</tr>
<tr>
<td>Austria</td>
<td>0.69</td>
<td>0.72 (1908)</td>
</tr>
<tr>
<td>Country</td>
<td>Aver. 1901-05</td>
<td>Year 1909</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Belgium</td>
<td>0.49 (3 yrs.)</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>0.45</td>
<td>0.53</td>
</tr>
<tr>
<td>Spain</td>
<td>0.38</td>
<td>0.44</td>
</tr>
<tr>
<td>Hungary</td>
<td>0.38</td>
<td>0.43</td>
</tr>
<tr>
<td>Servia (crude)</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Sardinia</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>France (Towns)</td>
<td>0.98</td>
<td></td>
</tr>
<tr>
<td>Denmark (only)</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>0.80</td>
<td>0.90</td>
</tr>
<tr>
<td>New South Wales</td>
<td>0.80</td>
<td>0.90</td>
</tr>
<tr>
<td>Victoria</td>
<td>0.76</td>
<td>0.82</td>
</tr>
<tr>
<td>South Australia</td>
<td>0.76</td>
<td>0.86</td>
</tr>
<tr>
<td>Queensland</td>
<td>0.76</td>
<td>0.83</td>
</tr>
<tr>
<td>West Australia</td>
<td>0.74</td>
<td>1.09</td>
</tr>
<tr>
<td>All Australia (average)</td>
<td>0.74</td>
<td>0.90</td>
</tr>
<tr>
<td>Tasmania</td>
<td>0.68</td>
<td>0.82</td>
</tr>
<tr>
<td>New Zealand</td>
<td>0.75</td>
<td>0.82</td>
</tr>
<tr>
<td>Japan</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>United States (Registration area)</td>
<td>0.68</td>
<td></td>
</tr>
<tr>
<td>Jamaica</td>
<td>0.16 (av 1895-04)</td>
<td></td>
</tr>
<tr>
<td>Ceylon rare</td>
<td>0.012 per 1000</td>
<td></td>
</tr>
<tr>
<td>India, Punjaub</td>
<td>.7 per cent of hospital cases</td>
<td></td>
</tr>
<tr>
<td>Bombay</td>
<td>.05</td>
<td></td>
</tr>
<tr>
<td>Assam</td>
<td>.005</td>
<td></td>
</tr>
<tr>
<td>Cairo (1891)</td>
<td>.189 per 1000</td>
<td></td>
</tr>
<tr>
<td>Algiers (town)</td>
<td>.56</td>
<td>1.00</td>
</tr>
</tbody>
</table>

(Taken from Hon. Rollo Russell's "Preventable Cancer," pp. 30 & 31)

TABLE SHOWING MORTALITY FROM CANCER IN TOWNS OF EUROPE

Calculated per 1,000 of the population.

<table>
<thead>
<tr>
<th>England</th>
<th></th>
<th>Germany</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canterbury (1881-90)</td>
<td>1.13</td>
<td>Berlin 1900</td>
</tr>
<tr>
<td>Chichester</td>
<td>1.18</td>
<td>Strasburg</td>
</tr>
<tr>
<td>Durham</td>
<td>0.32</td>
<td>Hamburg 1898</td>
</tr>
<tr>
<td>Derby</td>
<td>0.52</td>
<td>Dresden 1900</td>
</tr>
<tr>
<td>Bolton</td>
<td>0.40</td>
<td>Munich</td>
</tr>
<tr>
<td>Blackburn</td>
<td>0.38</td>
<td>Stuttgart</td>
</tr>
<tr>
<td>London</td>
<td>0.68</td>
<td>Switzerland 1900</td>
</tr>
<tr>
<td>Birmingham (1900)</td>
<td>0.85</td>
<td>Geneva</td>
</tr>
<tr>
<td>Manchester</td>
<td>0.78</td>
<td>Lucerne</td>
</tr>
<tr>
<td>Liverpool</td>
<td>0.77</td>
<td>Copenhagen</td>
</tr>
</tbody>
</table>

There is, however, a large number of countries with...
Scotland
Aberdeen 1900 0.95  
Glasgow  
Edinburgh 1.16  
Ireland 0.61  
Kerry 1900 0.26  
Armagh 1.04  
France
Paris 1900 1.04  
Rouen 1.73  
Lyons 1.53  
Bordeaux 0.97  
Marseilles 0.69  
Spain
Seville 1900 0.85  
Barcelona 0.53  
Madrid 0.78  
Norway
Christiania 1900 0.66  
Sweden  
Stockholm 1.10  
Russia  
France  
Prague  
Austria  
Italy  
Spain  
Belgium  
Brussels 0.44  
(Taken from Hon. Rollo Russell's "Preventable Cancer" pp. 27-28)

From a survey of statistics, it would appear that the countries with the highest Cancer death-rate in the world are:— Great Britain, Switzerland, Holland, Sweden and Denmark, while the states of Baden, Bavaria and Wurtemberg are also unusually high. If we compare this with the comparative wealth of the different nations, Scotland, Belgium, Switzerland and Holland are considered high in this respect.

On the other hand the countries with the lowest death-rates are, or rather have been, Italy, Hungary, Spain, Portugal, Turkey, while Roumania, Sardinia, Corsica, Sicily and the Faroe Islands and Greenland are very low.

There is, however, a large number of countries with
native populations, especially tropical countries, where the cancer death-rate is far below these, and in some cases it has been so small that many medical officers have never seen a case. Countries of immunity or rarity are:— the greater part of Northern, Central, East and West Africa, where the natives have not adopted to any extent European customs; large parts of India, China, Siam and Burmah as well as many of the islands in Oceania; parts of the West Indies, Brazil and Mexico, and in regions in Asia where the habits of the people are frugal.

**DISTRIBUTION OF CANCER IN EUROPE**

England. In England as in the majority of countries, the highest rates have been in the rich residential districts, in the large cities where the wealth of the nation is chiefly found, and the lowest in mining and industrial districts. Cambridgeshire, Huntingdonshire, Peterborough, Stamford, Spalding and Bourne were found to be included in an area of special cancer prevalence in two successive decennial periods. Huntingdon, Cambridge, Sussex are the highest counties, Monmouth and Derbyshire lowest, while Cornwall, Dorsetshire, Wiltshire with Devonshire are fairly low. Cancer is...
also prevalent in North Wales. The highest rate was found in London, but probably this was largely due to the large proportion of cases dying in hospitals. It must, however, be borne in mind that the percentage of people over 35 years in agricultural and residential districts is higher than in the industrial and mining centres.

In the report of Dr. Bashford of the Imperial Cancer Research Fund 1913 he states: In the census of 1901 out of one million males of all ages, 311,354 were over 35 years of age; in 1911, 339,348 were over 35. This incongruity of the age constitution of the population at the 1901 and 1911 censuses had led to an over-estimation of the cancer death-rate in the later years of the intercensal period.

The following is a comparison of two counties, one industrial, the other largely agricultural.

### Deaths from Cancer per 1000 living in 1910

<table>
<thead>
<tr>
<th>Province</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Wales</td>
<td>1.076</td>
<td>1.070</td>
</tr>
<tr>
<td>Huntingdonshire</td>
<td>1.267</td>
<td>1.644</td>
</tr>
<tr>
<td>Lancashire</td>
<td>0.801</td>
<td>0.976</td>
</tr>
</tbody>
</table>

### Proportion of persons over 35 years in 1000 of all ages

<table>
<thead>
<tr>
<th>Province</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>England and Wales</td>
<td>33.935</td>
<td>35.574</td>
</tr>
<tr>
<td>Huntingdonshire</td>
<td>38.498</td>
<td>41.046</td>
</tr>
<tr>
<td>Lancashire</td>
<td>33.053</td>
<td>34.522</td>
</tr>
</tbody>
</table>
Scotland. In Scotland cancer has been found to be as prevalent, if not more so, in towns than in the rural districts.

It is least prevalent in the Western Islands, where the conditions are purely rural and the people very poor. It is low in Ross, Cromarty, Caithness and Sutherland. The mortality was found to be highest in such prosperous counties as Nairn, Forfar, Roxburgh, Midlothian, Dumbarton, Wigtown and Dumfries; of the towns, Edinburgh has shown the largest proportion and Glasgow the lowest. The table given will more fully illustrate this.

Ireland, which is the poorest of the countries forming the United Kingdom, seems to be the least prone to Cancer. The death-rate is especially low in the poor counties of the South and West, and high in the well-to-do province of Ulster, which comprises the important city of Belfast. The highest cancer death-rate, however, was found in the district of Armagh. Next in order come the counties of Dublin and Londonderry, while the lowest rates were in the desolate and poverty stricken counties of Clare, Mayo and Kerry. (Roger Williams "Nat. Hist. of Cancer" p. 28).

During the potato famine in Ireland, there was a decrease in the Cancer death-rate.
France. French statistics would seem to illustrate similar conditions. The highest death-rates from Cancer were found in Paris and its neighbourhood.

The highest Cancer death-rates known to Mr. Roger Williams have been in the small villages of Normandy:

<table>
<thead>
<tr>
<th>Village</th>
<th>Rate Per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oulchy</td>
<td>4.0</td>
</tr>
<tr>
<td>St. Sylvestre</td>
<td>3.65</td>
</tr>
<tr>
<td>Rocroi</td>
<td>2.66</td>
</tr>
</tbody>
</table>

The impoverished provinces of Brittany and the Mediterranean coast have the lowest mortality from malignant disease in France. It is also interesting to note that in districts where wines and spirits were drunk, the rate was much lower than in those areas where beer and cider were the staple drinks. Another very striking fact is that in France the disease does not appear to be more rampant among the rich than it is among the poor; the rich quarter of the Elysee in Paris having for years had a much smaller mortality than the poor quarters of Montmartre. This may perhaps be explained by the fact that the poorer classes have a very strong predilection for harmful liquors such as absinthe, while the rich are more inclined to frugality and daintiness than to excess.

Belgium. In Belgium there does not appear to have been any marked peculiarity of distribution, while the average rate of the country has been only moderately high.
According to Clive Holland, the people live more frugally than those of corresponding classes in Britain.

Germany. Here again, the large towns show a much higher death-rate than the smaller towns, and the rural districts. There has also been a remarkable difference in the rates of the prosperous districts of the West and the poor provinces and villages bordering on Poland.

The highest rates for Germany according to Hon. Rollo Russell, "Preventible Cancer" have been found in the beer consuming provinces.

Austria. The same authority states that the mortality from Cancer in Austria was much higher in prosperous provinces than in poor.

Italy. In Italy the same state of matters is observed, Florence having a remarkably high rate, although in many parts a low death-rate is recorded.

