samples giving positive results were inspected by the council's veterinary inspector; 4997 cows in all were examined, and of these 147 were found to present tuberculous udders. Provincial local authorities have shown willingness to cooperate with the council in preventing the sale of milk from cows which the council's veterinary inspector has certified to be suffering from tubercular disease of the udder, and in a few instances veterinary inspectors have been appointed by the local authorities to deal with this danger.

The report by Dr. Kerr upon the medical work of the council, as the education authority, deals with a period for the twenty-one months ending December 31, 1908. This period has been marked by great activity in all matters concerning school hygiene and the physical care of children. There are, in the opinion of the medical officer, further and wide-reaching changes in prospect. He states:—"Any public provision for protecting and aiding growth and development of children during the years of school life—three to sixteen years of age—should be entirely committed to the Education Authority. This would allow such matters as feeding, teaching, cleansing, medical treatment, or social protection of school children, when these duties become a public care, to be administered by the one authority, and by bringing all the various problems into a correct relation and perspective would also effect considerable financial economy. On the other hand, transient conditions in which the child bears the same social relations as any other individual, as for instance when affected with typhoid or scarlet fever, or when guilty of a crime, would still come under the same provision by the Sanitary Authority or Police respectively as at present. Fortunately this is the line taken by all the recent legislation in matters concerning children."

The educational work of the county council which falls under the direction of a medical officer is very extensive, embracing the examination of candidates for employment and scholarships; medical inspection of school children, including the inspection and the hygienic condition of school premises, &c.; a large amount of work to promote cleanliness and to prevent communicable disease; and prescribing the special school work amongst the scholars in schools for the mental or physically defective, the blind or deaf, &c. The medical staff at the end of 1908 numbered fifty-two, and it has been decided to increase the staff by the addition of sixteen school doctors in the summer. The school nursing staff consists of a superintendent, two assistants, and fifty-one school nurses; these undertake the oversight of personal hygiene in both elementary and secondary schools. Upon the subject of underfed school children, the medical officer directs attention to the fact that there is no certain criterion of this condition, and it seems often quite impossible to distinguish between bad feeding, improper feeding, and bad home conditions. The treatment of those children in whom medical inspection discovers defects has received a great deal of consideration at the hand of the county council. A solution has not yet been arrived at, but it is certain that visual troubles, discharging ears, ringworm, and conservative dentistry are matters on which neither the private practitioner nor the hospitals can give sufficient or satisfactory relief, and the establishment in London of school clinics to deal with these conditions amongst school children will probably be the eventual solution. The work of the school nurses was almost entirely directed to effecting the cleansing of scholars' heads, bodies, and clothing. Nearly twenty thousand children are known to the nurses as uncleanly in these respects. That such conditions are tolerated gives an idea of the conditions of the homes, which are often so dirty and dark, and wanting in the means of cleansing, that it would be an injustice to exclude such children and prosecute the parents. It appears that the municipal cleansing stations provided for cleansing verminous persons are inadequate to deal with all these cases. The Children's Act, 1908, gives power to the education authority to examine and cleanse these children in default of the parents, and it looks as if that authority will have to make some provision for dealing with these cases, at least in some parts of the metropolis.

The open-air schools provided by the council (four in number) are doubtless doing a great service, physically and educationally, to children with ailments which unfit them to take their place in the school class-room with the ordinary scholars. Children with scrofulous and tuberculous conditions, anæmia, adenoids and enlarged tonsils, heart disease, and certain bone, nervous, and eye diseases, profit considerably by a few months in these open-air schools.

PROBLEMS OF THE SOUTH-WESTERN HIGHLANDS.[1]

THE southern Highlands of Scotland consist of a complex series of gneisses, schists, crystalline limestones, and quartzites, trending across Scotland approximately from south-west to north-east. These metamorphic rocks are bounded abruptly to the south by the Highland boundary fault, which brings them against Upper Palæozoic rocks. Their northern boundary is less regular, and is generally the junction with the Moine gneiss, the rock which occupies so much of the Northern and Central Highlands. The schists and the associated rocks between the Moine gneiss and the boundary fault may be conveniently grouped together, under the name proposed by Sir Archibald Geikie, as the Dalradian system.

The most important difficulty in the interpretation of these rocks is the uncertainty as to which is the upper and which the lower end of the succession. According to Nicol, the southern members are the youngest, and there is a descending series to the north. This view is contradicted by many obvious facts in the field geology, and the view is therefore widely held that Nicol's order must be reversed, and that the beds of the southern margin are the oldest. One serious difficulty in the second view is that the southern rocks are much less altered than the northern, and this theory therefore involves some measure of selective metamorphism. Several ingenious interpretations have been advanced to overcome this difficulty. The author of the address, however, held that both views as to the order of succession are correct in parts. For convenience of reference, the Dalradian system may be divided into five series, which, with their relations to the other pre-Cambrian rocks, are shown in descending order, as follows:—

Algonkian	Torridon Sandstone	
Dalradian	Main sequence (5) Schichallion Quartzite (4) Blair Atholl Limestones and Black Schists and interbedded Quartzites (3) Ben Lawers series (2) Loch Tay Limestones and associated garnetiferous mica schists (1) Loch Lomond Gneiss	On Southern Margin Age ? Upper Dalradian or later: Aberfoil Slates and Grits Ben Ledi Schistose Grits
Caledonian	Moine Gneiss and associated schists	
Lewisian	Lewisian Gneiss	

This classification adopts Nicol's succession in part, as it accepts the Aberfoil and Ben Ledi series as younger than the Loch Lomond gneiss, against which they rest, and it is consistent with the less altered condition of the southern rocks and the steady diminution in the metamorphism of the rest of the rocks going northward, as, for example, from the Loch Lomond Gneiss to the Loch Awe Grits, and from the garnetiferous mica schists of the Loch Tay series to the black schists and unfoliated quartzites near Blair Atholl.