In Switzerland. Lucerne was found to have the highest death-rate from Cancer and Valois the lowest, the former being the richest and the latter among the poorest, if not the very poorest district in that country. It may be worthy of note that Lucerne, lying in the east of Switzerland, is a beer and cider drinking district, also that the mortality for Switzerland as a whole is the highest for any country in Europe. There are no millionaires in
Switzerland but at the same time there are no paupers, and wealth is on the whole, evenly distributed. The population shows a steady increase and a diminishing death-rate, while the consumption of meat would appear to be considerable. (Roger Williams "Nat. Hist. of Cancer")

Denmark. Next to Switzerland, Denmark is reported to have the highest cancer death-rate in Europe, says Williams in his "Nat. Hist. of Cancer." Statistics, however, are only available for the towns, and it is probable that the actual figures are somewhat lower than those generally quoted for this country. Mainly engaged in agriculture and, like Switzerland, although there has been no development of great industries, the population has nevertheless within comparatively recent years experienced a change from poverty to prosperity.

Scandinavia. In the countries of Norway and Sweden, the death-rate from Cancer is fairly high. A curious feature observed in Sweden is that in the small towns, the death-rate from cancer appears to be higher than in the large. In Norway, however, the highest mortality is found in the larger shipping centres where the people are most prosperous.
In Holland consisting of a fertile plain, traversed by many canals and rivers, the cancer mortality is high. Agriculture is the main occupation of the population. In the unproductive provinces of Dreunthe, where large pauper colonies have been established, the lowest death-rate is found. (Roger Williams).

**Distribution of Cancer in Asia.**

All indications would seem to point to the fact that cancer is much less prevalent in Asia than it is in Europe. Especially is this the case in those parts which are remote from European supremacy. China. This fact is abundantly borne out in the case of China, where European civilising customs have penetrated almost less than in any other country. Hong Kong, however, must be taken as an exception, but then it is not a true specimen of China, its population being largely made up of immigrants, and the town largely subject to European customs, especially those of a low order.

According to Dr. Brunet (Revue d'Hygiene xxi, Nos. 2 & 3, 1905) cancer is comparatively little known in those parts of China where the people live on a simple diet of rice and millet, and are too poor to buy.
flesh. In some of the large towns, however, such as Pekin and Shanghai, cancer is fairly common. Here the staple food comprises fish, pork and fowl, for it is by no means the case that all Chinamen live on rice. In Japan, Cancer is also less frequently met with than in the majority of countries, the people are of a very frugal and temperate disposition, and live mainly on vegetable diet.

No reliable statistics can be obtained for the northern part of Asia, but in Asia Minor, Arabia and Persia, Cancer would seem to be rare.

For India also, a country of such vast extent and with a population so huge, statistics must be of a more or less problematic nature. As far as can be ascertained, however, Cancer would seem to be much less prevalent than in Europe, although it attacks Hindu and Mohammedan alike. In the high lying province of Kashmir, with the exception of Cancer of the "kangri-burn" variety, the disease is exceptionally rare. In Assam, according to Dr. Dalgetty (Journal of Tropical Medicine Ap.15.02) malignant tumours are rare, only eight cases of Cancer and Sarcoma having occurred in five years in a large Hindu population at Adampore. In Bengal and Madras, Cancer would seem to have been more prevalent. Many
of the cases in Madras were found to be of the mouth and tongue, possibly attributable to the habit of "betel"-chewing, this composition having a peculiarly irritating affect during chewing. The same remarks apply to Travancore, where cancer of the lips, tongue and jaws formed 70.6 per cent of the cancer cases.

In Ceylon, malignant tumours seem to have been very rare, and in Burmah and Siam, although they are perhaps slightly more common, the same state of things prevails.

DISTRIBUTION OF CANCER IN AUSTRALIA & OCEANIA.

Throughout the entire territory covered by Australia and Oceania, cancer has been found to be most prevalent among the white population. Authorities on the subject have stated that malignant tumours are practically unknown among the native inhabitants.

In Australia the great bulk of the white population is to be found in the large coast towns in the temperate regions, where the style of living is very much like that adopted in large European cities. Immigration does not take place to any great extent. The people are, on the whole, prosperous and live well, consequently we find that the cancer mortality has been on the increase.
In Australia as in Europe, the death-rate in the large town districts is much greater than it is in rural areas. A curious fact which may be observed in all the states forming the Union is that men seem to be more prone to cancer than women, a reversion of the usual state of matters. Another noteworthy fact is that the Australian Aborigines are practically immune from cancer, years occurring without a case being seen. (G.C. Adams, Lancet, vol.i.1904). Although they form but a very insignificant fraction of the population (60,000) the fact is striking.

New Zealand. Here the social conditions of existence resemble in great part those of Australia. The people are prosperous and much given to the eating of meat. As in Australia, cancer is also more prevalent among males than females.

Malignant tumours are very rare in British New Guinea. During four years spent at Port Moresby, Dr. Craigen had not seen one case. He gives the following reasons for the non-occurrence of Cancer:

1. The Papuans die young, very few live to reach sixty years of age.

2. Malaria is common and it has been shown that Cancer is not common in malarial districts.

3. Very little meat is eaten, the diet chiefly consisting of bananas, yams, sweet potatoes, &c.

In the South Sea and Fiji Islands malignant tumours are rare. This also is the case in the other islands comprised in Oceania.
DISTRIBUTION OF CANCER IN AMERICA

United States. In consequence of the inadequate system of compulsory death registration in the United States, the cancer mortality returns must necessarily be somewhat inaccurate and unreliable. It would appear, however, to be much the same as in Europe, and to be on the increase. In large cities, especially in those where there is a mixture of various races, the mortality has been high, considerably higher than among the same races in Europe. The consumption of meat in the United States is considerably higher than in Europe. The highest cancer rates have been found in the Northern part of the States, especially in the wealthy city districts of the Atlantic coast. The lowest rates have been found in the southern localities, and above all, in those districts where the population is mainly negro. The cancer mortality among the negroes has, however, increased rapidly since their emancipation.

British North America. Here cancer has been found fairly common amongst the white population, but of very rare occurrence among the Aborigines.

In the States of Central America, the disease has been comparatively rare, but in Mexico, in the high-lying parts it is fairly common.
In the Bermudas and Bahamas, cancer has been met with but not with notable frequency, and in the West Indies generally it has been distinctly rare.

In South America. In Uruguay and Argentina Cancer has been fairly common, but in Brazil, especially in those regions lying near the Equator, the disease has been of comparatively rare occurrence.

**DISTRIBUTION OF CANCER IN AFRICA**

Africa as a whole is believed to be more immune from malignant diseases than any other part of the world, but especially does this apply to its Northern territories: Egypt, Algeria, etc. The consensus of opinion among medical men in Egypt is, that cancer is never found either in male or female among the black races of that country. (Dr. F.C. Madden, B.M.J.). Among the Arabs, however, whose mode of living and eating somewhat resembles that of Europeans, cancer has been fairly often met with. In many of the towns of Algeria, no cases of cancer have been recorded. In Tunis also it is extremely rare. This also applies to Morocco, Sudan and Somaliland, while in most of the parts of Central Africa the disease has been but infrequently met with according to the "Report on Cancer in the British Colonies, 1905."

On the West Coast of Africa (Bathurst and Gambia
Hospitals) no case occurred among 9,068 hospital patients.

In Mashonaland, BechuanaLand, Natal and other parts where natives are numerous, the same state of matters prevails.

In South Africa, however, among the Boer and European population, cancer is common, but here again among the natives, who are for the most part vegetarians, malignant tumours are practically unknown.

CANCER AMONG JEWS

It has been often stated that members of the Jewish race are much less liable to malignant disease than Europeans. After careful enquiry, Mr. Roger Williams finds that the statement is baseless. The death-rate from cancer among Jews varies according to their mode of life, approximating to that of the people among whom they live, but slightly lower. He quotes the following statistics from the U.S.A. census report for the year 1880.

<table>
<thead>
<tr>
<th></th>
<th>Jews</th>
<th>Other U.S.A. whites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>.135</td>
<td>.13</td>
</tr>
<tr>
<td>Females</td>
<td>.216</td>
<td>.235</td>
</tr>
</tbody>
</table>

Cancer mortality per 1000.
For most of the facts given above, I am indebted to the works of Mr. Roger Williams and the Hon. Rollo Russell.

On reviewing the incidence of Cancer in the various countries throughout the world, it will be seen that several facts stand out clearly and emphatically. The most outstanding of these is that in the great majority of countries, the prosperous districts are much more subject to the disease than the poor. Then again, the facts detailed above would seem to indicate that poor countries where fare is frugal and largely vegetable in nature are less subject to the disease than those where much meat is consumed and the mode of living richer. Moreover, races and people which have not hitherto been subject to cancer become subject to the disease when they adopt European or American customs with regard to food.

All this would seem to point to the fact that in the production of Cancer, food is one of the chief, if not the chief factor. This, however, does not account for the disease being prevalent in one district more than in another only a little way removed from it, and where the mode of living is practically identical, and I therefore hope to show that other factors such as climate, soil, etc., must play some part in the production of the disease.
The Cancer death-rate for the Registration Counties of Wales, according to the Registrar General's Report for the year 1910 was as follows:

<table>
<thead>
<tr>
<th>County</th>
<th>Death-rate per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anglesey</td>
<td>1.49</td>
</tr>
<tr>
<td>Carnarvonshire</td>
<td>1.33</td>
</tr>
<tr>
<td>Denbighshire</td>
<td>1.06</td>
</tr>
<tr>
<td>Flintshire</td>
<td>0.702</td>
</tr>
<tr>
<td>Merionethshire</td>
<td>1.5</td>
</tr>
<tr>
<td>Montgomery</td>
<td>0.86</td>
</tr>
<tr>
<td>Brecknock</td>
<td>0.97</td>
</tr>
<tr>
<td>Cardigan</td>
<td>1.34</td>
</tr>
<tr>
<td>Radnor</td>
<td>1.42</td>
</tr>
<tr>
<td>Pembroke</td>
<td>1.21</td>
</tr>
<tr>
<td>Carmarthen</td>
<td>0.81</td>
</tr>
<tr>
<td>Glamorgan</td>
<td>0.68</td>
</tr>
<tr>
<td>Monmouth</td>
<td>0.69</td>
</tr>
</tbody>
</table>

These figures give an average death-rate from malignant disease for the whole of Wales of 1.08 per 1000 living, which is slightly above the average for England and Wales (0.97 per 1000). As can be seen from the above figures, the counties which are almost exclusively agricultural, Anglesey, Cardigan, Radnor, Merioneth, Pembroke and Carnarvon, have the highest mortality from this disease and without doubt this fact is largely due to the higher average age of the population. On the other hand, those counties which are largely industrial, Monmouth, Flint and Glamorgan, have a death-rate from Cancer which is much below the normal. During recent years, owing to the great depression in the slate trade, the young men from the quarries of Carnarvon and Merioneth have departed in hundreds to earn a more remunerative livelihood in the coal mines of South Wales.
At a town in Merioneth of about 10,000 inhabitants, there are at present about 300 empty houses, where formerly it was difficult to obtain a house at any price. This is the history of all the small towns in the neighbourhood of the slate quarries, and I believe that the high cancer death-rate in those counties is partly due to the high percentage of people at and above the age when malignant disease is most prevalent. Similarly there has been a great exodus of young men from the agricultural counties to the towns, the coal mines and the colonies.

A fact which may to some extent explain the low death-rate from malignant disease in Glamorgan, Monmouth and Flint is that miners are but little prone to Cancer. The United States statistics for this class show a cancer death-rate of .33 per 1000. According to Roger Williams "there are few districts where cancer is less prevalent than in the great colliery centres of Derbyshire, South Wales, Lancashire and Durham." (Nat.Hist. of Cancer, p. 354).

General Statistics for the County of Anglesey, with detailed Statistics for the South Eastern division of the County.

As I have previously stated, the Registration County of Anglesey consists of only a part of the island;
two sub-districts bordering the Menai Straits being included in the Bangor and Carnarvon Registration Districts; it will thus be seen that it was not easy to obtain statistics for the whole county.

Owing to the kindness of several Registrars and also the Registrar General, I have been able to obtain the general death-rate and the cancer death-rate for the whole county during the decennium 1901-10. The rates have all been reduced to the common rate of per 1000 living.

COUNTY OF ANGLESEY. TABLE 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths from all causes</th>
<th>Deaths from Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>16.96</td>
<td>.808</td>
</tr>
<tr>
<td>1902</td>
<td>19.49</td>
<td>1.27</td>
</tr>
<tr>
<td>1903</td>
<td>17.18</td>
<td>1.15</td>
</tr>
<tr>
<td>1904</td>
<td>16.31</td>
<td>.83</td>
</tr>
<tr>
<td>1905</td>
<td>16.72</td>
<td>.79</td>
</tr>
<tr>
<td>1906</td>
<td>14.44</td>
<td>1.1</td>
</tr>
<tr>
<td>1907</td>
<td>16.18</td>
<td>1.231</td>
</tr>
<tr>
<td>1908</td>
<td>16.61</td>
<td>.96</td>
</tr>
<tr>
<td>1909</td>
<td>15.43</td>
<td>1.281</td>
</tr>
<tr>
<td>1910</td>
<td>15.77</td>
<td>1.34</td>
</tr>
</tbody>
</table>

Average for the 10 years 16.529 1.07
The Registration County of Anglesey
+ Beaumaris District
+ Llanidan District
together constitute the geographical County of Anglesey.

The average death-rate from Cancer in England and Wales during the years 1901 to 1905 was .86 per 1000 while in the year 1910 it was .96 per 1000, the general death-rate in England and Wales (1900-02) was 17.16 per 1000; thus, while the general death-rate from all causes in Anglesey approximates to that for the whole country, the death-rate from malignant disease is perceptibly higher.
I come now to the district with which I have been connected for the last fifteen years. It comprises the south-eastern portion of the island, and is officially called "The Llanidan District of the Carnarvon Union."

The population of this district according to the last census was 2,991. During the period 1901-10 the deaths from Cancer numbered 38, and the rate per 1000 living is considerably higher than the rate for the whole county.

It may be of interest to compare the mortality from Cancer and Phthisis in this district during the decennium 1901-10 with that of 1851-60 according to the information obtained through the courtesy of the Superintendent Registrar at Carnarvon.

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths from All Causes</th>
<th>Deaths from Cancer</th>
<th>Deaths from Phthisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>17.05</td>
<td>1.66</td>
<td>1.34</td>
</tr>
<tr>
<td>1902</td>
<td>22.06</td>
<td>2.006</td>
<td>3.009</td>
</tr>
<tr>
<td>1903</td>
<td>17.81</td>
<td>1.67</td>
<td>1.67</td>
</tr>
<tr>
<td>1904</td>
<td>16.71</td>
<td>1.33</td>
<td>1.67</td>
</tr>
<tr>
<td>1905</td>
<td>18.05</td>
<td>.66</td>
<td>1.34</td>
</tr>
<tr>
<td>1906</td>
<td>9.69</td>
<td>1.003</td>
<td>2.34</td>
</tr>
<tr>
<td>1907</td>
<td>18.72</td>
<td>1.67</td>
<td>1.67</td>
</tr>
<tr>
<td>1908</td>
<td>17.38</td>
<td>1.34</td>
<td>2.006</td>
</tr>
<tr>
<td>1909</td>
<td>16.04</td>
<td>1.003</td>
<td>1.67</td>
</tr>
<tr>
<td>1910</td>
<td>16.04</td>
<td>1.67</td>
<td>1.003</td>
</tr>
</tbody>
</table>

Average for 10 years: 16.9 1.23 1.77
According to the Census Returns of 1851, the population of the district was 3536. The death-rates for the decennium 1851-60 I have worked out to be as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths from all causes</th>
<th>Deaths from Cancer</th>
<th>Deaths from Phthisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1851</td>
<td>20.36</td>
<td>.56</td>
<td>3.1</td>
</tr>
<tr>
<td>1852</td>
<td>19.5</td>
<td>.56</td>
<td>1.9</td>
</tr>
<tr>
<td>1853</td>
<td>16.7</td>
<td>.56</td>
<td>4.2</td>
</tr>
<tr>
<td>1854</td>
<td>15.5</td>
<td>.00</td>
<td>3.3</td>
</tr>
<tr>
<td>1855</td>
<td>16.1</td>
<td>.28</td>
<td>3.1</td>
</tr>
<tr>
<td>1856</td>
<td>16.3</td>
<td>.00</td>
<td>3.6</td>
</tr>
<tr>
<td>1857</td>
<td>20.6</td>
<td>.00</td>
<td>3.6</td>
</tr>
<tr>
<td>1858</td>
<td>20.9</td>
<td>.00</td>
<td>4.8</td>
</tr>
<tr>
<td>1859</td>
<td>16.7</td>
<td>.28</td>
<td>4.8</td>
</tr>
<tr>
<td>1860</td>
<td>21.8</td>
<td>.28</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Average for 10 yrs. 18.44 .252 3.67

The death-rate from Cancer (1901-10) is much higher than that of England and Wales, and that from Phthisis considerably so, although the number of deaths from the latter disease is still relatively high, there has been a marked decrease within living memory.

The Cancer mortality, on the other hand, has increased to an alarming extent according to the deaths registered; thus while in 1851-60 cancer was a cause of death in only 1.3 per cent of the deaths, in 1901-10 over 7 per cent of deaths are certified as being due to
malignant disease, an apparent increase of over five times.

According to Roger Williams, the deaths from Cancer among females as compared with males, is: Females 67 per cent, Males, 33 per cent.

According to the Annual Report (1910) of the Registrar General, the cancer mortality among males is .85 per 1000 while among females it is 1.07 per 1000. He states that from 1861-80 the increase in the female mortality from this cause was greater than that in the mortality of males, but that since 1890, the reverse has been the case. In his calculations, he maintains that equilibrium will be reached about the year 1932 and that thereafter the rate among males will exceed that among females. In this part of Anglesey, equilibrium has already been reached, the number of males and females who died of Cancer during the period 1901-10 being equal, Males 19, Females 19.

D'Arcy Power found that in a certain village where Cancer is very prevalent the men were attacked quite as often as the women.

In Scotland, the death-rate among females is over 50 per cent higher than among males.

In New Zealand, according to the Government Report, the Cancer mortality among males is higher than among
Year 1906, Males .71, Females .68.

In this district I have found that the various organs of the body are affected as follows:

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td>38.8 per cent</td>
<td>31.56 per cent</td>
</tr>
<tr>
<td>Uterus</td>
<td>11.11 &quot; &quot;</td>
<td>11.11 &quot; &quot;</td>
</tr>
<tr>
<td>Intestines</td>
<td>11.11 &quot; &quot;</td>
<td>11.11 &quot; &quot;</td>
</tr>
<tr>
<td>Liver</td>
<td>11.11 &quot; &quot;</td>
<td>11.11 &quot; &quot;</td>
</tr>
<tr>
<td>Breast</td>
<td>11.11 &quot; &quot;</td>
<td>5.55 &quot; &quot;</td>
</tr>
<tr>
<td>Lips &amp; Neck</td>
<td>11.11 &quot; &quot;</td>
<td>11.11 &quot; &quot;</td>
</tr>
</tbody>
</table>

From the above, it will be seen that the stomach is the prevalent seat of the disease, even among females, the number of deaths — six — almost equalling the number dying from Cancer of Uterus and Breast.

Dealing with the cases of death from Cancer in the whole county of Anglesey during 1910, the figures obtained give the following percentages:

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td>44 per cent</td>
<td>36.36 per cent</td>
</tr>
<tr>
<td>Lip(Epithelioma)</td>
<td>8 &quot; &quot;</td>
<td>3.03 &quot; &quot;</td>
</tr>
<tr>
<td>Rectum</td>
<td>12 &quot; &quot;</td>
<td>2.09 &quot; &quot;</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>12 &quot; &quot;</td>
<td>6.06 &quot; &quot;</td>
</tr>
<tr>
<td>Uterus</td>
<td>12.12 &quot; &quot;</td>
<td>15.15 &quot; &quot;</td>
</tr>
<tr>
<td>Breast</td>
<td>15.15 &quot; &quot;</td>
<td></td>
</tr>
</tbody>
</table>

The stomach is the commonest site of the disease in both males and females. Indeed, on comparing the above figures with those given by the Registrar General the percentage of deaths from Cancer of the stomach is
remarkably high in Anglesey.

According to the Registrar General's Report for 1910, the following percentages obtain among males and females in England and Wales:

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lips, tongue, jaw</td>
<td>10.8 per cent</td>
</tr>
<tr>
<td>Stomach</td>
<td>21.4</td>
</tr>
<tr>
<td>Breast</td>
<td>.2</td>
</tr>
<tr>
<td>Intestines &amp; Rectum</td>
<td>18.2</td>
</tr>
<tr>
<td>Liver &amp; Gall bladder</td>
<td>12.4</td>
</tr>
<tr>
<td>Uterus</td>
<td></td>
</tr>
</tbody>
</table>

Haviland found the following percentages obtain among females:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast</td>
<td>36.55 per cent</td>
</tr>
<tr>
<td>Uterus</td>
<td>31.45</td>
</tr>
<tr>
<td>Other organs</td>
<td>32.00</td>
</tr>
</tbody>
</table>

In Germany, according to the analysis of the German Committee for Statistical Study, Cancer of the Stomach preponderates in men, being 41.3 per cent; in women, Cancer of the breast, with 24.3 per cent of the cases.

In New Zealand, during the years 1903-07, the following percentage obtains:

<table>
<thead>
<tr>
<th>Males</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach &amp; Intestinal Canal</td>
<td>44.82 per cent</td>
</tr>
<tr>
<td>Liver</td>
<td>17.68</td>
</tr>
<tr>
<td>Mouth, Lips, Throat &amp; Neck</td>
<td>28.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach &amp; Intestinal Canal</td>
<td>34.36</td>
</tr>
<tr>
<td>Liver</td>
<td>13.40</td>
</tr>
<tr>
<td>Mouth, Tongue, Throat</td>
<td>5.50</td>
</tr>
<tr>
<td>Breast</td>
<td>14.23</td>
</tr>
<tr>
<td>Ovary, Uterus, Vagina</td>
<td>20.69</td>
</tr>
</tbody>
</table>
The Imperial Cancer Research Investigators examined 1,589 cases of Cancer in India. In only 76 of these were the internal organs attacked. In Travancore, lips, tongue and jaws were responsible for 70.6 per cent, and the stomach for only 1 per cent.

The age incidence of Cancer among the cases that occurred in this part of Anglesey is shown in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 - 35 years</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>35 - 40</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>40 - 50</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>50 - 60</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>60 - 70</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>70 - 80</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>over 80</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

The average age at death appears to be higher than is the case in general. Males, 68.4 years, Females 61 years.

As there is but little variation in the occupations of the males and females in this district, nearly all the men taking part in agriculture and the women doing the ordinary house and dairy work, the classification of the death-rates, according to occupation, is much simplified. Out of a total of 38 deaths from Cancer during 1901-10, 7 were farmers, 4 agricultural labourers, 1 carpenter, 1 grocer, 1 cattle dealer, 1 postman, 1 plasterer, 1 roadman and two had retired from their professions.
Fourteen of the females were farmers' wives or daughters, 3 were domestics, 1 midwife, and 1 a widow, who attended to all the work on her small farm.

The Hon. Rollo Russell ("Preventable Cancer" p.93) states that the cancer death-rate for farmers and graziers is above the mean; 170 out of 1308 deaths in the period 1900-02.

The population, according to the last census was 2,991, a decrease of 545 since 1851. The district is flat and lies between 10 and 60 feet above sea level. The soil varies, consisting of sand, gravel, loam and clay. There is one small sluggish river which flows for a great part of its course through marshes in a south-westerly direction, and received several small streams; these marshes and the adjacent lands are flooded after heavy rains. The river is tidal for the last three miles of its course and empties itself into the Menai Straits.

The annual rainfall during the last four years was as follows:


and the hours of sunshine during 1913 numbered 1510.2.

There are four small villages, but a fair proportion of the inhabitants live in scattered farmhouses. The sanitation could be greatly improved, in fact, many
TOPOGRAPHY OF THE DISTRICT

It comprises the south eastern portion of Anglesey, runs along the Menai Straits and Carnarvon Bay for about eight miles extending between four and five miles inland, the whole area being 15,544 acres of which about 2,000 acres bordering the Bay consist of sand dunes and is uninhabited. The population, according to the last census was 2,991, a decrease of 545 since 1851. The district is flat and lies between 10 and 80 feet above sea level. The soil varies, consisting of sand, gravel, loam and clay. There is one small sluggish river which flows for a great part of its course through marshes in a south-westerly direction, and receives several small streams; these marshes and the adjacent lands are flooded after heavy rains. The river is tidal for the last three miles of its course and empties itself into the Menai Straits.

The annual rainfall during the last four years was as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall</th>
</tr>
</thead>
<tbody>
<tr>
<td>1910</td>
<td>48.210 in.</td>
</tr>
<tr>
<td>1911</td>
<td>40.115 in.</td>
</tr>
<tr>
<td>1912</td>
<td>42.240 in.</td>
</tr>
<tr>
<td>1913</td>
<td>39.285 in.</td>
</tr>
</tbody>
</table>

and the hours of sunshine during 1913 numbered 1510.2.

There are four small villages, but a fair proportion of the inhabitants live in scattered farmhouses. The sanitation could be greatly improved, in fact, many
of the houses have lately been condemned as unfit for habitation. I have, however, met with more cases of malignant disease in the newer and better built houses, than in the small unhealthy cottages. The drainage in some places leaves much to be desired, sewage water from cowhouses, pigsties, etc. finding its way to the roadside, though these insanitary conditions have undergone considerable improvement during late years.

Many of the villagers obtain their water from pumps and surface wells, though there are several good springs in the district. Many of the dwellers in outlying farms have doubtful water supplies; in a great many cases it is obtained from a pump in close proximity to the manure heap, and wells often situated in fields are left unprotected from the incursions of cattle.

The men are mostly tenant farmers, agricultural labourers, and slate quarrymen. The mode of life among the majority of the people does not vary much. Four meals at least are taken every day, and, on an average, tea is drunk at three of these. Many live to a good old age, the number over 80 years living at present in a village of 550 inhabitants numbering 13. The infantile mortality, however, is high. It may be interesting to note that a death from Pneumonia is of very rare occurrence. The men and women are of temperate habits.
There are two small areas in the district in which cancer has been remarkably prevalent. One of these, scarcely a mile square, is specially noticeable on account of its high cancer mortality. The number of deaths in this area from all causes during the years 1902-13 was 26, of which 11 were due to cancer, and there are at present two cases suffering from this disease. It is about 80 feet above sea level, and is very exposed, the soil is poor and clayey, the drainage bad, the ditches by the roadside which are half filled with stagnant water for a great part of the year, are often contaminated with sewage; the fields to a great extent are in a wet and sodden condition, and in dry weather the surface becomes caked and hard.

The people living in this neighbourhood are, for the most part, small tenant farmers; the houses are all from 20 to 80 years old, are built of stone, and are fairly roomy and comfortable. They are at no great distance from one another, in some cases but a few yards.

I have made a careful enquiry as to the water supply in every instance, and I feel constrained to make a short note on the cases that have occurred in this area during the last thirteen years. In order to show the position of the houses, etc., I have drawn a small sketch map of the parish on which this area is specially marked. It will be noticed how the disease has attacked persons
living in neighbouring houses within a stone's throw of one another.

The second area consists of the land bordering the river previously mentioned, this river is dammed to form a millpond. The depth of the water in the pond depends upon the amount of work done at the mill, and on the opening or closing of the flood-gate. If this is closed, the effect is seen for a considerable distance higher up, the land being covered with water. This marshy land forms a fine nursery for reeds, flags, wild flowers, etc., and in summer the vegetation is luxuriant, but in the autumn all this disappears, and there is a smell of decaying vegetable matter all along the riverside.

Nine deaths have occurred in this area during the last 25 years, and of these, four were due to Cancer. A fifth, who lived here for some years, had a Rodent Ulcer on the face, and died of malignant disease in another part of the island, while a sixth who used to spend his holidays in a house close to the river, died from Cancer of the Lung in Liverpool.

Incidentally, I may state that of the cases that were not malignant, one was a typical case of Addison's Disease, and the other of Pernicious Anaemia.

The other cases of Cancer were scattered throughout the district, and I shall only note a few of them which appear to me to be of special interest.
Cases in the First Area.

   Farmer and casual labourer; had always been a remarkably healthy man; did not indulge in alcohol or tobacco, but was a great tea drinker; died of Cancer of the Stomach.

Family History. His father and one brother who resided in another part of the island, both died of Cancer of the stomach, another brother living in America is at present suffering from Cancer of the Stomach.

He obtained his drinking water from a good well some distance from the house, but when pressed for time use was made of a pump close by, the purity of this water not being always above suspicion owing to the proximity of the cowsheds. During rainy weather the water was often contaminated from this source.

   He had lived in the same house for over 30 years.

   Farmer by occupation, and a near neighbour of the above, had always been a healthy man, of temperate habits; died of Epithelioma of the face.

Family History. An elder brother who resided in the same parish died of Epithelioma of the face. A sister who lived in the adjoining parish died of Cancer, and another brother is now suffering from Epithelioma of the face.
He had lived in the same house for over 50 years. The same remarks as to water supply are applicable to this case also.

M.W. aged 63 years at death. Female. Widow. Lived on a small farm, had ten children, eight of whom died in infancy and childhood; always a healthy woman and a great tea-drinker. Died of Cancer, the starting point of which was in the Cervix. When first seen, the growth had involved bladder and rectum. She was advised to consult a Liverpool Gynaecologist and the diagnosis of malignant disease was confirmed, but the case was too far advanced for operation. She returned home and died in a month.

No family history of Cancer.

W.W. aged 49 years at death. Husband of above, died of cancer of the Rectum in 1898, i.e. ten years before his wife. He had been operated upon at the Royal Infirmary, Liverpool.

He had lived in the same house for over 20 and his wife for over 30 years. His sister, who lived in another part of the island, died of Cancer at the age of 48 years.

Water was obtained from a pump close to the house and cowsheds.
Had one child. Lived on a small farm, was always weak and anaemic and a great tea-drinker. Died of Cancer of the Uterus. She consulted a Liverpool Gynaecologist but as she was suffering from Chronic Nephritis, it was not deemed advisable to operate.

Family History. One maternal uncle residing in Liverpool died of Cancer of Stomach. A second maternal uncle residing at Sheffield died of Cancer (site not known) while a third, living with J.H. suffered from a Rodent Ulcer which I removed. A maternal cousin died of Carcinomatous tumour of Neck.

The water was obtained from a pump close to the house where she had lived all her life.

Minister. Strong constitution and of temperate habits, died of Cancer of Stomach. Diagnosis confirmed by P.M. examination. All the male members of this family lived to a great age, while the females died young from Phthisis.

No family history of Cancer.

He had lived in the same house for over 20 years. A manure heap was situated close to the house, and the water was obtained from an unprotected well in a neighbouring field.

7. E.J. aged 45 years. Spinster. Housekeeper on a small farm, always been healthy; tea-drinker. Was exhibited at a meeting of the Royal Society of Medicine
London, (Section of Laryngology) by Dr. Middlemass Hunt. She was suffering from a bony growth of the nose and nasopharynx - malignancy was suspected (B.M.J. May 18.12, p. 1131). Since then she has undergone two operations.

No family history of Cancer.

Has lived on the same farm for over 15 years. Water supply good.

8. M.J. aged 54 years at death. Female. Widow. Lived on a small farm, had always been remarkably strong and healthy; a great tea-drinker. She had eight children. Died of Cancer. Was operated on at the Royal Infirmary, Liverpool for Cancer of the Left Breast in 1907. In 1911, she underwent a second operation for Cancer of the right breast; some months afterwards, she developed symptoms of Pleurisy with effusion of the right side. The chest was tapped and 50 oz. of clear straw-coloured fluid withdrawn. In a month the fluid had re-accumulated. The same process was again gone through, and 50 oz. of fluid which was slightly tinged with blood, removed. In yet another month the same signs reappeared, and a third time about the same quantity of clear fluid was withdrawn. The patient got very disheartened when the effusion recurred for the fourth
time. On this occasion, after tapping the chest and withdrawing about 30 oz. of clear fluid, I immediately injected 20 min. Adrenalin Chloride 1 in 1000 into the Pleural Cavity. I repeated this on alternate days five times with gratifying results. No re-accumulation of the effusion occurred, but the patient felt some very uncomfortable sensations about the heart for nearly two hours after each injection. After this, she rallied considerably for some months, but signs of Cancer of the Liver became evident. The disease spread rapidly, involving the peritoneum, the edge of the affected area being distinctly palpable through the abdominal wall, notwithstanding a considerable amount of Ascites.

No family history of Cancer.

Water obtained from a pump close to cowsheds.

She had lived in this house for over 12 years.


No family history of Cancer.

Manure heap close to the house. She had lived in the same house for over 20 years.

No family history of Cancer.

He had lived in the same house for over 10 years. His wife was operated on at the Royal Infirmary, Liverpool, in 1898 for Cancer of Breast. There has been no recurrence up to date.

11. J.E. aged 60 years at death. Female. Married. Died of Cancer of the Stomach. She had five children, had always been healthy, of temperate habits, but a great tea-drinker. Had lived in the same house for over 30 years. No family history of Cancer.

An interesting fact in connection with this case was, that she came of a haemophilic family, several male members of which died from this cause.

12. W.E. aged 68 years at death. Husband of above. Died of Carcinomatous tumour of neck. Was operated on at Royal Infirmary, Liverpool. He had always been a healthy man, great smoker and tea-drinker, and a small farmer by occupation.
Family History. Two paternal uncles who resided in England, and a female cousin who lived in this district died of Cancer. Another uncle, who also lived in this district, had a Rodent Ulcer, which, however, was not the cause of his death.

13. M.W. aged 69 years at death. Female. Married. Had several children, died of Cancer of the Stomach. She had been suffering from a Rodent Ulcer of the face for many years, and had lived in the same parish for over 30 years. Great tea-drinker.

The last five cases obtained their water from the same source - a small surface well in a field close to the village - which was unprotected and frequently visited by cattle and poultry. Complaints had often been made of the unsatisfactory state of the water for drinking purposes.

14. M.G. aged 42 years. Married. No children. Has recently undergone an operation for a growth involving the Uterus and Bowel. This growth on microscopic examination, proved to be malignant. She had lived in this area all her life on a farm, the house was always damp, and the manure heap close by.

No family history of Cancer.
1. W.D. aged 68 years at death. Male. Married. Farmer, died of Cancer of the Stomach. Had always been strong and healthy, of temperate habits, smoker and tea-drinker. Had lived in same house for over 30 years. Pigsties, cowsheds and manure heap were close to the house. Water supply good. No family history of Cancer.

2. K.A.R. aged 33 years at death. Spinster. Died of Cancer which originated in the left side of the tongue, caused by the irritation of a jagged tooth, and subsequently invaded the cervical glands and left lung. She was operated on twice at the Southern Hospital, Liverpool. At the first operation, the growth only was excised, but the disease quickly recurring, the whole tongue, together with the now affected cervical glands, was removed. Notwithstanding this, the disease invaded the left lung giving rise to haemoptysis, and also involved the Brachial Plexus, causing excruciating pain in the left arm, necessitating the administration of heavy doses of morphia.

She had resided at the same house for about 15 years, and had taken her share in the work of the farm, had always been healthy with the exception of an attack of chorea which lasted some weeks.

No history of Cancer in the family.

Water supply good.
3. W.W. aged 44 years at death. Bachelor. Miller and farmer, died of Epithelioma of upper jaw, which invaded the bloodvessels of the neck causing fatal haemorrhage. Always temperate in his habits, non-smoker and not a great tea-drinker. Had lived in the same house for over 30 years. He was sent to the Royal Infirmary, Liverpool, but returned home without undergoing an operation.

No family history of Cancer.

Water supply good.

The cowsheds, pigsties, etc., in this and the previous case were at some distance from the houses, which were only a few yards distant from one another.

4. H.O. aged 56 years at death. Male. Married. Carpenter. Died of Intestinal obstruction due to Cancer of Sigmoid. He had previously suffered for many years from renal stone. Of temperate habits, great smoker, moderate tea-drinker. Had lived in the same house for over 20 years, was seen by a Liverpool consultant who did not advise operation. Water supply not above suspicion.

Family history. One of his sisters who resides in the district is now suffering from Cancer of the Uterus. As far as I can ascertain, no other member of the family
suffered from this disease.

His brother-in-law, who resided in Liverpool, but spent his holidays at the house of the above, died of haemoptysis due to Cancer of the Lung.

R.E. Widower. Retired farmer. Suffered from Rodent Ulcer of the face, left the district, and died in another part of the island.

The following are cases in which Cancer affected more than one member of the family:

1. W.E. his father and one brother, all died of Cancer of Stomach, another brother in America is now suffering from Cancer of Stomach.

2. J.G. and one brother, both died of Epithelioma of face. A sister died of Cancer and another brother is now suffering from Epithelioma of face.

3. W.W. died of Cancer of Rectum. A sister residing in another part of the island died of Cancer.


5. W.E. cousin of No. 4 died of Carcinomatous growth of neck, the three uncles mentioned in the previous case were his paternal uncles.


9. E.T. and T. brother and sister, both died of Cancer of Stomach.

10. H.O. died of Intestinal Obstruction due to Cancer of Sigmoid. M.R. his sister is now suffering from Cancer of Uterus.

11. M.H. now suffering from Cancer of Stomach, her mother died of same complaint in same organ.

12. A.W. died of Intestinal Obstruction due to Cancer. I am informed that her daughter is now suffering from Cancer of the Stomach.

13. J.J. died of Cancer of Stomach, his brother R.J. died of Cancer of Liver.

14. M.M. died of Cancer of Breast, her mother and her daughter both died of Cancer of Breast.

15. G.E. died of Cancer of Breast, her mother died of Cancer of Bowel.

Cases occurring in same house:

1. Husband and wife.
2. Husband and wife.
3. Husband and wife.
4. Uncle and niece.
5. Husband and wife.
6. Father and daughter.
7. Father and daughter.
8. Father and daughter.
9. In this house, three successive tenants suffered from malignant disease:
   1st. Epithelioma of Ear.
   2nd. Dilatation of Stomach, probably due to Cancer of Pylorus.

They were not related to one another.
CONCLUSIONS

I have endeavoured in the preceding sections of this dissertation to give some account of the occurrence of Cancer among the human races of the globe, and more particularly in England and Wales, and with still more detail in Anglesey and the South Eastern division of the island. It will be my aim in what follows to deduce from all the information I have been able to collect, such conclusions as the facts seem to warrant. I believe that this purpose will be best gained by asking a certain number of questions:

1. Is Cancer on the increase in Anglesey? If so,
2. What reason or reasons can be given to account for such increase?
3. Are certain localities more liable to Cancer than others?
4. Is Cancer a hereditary disease, or a disease a tendency to which can be inherited?

I feel, however, that the value of any deductions I may draw must be somewhat minimised by the smallness of the area under observation and the paucity of the inhabitants.

1. Is Cancer on the increase in Anglesey?

The question as to the real increase of Cancer is a vexed one. It has been and is contended by several
 eminent authorities that Cancer has not really increased but that the recorded increase has been apparent only, being due to better diagnosis, better registration, difference in classification, survival to later ages, and other factors.

Dr. Newsholme, in his vital statistics, observed that "the curve of the Scottish Widows' Fund Office has the easiest gradient of all, strongly confirming the view that the apparent increase of cancer mortality is caused by increased accuracy of diagnosis and certification."

According to him, "the Frankfort statistics show that, when cancer cases are divided into accessible, inaccessible and ill-defined between 1860 and 1889, there has been no increase in the mortality from this malady in accessible positions."

Dr. Bashford of the Imperial Cancer Research Fund states that "there is nothing in the statistical investigations of the Imperial Cancer Research Fund which points to an actual increase in the death-rate from Cancer."

The majority of scientific observations do, however, tend to prove that the mortality from malignant disease has increased enormously during the last fifty years.

Mr. Roger Williams states "I find it quite impossible to believe that anything like the great increase in the cancer mortality can be accounted for by
improved diagnosis, by more accurate death certification, by changes in classification, or by alterations in the sex and age distribution of the population."

In an article on Cancer in the last edition of Quain's Dictionary, the authors state that the explanation of the increase by "better diagnosis" would not apply to the last ten years. "The actual increase," they proceed, "is now admitted by the heads of the Statistical Departments in England, Scotland and Ireland."

Dr. Haviland in a letter published in the Lancet of Aug. 9, 90, states "that the increase in the cancer mortality is real is a fact few medical men would dispute." Ogden's figures show that all the seats of the

The Hon. Rollo Russell in his "Preventable Cancer," states that the malady shows a real and regular increase in all civilised countries during the last fifty years. can possibly be. (M.B.J. Dec. 30, 93).

Even as early as 1888 it was recognised that the increase in the cancer mortality could not be attributed merely to improved diagnosis and greater accuracy in death certification.

Sir Spencer Wells (Lancet 1888 page 1192) is stated to hold that the increase is too marked for any such explanation.

Dr. H. Häberlein concludes that there has been a.
large actual rise in the mortality from this disease (Deutsches A. für Klin. Med. XLIV. 1889)

Dr. Stevenson's Report to the Registrar General for 1908 stated that the cancer mortality for males increased in that year at every age at which cancer is an important cause of death.

Dr. Claud Muirhead, the Medical Officer of the Scottish Widows' Life Assurance Society, found that the cancer death-rate among the assured males was nearly twice as great in 1881-90 as in 1861-70, and every death—where there was a suspicion of cancer was carefully investigated. (Roger Williams. "Nat. Hist. of Cancer," p.56).

Dr. Ogle's figures show that all the seats of the disease have participated in the increase. The reality of the increase in the cancer mortality is, he maintains as clearly established as any such statistical results can possibly be. (E.B.J. Dec. 30. 93).

In refutation of the theory that cancer has only apparently increased, Dr. Hoffman of the Prudential Assurance Co. of America states that in Rhode Island, during the period from 1876-80 to 1896-1900 cancer of the breast among women increased by 115 per cent.

In England and Wales also, according to the 73rd Annual Report issued by the Registrar General, cancer of the breast has steadily increased during the years
In 1875, cancer cases formed only 4.9 per cent; in 1883, 7 per cent, in 1908, 12.2 per cent. The means of detecting cancer pathologically have not altered during those years. (Med. Annual 1910, page 203).

The post mortem statistics of certain old established hospitals reveal an increasing ratio of cases found to be cancerous; this in different parts of the world. (Barlow and Taylor on the St. George's and Middlesex Hospitals).

The Hon. Rollo Russell ("Preventable Cancer") gives the following reasons which seem to me incontrovertible, for his belief in the reality of the increase in the cancer mortality:

Firstly, it is too widespread and general in civilised countries.

Secondly, too equally shared by external and internal sites.

Thirdly, too continuous since more thorough registration and clearer diagnosis have been in use, to be accounted for by anything but an actual increase of the malady and of the liability to it.

It has been argued in various quarters that the
apparent increase may be due to better sanitation and hygiene, causing more persons to live beyond middle age. But this would not apply to the increase in every age group. Moreover, there has, as a matter of fact, been no increase in the proportional number of people living beyond 35 in the period 1881-91 compared with previous periods. On the other hand, according to Mr. W. Evans "Medical Science of To-day" and other medical works, it is affirmed that a large number of cases of Cancer taken early do admit of cure, so that there must therefore be an increasing number of people who have had Cancer but died of other disorders.

My own observations have led me to the conclusion that there is a real increase in the cancer mortality of Anglesey and North Wales, although not to the extent that the statistics show. In the year 1901 the cancer death-rate for the whole of North Wales was 1.2 per 1000 living, being the third highest death-rate from this disease in England and Wales. According to a coloured map in Haviland's "Incidence of disease etc." North Wales was fairly free from Cancer in the years 1851-60, the death-rate being under .3 per 1000 living, so that it has apparently increased fourfold.

In the Registration County of Anglesey according to Haviland during the decennium 1851-60 the cancer death-rate was below .2 per 1000 living. In 1910 it
had increased more than sevenfold, being 1.501 per 1000.
The death-rate from this cause during the last ten years
has grown steadily higher. In 1901 it was .976 per 1000.
The average for the years 1901-05 was 1.2 per 1000, while
for the years 1906-10 it was 1.31. See Table 2. The
same medical men are in practice here to-day as in 1901,
there has been no addition to their number, so that the
plea of better diagnosis and certification does not hold
water in this case. The same fact is true of the sub-
districts in the island, the practitioners with one or two
exceptions are the same men, but there is a steady growth
in the death-rate from Cancer. In this - the south-
eastern division of the county - the average rate from
malignant disease during 1901-05 was 1.06 per 1000 (and
this in spite of the fact that in one year it happened
to reach the high rate of 2.006 per 1000), while in the
years 1906-10, it had risen to 1.33 per 1000. During
the decennium 1851-60 I find it was as low as .25 per
1000, and that in four several years, three of them being
consecutive, no death from malignant disease was regis-
tered. It must, however, be confessed that at that time
no medical man resided in the district, and that in
several instances there was no medical certificate of the
cause of death.

The writer of a leading article in the Lancet of
July 17, 1886, states that, while in London the uncertified
deaths formed only 1.3 per cent of the total number; in
the Welsh division they formed 8.5 per cent—the highest percentage in England and Wales. If this was the state of affairs in Wales in 1886, we may naturally conclude that the percentage of uncertified deaths in Anglesey in the years 1851-60 must have been considerably higher.

Taking into consideration, however, the nature of malignant disease, its duration, the pain and discomfort usually associated with it, it seems very improbable that many died from Cancer without being under medical care and treatment, and consequently without being certified as having died from Cancer.

Another factor, which undoubtedly to some extent, explains the present high mortality from cancer in Anglesey is the alteration that has taken place in the age of the inhabitants. I have no figures at hand to prove this, but I have lived here practically all my life, and I know that, owing to the great change that has taken place in agricultural methods, there
are fewer farm hands and domestic servants in all parts of the county. These were usually men and women in the prime of life, a heavy percentage of them are forced to emigrate or to seek employment in towns or collieries, and I feel sure that the number of agricultural labourers in Anglesey has decreased by hundreds during the last forty years.

In this district alone, the decrease in the number of the inhabitants since 1851 is nearly 550.

As has been shown by others, notably Roger Williams, the increase in the cancer death-rate from Tubercular diseases. He states that "during the last half of the nineteenth century, the cancer mortality for our country tripled; while during the same period the tubercle death-rate declined to the extent of nearly one half."

In the South-eastern division of Anglesey, the death-rate from Phthisis has decreased from 3.67 per 1000 living during 1851-60 to 1.77 per 1000 during 1901-10, while cancer has increased at an alarming rate.
To what is the increase in the Cancer death rate due?

All the authorities whom I have consulted on the above question, and who support the view that malignant disease has greatly increased during recent years, agree in concluding that the answer is to be found in the conditions of modern life. Some emphasise the great change in diet, while others impute the increase to the strain and stress undergone by men and women during the last half century.

C.P. White states in his book on the Pathology of Cancer, - "the various influences grouped together "under the title of civilisation play a part in pro- "ducing a tendency to cancer. It is probable that no "one factor in civilisation is responsible, but that "it is the condition as a whole that is at fault. Un- "natural and excessive food, unhealthy surroundings, "indoor and sedentary occupations, and the mental "anxiety and worry which are inseparable from civilised "life, probably all take a share in producing a wear "and tear of life that is conducive to the formation of "an unstable condition of equilibrium."

"The malady shows a real and regular increase in "all civilised countries during the last fifty years, "or since records have been kept. This increase cor- "responds with the regular and very large increase in "the consumption of stimulant meat and drinks, of hot "food and drinks, and with the increased consumption,
"now far exceeding physiological requirements, or ad-
"juncts of many sorts, including unwholesome forms of
"sugar, pickles, drugs, preservatives and adulterants,
"salt in excess, strong cheese, condiments, and tobacco."
(Rollo Russell. p. 105).

Dr. Hislop in the B.M.J., Oct. 23, 09 reporting cases in a certain district in New Zealand, where cancer was very prevalent, states:--

"With regard to their diet, they were all hearty,
"some of them very large eaters of meat. They drank
"tea with all their meals, and frequently between meals.
"The tea is taken very strong, and often drunk out of
"tin pannikins in which it has stood for a considerable
"time."

The Hon. Rollo Russell supports the above statements by giving the cancer statistics of nearly all the countries of Europe, America, and parts of Asia and Africa.

Dr. David Heron reported in the B.M.J., states that Cancer in the metropolis appears to be co-related with a higher social status.

Sir George Beatson (B.M.J. June 15, 12) states:--
"that the wider diffusion of luxury and the accompany-
"ing artificiality and strain of daily life have some
"share in the matter, because surroundings, although
"they may not be the actual cause of the disease, may
"produce it in those predisposed to it."

After a thorough examination of the obtainable cancer statistics for the whole world, Mr. Roger Williams (page 85) concludes:— "That the cancer mortality is "lowest where the struggle for existence is hardest, "the density of population greatest, the tubercle mor-
tality highest, the birth-rate highest, the average "duration of life shortest, the infantile and general "mortality highest, and where sanitation is least "perfect — in short, among the poor of the industrial "classes of our large towns; whereas among the wealthy "and well-to-do — where the standard of health is at "its best and life is easiest, and all the conditions "of existence are just the converse of the foregoing — "and among the agricultural community, there the "cancer mortality is highest."

He believes that the increase in cancer during the last century is due to the spread of industrialism and the urbanisation of the various countries of Western Europe, to the sudden change from poverty and want to riches and plenty. The writer of the leading article in the B.M.J., Feb. 25. 93, states:— "The British Medical Association has long held similar "opinions to Mr. Roger Williams as to the increase of "Cancer."

The wages of all classes of labourers have vastly
increased during the last century, while all the
necessaries of life have become much cheaper; the
amount of meat eaten is equal to 130 lbs. per head per
annum, while the tea consumed equals 6.53 lbs per head
per annum. Forty-two millions of people in the United
Kingdom consume in food and drink alone, an amount equal
to the whole of the income of over three hundred million
of the people of India.

It is noteworthy in this connection that in more
than one-half of the cancer cases of Britishers the
site of the disease is the gastro-intestinal tract.
Roger Williams explains the concomitant increase in food
consumption and cancer as follows:— "Malignant tumours
in mankind and animals consist mainly of albuminous and
proteid substances; and it seems not unreasonable to
"suppose that they must be the outcome of excess of
"these substances in the body."

"When excessive quantities of such highly stimula-
ting forms of nutriment are ingested by beings whose
"cellular metabolism is defective, I believe there may
"be thus excited, in those parts of the body where vital
"processes are most active, such excessive and disorder-
"ly proliferation as may eventuate in cancer. At any
"rate, ascertained facts justify the belief that there
"is a certain relation between the conditions of exis-
nence - in which alimentation plays an important part -
"and the incidence of Cancer." (Page 13. Roger
Williams).

From my own-observations, I am much inclined to
believe that the great increase in the cancer mortality
of Anglesey cannot be accounted for by improved diag-
nosis, by more accurate death certification or by alter-
ations in the age and sex distribution of the population.
That all these factors have been at work in the island
is doubtless true, but I find, in the great change which
has taken place in the mode of living of the inhabitants,
a more definite answer to the above question.

It must be remembered that until the Suspension
Bridge and, later on, and to a greater degree, the
Tubular Bridge were built across the Menai Straits,
Anglesey was isolated from the rest of the country.

The making of the London and North Western Railway
from Chester to Holyhead opened up a great part of North
Wales to external influences, increased the prosperity
of the inhabitants, and brought to their doors the mer-
chandise of all the world.

"North Wales, where the cancer mortality was
"formerly much below the average, is now subject to a
"high rate; and this change seems to have coincided
"with the invasion and settlement of the locality by
"well-to-do immigrants from the large towns of
"Lancashire and the Midlands with their industrial, "wealth-producing innovations, etc." (Roger Williams, page 83).

There are several octogenarians living who delight to tell me how the times have changed since their childhood. Then the wages of farm labourers were seldom higher than sixpence a day, and their food was of the plainest.

They and their families seldom saw butcher's meat, and they were too poor to obtain bacon except for their Sunday dinner. They lived almost exclusively on the produce of the island, their staple food consisting of barley-bread, oatcake, potatoes and butter-milk; tea was a luxury seldom indulged in by the poor and sparingly used by the better-off. Now-a-days all has been changed, farm hands would now look askance at the simple fare of their forefathers, for at that time they had only three meals a day, while now they often partake of five. They have tea at least three times a day and beef or mutton for dinner; in their homes the women drink tea all day and find tinned foods too convenient to take the trouble of cooking porridge, soup, etc. In fact none of the various dishes in which oatmeal formed the chief ingredient are to be seen, their very names being almost forgotten.

As the above facts show, a great change has taken
place in the habits of the people; while formerly they
were hard living and abstemious of diet, they are now
great tea drinkers and moderate meat-eaters.

The Hon. Rollo Russell ("Preventable Cancer" pages
79-91) gives statistics showing incidentally that the
cancer mortality is high amongst persons addicted to
alcoholic drinks, such as brewers, innkeepers, etc. It
must be stated that in Anglesey, on the contrary, all
classes of the community drink less alcohol than was the
case sixty years ago; at that time the great majority
of the farmers were heavy drinkers, but now circumstances
force them to almost total abstinence. Yet cancer has
increased.

Another cause given is worry. It is generally
supposed that agricultural communities are free from the
storm and stress of modern life; this is a mistake.
Naturally the struggle for existence and the competition
that is so keen in our great cities is not felt to so
great an extent in our rural hamlets, but the farmers of
the present day have a much harder, more strenuous, and
more worried life than their predecessors. Large farms
are now worked by two or three men and the farmer him-
self has to do an equal, if not a heavier share of the
labour. He has to study the markets, note the rise and
fall in the prices of stock, grain, etc., or risk heavy
losses. The rates alone are more than equal to the
rents paid eighty years ago. All these circumstances
have added to the wear and tear of a farmer's life and have diminished the sweet content of the countryside. Whatever conclusion one might come to from the above history, the fact is undeniable that the great increase in the cancer mortality in Anglesey has advanced pari passu with the marked change that has taken place in the diet and habits of the people during the last fifty years.

3. Are the residents of certain localities more liable to Cancer?

In the preceding pages I have quoted the opinions of eminent authorities on the question of the increase in the death-rate from malignant disease, and to give my own conclusions, based on my own observations on the same subject.

The Hon. Rollo Russell and Mr. Roger Williams are the two great champions of the theory that this immense increase is due to the great change that has taken place in the habits of the people, and the facts they adduce seem to me to give an incontrovertible reply to the question, but they do not attempt to explain why certain areas have obtained an unenviable reputation as having an abnormally high death rate from cancer.

Dr. Haviland made a very thorough investigation, carried on for several years into the incidence of
certain diseases in the Lake District, and the deductions he draws as to the incidence of cancer are noteworthy. He found that the counties with the highest cancer mortality are characterized by the frequency of rivers that at seasons flood the soil; also by soils of a retentive nature such as clay and boulder. These rivers invariably flood their adjacent districts during rainy seasons, and generally have their water coloured by the suspension of alluvial matter. The flats of the low-lying land through which these sluggish rivers pend their way to the sea entrap the waters of the flood. These imprisoned waters contain all kinds of filth, the washings of manure from cultivated lands, dead leaves, trees, etc., causing the vegetation to decay. This decay, according to Haviland, is accompanied by the extrication of foul gases, which pollute the air and sour the soil. The land thus becomes conducive to the growth of microphytes and other minute organisms, which find their way into the air and water of a locality. He gives the following figures to prove his contention:

<table>
<thead>
<tr>
<th>Year</th>
<th>London Basin</th>
<th>Lake District</th>
</tr>
</thead>
<tbody>
<tr>
<td>1851-70</td>
<td>Death rate from cancer among females at or above 35 years.</td>
<td></td>
</tr>
<tr>
<td>London Basin</td>
<td>18.21 per 10000 in the clay and flooded groups.</td>
<td></td>
</tr>
<tr>
<td>Lake District</td>
<td>15.71 per 10000 in the clay and flooded groups.</td>
<td></td>
</tr>
<tr>
<td>London Basin</td>
<td>11.27 per 10000 in the chalk (limestone) areas.</td>
<td></td>
</tr>
<tr>
<td>Lake District</td>
<td>9.27 per 10000</td>
<td></td>
</tr>
</tbody>
</table>
In the Lake District itself, he found the highest cancer mortality in the neighbourhood where the River Eamont joins the River Eden at right angles, a direction most favourable, during heavy rains and sudden thaws, to the production of floods; while a very high mortality obtained in all the localities below 250 ft. high and between the hills and the sea-coast. The death-rate among females throughout England and Wales during 1851-70 was 4.81 per 10000, while in the districts of Penrith and Carlisle through which the River Eden flows, it was respectively 6 per 10000 and 7 per 10000.

Dr. Roger Williams (page 84) dismisses the subject thus:

"in favour of the opinion that in this country cancer is specially prevalent in flat, low-lying, fenny districts, there is, I think, much to be said. This state of things is known to have existed ever since statistical records have been kept."

D'Arcy Power, in a very careful survey of two villages in which the cancer mortality was exceptionally high (Practitioner, May 1903), describes the first village as follows:

"The district is a flat country which lies from 60 to 150 ft. above sea level and consists geologically of gravel overlying boulder-clay. It is well-watered, for one small river rises within its confines, and it is traversed by another which rises a few
"miles away, while it is intersected by many small and
unnamed streams. There are several fens in the neigh-
bourhood, and much of the country shows the ordinary
characters of marshland. The population is scanty,
agricultural for the most part, and cancer is the pre-
vailing disease."

"An unduly large proportion of the cases of cancer
occurred near the streams which water the district -
one whole series of cases occurred in a hamlet traversed
by a small brook arising a mile or two away in a mere -
one of the rivers takes its origin in a fen which is
only 86 feet above sea level, the second river is only
69 feet above sea level when it enters the district.
"It is impossible I think to resist the conclusion that
the marshy grounds from which the rivers arise in this
district, have some causal connection with the numerous
"cases of cancer observed in the vicinity."

The second village was close to a bed of upper lias
clay and a sluggishly flowing brook ran through. "This
stream was dammed up some time ago at the point where
it passes through the village, and the village drains
"empty themselves into this portion. One drain became
"such a nuisance that it has been diverted quite recent-
ly to open a few yards below the dam. The water in the
lake is opaque and stagnant. This lake is about half a
mile in length, and it floods the surrounding meadows
"every two or three years," Glamorgan, writes (B.M.J. Jan.) I have quoted at so great a length from this article, because it is nearly altogether applicable to a neighbourhood where I have found cancer to be specially prevalent.

In India, where cancer is exceedingly rare, it has yet been found to be more frequent in Kashmir, a high lying valley with extensive tracts permanently under water, and large areas liable to annual floods.

In an article on cancer in New Zealand (B.M.J., Oct. 23. 09) describing a certain area where malignant disease was markedly prevalent, the writer (Dr. Hislop) states:— "The soil varies in many places from a light "shingly nature to a stiff clay which holds the moisture "and bakes in hot weather. The creek rises from some "springs which are situated in land that was a swamp in "precultivation days. It is in this district and es- "pecially along the line of this creek, that most of "the cases have occurred."

Dr. John Campbell reported in the B.M.J. May 14. 1910:— "The disease was one which prevailed in certain "localities particularly those that were low lying and "badly drained and situated on the banks of sluggish "streams. It was also shown that high lying districts "especially limestone areas, were remarkably free from "cancer."
Dr. Simons of Bridgend, Glamorgan, writes (B.M.J. Jan. 30.09) of a house where a series of five deaths occurred during twenty one years, "the house is built on the side of a stream that courses down the valley. "The stream which is often swollen with floods is not "sluggish, but the subsoil is always saturated with "moisture."

A medical man (F.H.) writes in the B.M.J., Feb. 14. 1914, recording a series of seventeen cases of cancer that occurred along a four mile stretch of main road in H--shire, during five years; "the nature of the "soil in this locality is chiefly clay - some gravel - "but clay subsoil."

The following statements are taken from W.T.Gibson's "Etiology of Cancer."

Behla states, concerning the German town of Luckau, that cancer is common in one suburb, which was built on what had once been marshy land; in the other, built upon a sandy substratum, it did not occur during the 23 years under review. He also states that cancerous localities are usually found in regions richly wooded, with numerous streams and rivers, and where there is a clay soil. The houses are frequently damp.

In the Fontainebleau district, Foucault found, that the cancer mortality increased in proportion to the lowness of the site and its humidity.
Noël noticed that inefficient drainage of the subsoil increased the incidence.

Haviland found that a certain "Cancer house" was situated in a hollow with a clay soil, cradled by ridges rising 500 to 600 ft. high within a radius of half-a-mile. The upper part of the hollow was relatively dry, but the lower was damp, and alders, rushes, and mosses grew luxuriantly, everything being apparently sodden. The house stood twenty feet above the level of the stream which sometimes flooded its banks.

A committee was appointed by the Birmingham and Midland Counties Branch of the B.M.A. to collect evidence of the distributional and other details of cancer cases.

The Report was compiled in 1899 and the returns extend over a period of 10 years. The following conclusions arrived at are of interest:—Cancer is most prevalent in low lying districts near sluggish streams, on clay soil and in old houses; a certain cancer area on a clay bed was sharply defined from an area almost free from cancer contiguous to it on a sand bed.

Haviland's contention that cancer is more prevalent on clay soil is corroborated by Butlin and others; the Thames cancer field is almost co-extensive with the London clay. The incidence is found to be lower upon sandy soils and especially upon carboniferous limestone.
Golb discovered the highest mortality from cancer in South Germany, upon a stretch of territory almost exactly corresponding with the tertiary formation with alluvial deposits, and marked by peaty and swampy spots and extensive clay soils.

The incidence of cancer is greater in the neighbourhood of sewage farms and badly kept manure heaps, and a higher death rate has always been associated with sewage contamination of the soil. The foul air from a cesspool has been found to enter a house 27 feet away.

Lloyd Jones thought that in Cambridge filth of all kinds - animal and vegetable - was present in the cancer districts.

Law Webb reported an unusual number of deaths from cancer - nine in 15 years - in a group of twenty cottages the water-supply of which was obtained from a certain pump close to a very filthy hovel.

The water supply of a certain "Cancer house" elsewhere was got from a pump near to some old cottages and not far from a cesspool. In yet another, where three cases occurred in the same family, the water was obtained from a pump just a few yards from a cesspool.

Armaudet, in a village of Normandy with a cancer death-rate equal to four times that of Paris, noted that the malady developed along a line corresponding to the districts supplied with water from certain pounds.
Mason adduced evidence from observations on over 400 cases in the Leamington district, which showed that emanations from sewage increase the incidence of cancer, and stated that improperly constructed drains ran beneath "Cancer houses."

Dr. Sims Woodhead in 1892 delivered a lecture on the "Etiology of Cancer" in which he states:— "Hirsch "entirely pooh-poohs the idea that climatic influence "and the state of the soil can have anything to do with "the comparative frequency of cancer in certain dis-"tricts. Haviland, however, maintains that in England "cancer is least prevalent on rocky ground and high "lying places, and most common in marshy regions and on "the wet soil of river basins subject to inundations. "The conditions present in these localities described "by Haviland are exactly those necessary for the "development of the psorosperms of rabbits." (B.M.J. May 7, 92). According to Sims Woodhead these psorosperm nodules have a strong resemblance to cancer.

W.T. Gibson explains the frequent occurrence of cancer on wet clay soils as follows:— "Soil bacteria "are capable of forming ammonia from certain fatty, and "even aromatic amines; and fatty amines are always "changed to ammonia before oxidation takes place — the "oxidation which results in the formation of nitrates to "serve as plant food."
When the soil is choked with organic matter nitrification (oxidation) becomes impossible and therefore a greater proportion of nitrogen in the form of ammonia and fatty amines must pass into the air. The close texture of a clay soil does not allow the easy percolation of oxygen while its tendency to retain water acts in the same direction. By experimental methods, it has been found that when a soil is kept moistened, ammonia and volatile nitrogenous compounds are evolved; these substances are also evolved from a clay soil under normal conditions. As nitrification takes place readily upon sandy and calcareous soils because of their porosity, the lower incidence of cancer on sandy soils and the close texture of clay and such retentive soils are substantially due to whatever it is that causes cancer. As I have previously stated, my attention was first drawn to the association of several deaths from cancer that occurred in a parish in the vicinity of N., which I have named the 'Cancer area.' It was no accidental series of cases as has sometimes been observed, but the deaths followed naturally year after year. No man of even ordinary powers of observation could fail to remark on the prevalence of the malady in this locality, and I have drawn a sketch map of the whole parish of the area in question as to the probable cause.

Moore and Wilson found that in cases of malignant disease, the alkalinity of the blood serum is higher than normal, while certain diseases antagonistic to malignancy - tuberculosis, gout, malaria, (and also starvation) - are marked by decreased alkalinity of the serum. It has been proved in the case of rabbits that the inhalation of ammonia and trimethylamine leads to the temporary increase in the alkalinity of the blood serum. Human and herbivorous faecal matter as well as vegetation, urine have also an alkaline reaction.
well as stagnant urine have also an alkaline reaction.

From the extracts just quoted, it will be seen that many eminent authorities give an important place to the influence of soil and natural environments on the incidence of cancer. A very obnoxious smell arises from it.

My own observations and investigations have convinced me that the soil is an important factor in the causation of malignant disease, and have led me to the conclusion that clay and such retentive soils are favourable media for whatever it is that causes cancer. As I have previously stated, my attention was first drawn to the subject by several deaths from cancer that occurred in a certain area in the parish of N-, which I have named the first "Cancer area." It was no accidental series of cases, as has sometimes been observed, but the deaths followed naturally year after year. No man of even ordinary powers of observation could fail to remark on the prevalence of the malady in this locality, and I have often been asked my opinion as to the probable cause.

I have drawn a sketch map of the whole parish of N- with a dividing line running through it; to the right of this line is the "cancer area" the soil of which consists chiefly of clay merging into loam in one direction, and into sand in the other. It varies in colour from a reddish hue where it mingles with the sand, to a slatey colour where it is almost pure clay.
This is the only large tract of clay in the district, and it is notable, as I have shown, for the number of residents who have fallen victims to malignant disease. The soil is difficult to drain, and when ploughed after a lapse of years, a very obnoxious smell arises from it. The number of persons in this area is about 185, while to the left of the line the number is nearly 700; out of the smaller population there have been 17 cases of cancer during the last 13 years, and in the larger 8; if the rate in the clay soil had been equalled in the village, where sand preponderates, the number of cases would have been 64; or putting it conversely, if the rate on the sandy soil had been applied to the clay soil there should only have been 2 cases.

There is a small hamlet with a population of about 100 at the southern end of the parish, which is built entirely on sand. It is not more than one mile distant from the "cancer area," yet during the last 14 years since I have been here in practice, not a single case of cancer has been recorded, and enquiries made among the oldest and most intelligent of the residents have failed to elicit the history of a single case. "What is the reason for this great disproportion?" was a question that frequently occupied my thoughts. I can find no difference between the habits of the people who dwell in the "cancer area" and those of their neighbours. I have previously described the diet of
the inhabitants, and here there is no deviation from the ordinary routine. In some cases the water supply is good; in others fair, but as the people generally do not drink cold water, I fail to see that in this district there is any connection between the water supply and the occurrence of the disease.

In my report of the cases I have shown that the manure heaps were, as a rule situated close to the houses; this is also the case in other parts of the parish, with this important difference, that the earth being permeable, absorbs all waste water, and that there are stagnant pools of urine, etc., to pollute the air. This is the sole and only difference I can find between the residents of the "cancer area" and those living in the rest of the parish; they dwell on a cold clay soil, which almost altogether prevents waste water, etc., from sinking into the earth, and the only deduction I can draw from the foregoing facts is that people living on clayey or retentive soils are more prone to cancer, than those who dwell on porous soils, such as sand or limestone.

I ought to mention that there is one village in the district which is situated partly on a limestone ridge. This ridge traverses the island in a south easterly direction. Here the residents live in precisely the same fashion as those in the other parts...
of the district, their habits being similar in all respects; yet, during the years 1901-10 out of a population of 850 only 6 were certified to have died of malignant disease. This is equivalent to 7 per 1000 living.

I have briefly described another small area where several cases of cancer have occurred, the few houses here are close to a sluggish stream which flows through what can only be described as a bog. The river and the bog seem to act as the clay does in the first area, by keeping the atmosphere frequently charged with the products of decaying vegetation.

The above conclusions have been strengthened by the enquiries I have made as to the incidence of cancer in the island as a whole. The following two districts form a remarkable contrast: In A-U- the population is 13,800 and in B- 12,570, in the former during the year 1910 the number of deaths from cancer was 26, in the latter 11. In 1912 the number of deaths from cancer in A-U- was 27 and in B- 9.

Excluding the Urban areas and dealing only with the Rural Districts in the above, in the Rural District of T- situated in A-U- the population is 9,336 and during 1912 there were 18 deaths from cancer; in the Rural District of A- situated in B- with a population of 8,710, there were only 3 deaths from cancer during the same year. Both the districts are agricultural; the habits of the people are identical, but here again
there is a difference in the soil. In T- it consists largely of an admixture of clay and loam; the crops are late as the farmers cannot sow early on account of the dampness and coldness of the soil. In A- the soil is chiefly a rich loam overlying the limestone ridge previously mentioned. It is evident that there is marked difference between the cancer death-rate in the two districts, and, here again, in my opinion, soil proves to be an important element in the causation of the disease. Contrary to what has been observed by others, this district with a low death-rate from cancer is the best wooded and sheltered portion of the island; while T- with a heavy cancer mortality is bare and wind-swept.

4. Is Cancer a hereditary disease, or a disease, a tendency to which can be inherited?

The question of the influence of heredity on cancer has been much discussed. Gross concludes (Encyclop. Med. Vol. 7, p. 314) that the evidence of the inheritance of cancer is far from being satisfactory, but that there can be no doubt about the inheritance of a peculiarity of the structure (of the breast) especially of its epithelial elements which predisposes it to the occurrence of cancer. Out of 1,164 cases he finds a family history of cancer in 8.5 per cent.
Bryant who found a family history of cancer in 12 per cent. of 600 cases takes up much the same position as Gross.

Paget puts the percentage as high as 33, while Winiwater places it as low as 6.

Roger Williams estimated that the proportion of women with cancer of the breast among whose relatives there was a history of cancer, was 24.2 per cent; according to Butlin it was estimated at 37 per cent., while Karl Pearson found that the proportion of cancerous relations only amounted to 8.56 per cent. of 1000 female cancer patients interrogated.

H. Percy Dunn, pathologist West London Hospital, reported in the Lancet, Jan. 23. 86, emphatically opposes the belief in the hereditary transmission of cancer. "Even the most favourable age, together with a family history of cancer, would, I believe, not be sufficient to provoke the disease without some extraneous condition."

Mr. Winter Blyth (Lancet, Jan. 7.88) writing in favour of the theory that cancer is contagious states:-

"Medical literature abounds with instances of cancer sequence among members of the same family; they are usually explained by the doctrine of hereditary predisposition - a term that means nothing - which has obscured the etiology and veiled for centuries the
now accepted contagious nature of tubercle. The cases of family infection are too numerous to be mere coincidences."

G. Sherman Bigg in his book on "Cancer" states:- "It is very improbable that cancer is hereditary, it is probable, however, that the child of an unhealthy parent would be likely to be of delicate constitution with impaired powers of resistance and would readily develop the malady in later life should other conditions essential to the disease be present."

G. White (Lectures on the Pathology of Cancer) states:- "It is impossible to obtain reliable statistics as to the inheritance of cancer because only in rare instances can we obtain a reliable family history. There is no doubt, however, that cancer does occasionally run in families."

Mr. Butlin teaches that heredity influences cancer, but that the relationship in the cases he has examined were almost invariably on one side, and there were scarcely any cases in which the history of cancer was divided between the families of both parents.

Roger Williams states: "To my mind the heredity-ability of cancer is more conclusively proved by the occurrence of several instances of the disease in certain families, in one or in successive generations, than by any other consideration. When we see families thus affected, in which tumours of this kind develop in
the same organs and that during several generations, it seems to be unscientific to deny the hereditability of the disease." He quotes instances from his own experience, of one family where seven members were affected, another where four, and six families where three members were attacked with mammary cancer, as well as Broca's famous case, and several other notable instances recorded by medical men at different times.

D'Arcy Power gives his opinion as follows:—"I do not believe cancer to be hereditary in the sense that all, or even some, of the children of parents who have died of malignant disease are themselves predestined to die from cancer, but I feel sure that under appropriate conditions they are more likely to do so than those who have not inherited any such proclivity."

I have found it difficult in a community formed chiefly of uneducated labouring classes to obtain a reliable family history. The older patients I have attended who suffered from malignant disease could give me no satisfactory information as to the cause of death of their parents. I have, however, been able to obtain a family history of cancer in what is under the above-mentioned circumstances a very large number of cases, which I may tabulate as follows:—

Case where three generations were affected. M.M., her mother, and her daughter.
Cases where two generations were affected.

W.E., his father and two brothers.
J.H. and two maternal uncles.
W.E. and two paternal uncles.
T.J. and daughter.
D.J. and daughter.
J.W., his daughter, brother and sister.
M.H. and mother.
A.W. and daughter (probably)
G.E. and mother.

Cases where members in one generation were affected.

W.W. and sister.
J.G. two brothers and one sister.
E.T. and one brother.
H.O. and one sister.
J.J. and a brother.

Some authorities deny the influence of heredity on the incidence of cancer, and explain its occurrence in members of the same family as due to contagion; I find it very difficult to accept that theory as in practically all the instances where I have obtained a family history of cancer, the members attacked did not reside in the same house, and in many cases dwelt at great distances from one another. Judging from my own experience and in face of the facts just mentioned, I am driven to the conclusion that certain families are more prone to fall victims to malignant disease than
Referring to the quotation from Sherman Bigg's book on cancer, one would not expect children of a "delicate constitution" to survive to the cancer age; and by far the greater number of cases I have attended were persons of robust constitution, who had been extremely healthy all their lives.

With regard to "cancer houses;" in country districts, where often the same family occupies the same house for generations, and where removals are rare, it is difficult to obtain a history of cancer occurring in the same house without the problem being affected as to considerations of heredity, environment, etc. In nine houses in this district more than one case of cancer occurred during the last 14 years, in four of these there was a history of heredity, there were four married couples, and there was only one house where three successive tenants suffered from some form of malignant disease. In the four instances where both husband and wife had cancer, it was at periods varying from 8 to 15 years that the second fell a victim to the disease. If the cause was contagion one would expect the remaining member to be attacked at a much shorter period of time, and the fact that both husbands and wives suffered from cancer is better explained, I believe, by their sharing the same environment and habits.
In conclusion, I may say that in my opinion, unless a person's ancestry was quite free from a cancerous taint it would be unwise to live in a house built on clay soil.

and and Wales generally; this is also the case in the other agricultural counties of Wales; owing doubtless to the higher average age of rural communities.

There has been a great increase in the mortality from cancer during the last 50 years in Anglesey, and a concurrent decrease in the death-rate from Phthisis.

This increase has been associated with a great change in the habits and diet of the people which suffered a greater alteration during the latter half of the 19th century than had been the case during several previous centuries.

Owing to the introduction of the railway and the greater facilities afforded to the transport of merchandise, the people of Anglesey who had formerly lived almost entirely on the produce of the island, were enabled to obtain, at low prices, articles of diet which had formerly been quite beyond their reach.

Although the increase in the cancer mortality is disseminated throughout the island, the disease attacks most frequently those persons who live on clay and such retentive soils, and those who dwell in the vicinity of stagnant water; while the people who live in limestone and sandy districts are far more
SUMMARY.

Cancer is more prevalent in Anglesey than in England and Wales generally; this is also the case in the other agricultural counties of Wales, owing doubtless to the higher average age of rural communities.

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free from malignant disease.

The part played by heredity in the occurrence of cancer is not insignificant; near relatives have frequently succumbed to the malady even when living at great distances from one another, and under totally different circumstances.

A. HAVILAND. "Geographical distribution of diseases in Great Britain."
W. ROGER WILLIAMS. "Natural History of Cancer."

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  " Dec. 30. 93.
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  " July 27. 86.
  " Jan. 7. 88 Elyth.
  " 1888, page 1192.
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by

WILLIAM HUGH WILLIAMS, M.B., C.M. (1894)

Taldrwst
Dwyran.
Anglesey.