The evidence in some points of this succession is still incomplete, especially as regards some of the rocks within easy access of Glasgow. The special points on which

[1] Abstract of the Presidential Address delivered to the Glasgow Geological Society, by Prof. J. W. Gregory, F.R.S.

further research would be most useful were therefore mentioned in the hope that the members of the Glasgow Geological Society would investigate them.

The problem is of interest from its bearing upon the early geological history and geography of north-western Europe. The structure of western Europe has been dominated by the formation of three great mountain systems, each due to pressure usually from the south, and each having its younger rocks exposed mainly on the northern flanks of the chain. The youngest is the Alpine system, formed mainly in Upper Cainozoic times, and including the Pyrenees, Alps, Carpathians, &c. A somewhat similar mountain system, of which fragments remain in southern Ireland, Devonshire, Brittany, and Germany, had been formed in Upper Palæozoic times; from its analogy with the Altai Mountains of Asia, Suess has called its mountains the European Altaids. Still earlier, in later Archæan times, there was formed the first of these European mountain systems, of which fragments occur in northern Ireland, the Grampians, and Scandinavia. There are many interesting analogies between these old Grampians and the later Altaids and Alps. The old mountain system to which the Grampians belonged probably extended far westward into the North Atlantic, and to its influence may be attributed the desert climate of Scotland during the deposition of the Torridon Sandstone.

THE ETIOLOGY OF LEPROSY.

THE eighteenth report of the Board of Health on leprosy in New South Wales contains the usual careful clinical records of the features of the disease in the patients admitted during the year, as well as a record of all the cases occurring in the Commonwealth during 1908. No case of leprosy has ever been heard of in Tasmania. In the other States the disease occurs apparently most frequently in Chinese and in aboriginals, and is more frequent in northern than in southern territories.

An account is given of a systematic test of Prof. Deycke's "nastin" treatment. Nastin is a vaccine made from a leptothrix found in some recent Lepromata, and not from the bacillus lepræ. It is pronounced valueless, any beneficial result being assigned to the natural fluctuations in the progress of the disease; one or more cases of spontaneous cure are noted. For the rest, the report is remarkable for the scepticism the author, Dr. J. Ashburton Thompson, expresses on the etiology of leprosy and on the value of isolation as a preventive of transference of the disease.

It will be remembered that the International Congress at Bergen last year endorsed the view that the bacillus lepræ of Hansen was the etiological agent. Dr. Thompson's views are seemingly published as a protest, and, holding the views he does, it is gratifying to learn that Dr. Thompson recognises that, as the presiding and executive member of the central health authority to which the Leprosy Act is entrusted, he has a clearly defined duty to perform, and that he performs it, notwithstanding his thinking "the *mère idée* on which that law is based to be of doubtful utility," and his statement, "I can at all events safely assert that its validity has not been demonstrated." One would have thought that the success which has attended the practice of isolation in Norway during the past forty years afforded sufficient evidence of its value even to the most sceptical, for Hansen's prophecy some forty years ago that in 1920 there would be no leprosy in Norway is in more than a fair way of being fulfilled.

HELIUM IN AIR AND MINERALS.

AN interesting paper on the occurrence of helium in the air of Naples and in minerals from Vesuvius is published by Prof. A. Piutti in the *Rendiconto* of the Royal Society of Naples (third series, vol. xv., p. 203). It is well known that in 1881 Prof. Palmieri read a paper before the same academy in which he claimed to have recognised the characteristic line D_3 of helium in the flame spectrum obtained by heating in a Bunsen flame "an amorphous, buttery substance of a yellow colour which was found as a sublimate on the edge of a fumarole near the mouth of Vesuvius." This is generally accepted as the first discovery of terrestrial helium, although Nasini and Anderlini in 1906, on examining the flame spectrum of a large number of volcanic incrustations, failed to recognise the presence of helium in any of the specimens they examined under the conditions described by Palmieri.

Prof. Piutti has now investigated with especial care, and by an ingenious method, the gas evolved on heating several Vesuvian minerals. The gas was expelled by heating the mineral in a quartz tube connected, through a three-way cock, with a Plücker tube, a Gaede air-pump, and a glass bulb containing cherry-stone carbon, which could be cooled to $-192°$ C. The latter served to absorb nitrogen and inert gases other than helium. All air was first entirely removed from the apparatus by the Gaede pump, special care being taken to ensure its complete absence prior to heating the mineral and during the course of the experiments. When the carbon is cooled by liquid air and the vacuum applied, any nitrogen present is first absorbed by the carbon, and the lines of argon and neon appear until the kathode space is formed. At this point, if even the smallest trace of helium is present, the D_3 line is seen distinctly by the side of the sodium lines. Control experiments showed that 0·073 cubic mm. could be detected in the apparatus employed. Helium can also be detected in the same way in 3·5 c.c. of ordinary air.

The examination of several radio-active forms of sanidinite from Vesuvius showed that the radio-activity was due to particles of zircon contained therein. This zircon was found to evolve helium, and other samples of zircon from different localities, Italian and otherwise, were also found to contain helium in varying proportions. No relation could, however, be traced between the proportion of helium and the radio-activity or density of the samples. The Vesuvian zircon had the highest radio-activity, but the proportion of helium was relatively low.

THE SUGAR INDUSTRY IN HAWAII.[1]

HAWAII and its associated islands, Maui, Oahu, Kauai and others, form a volcanic group in the Pacific 20° north of the equator, largely devoted to sugar production. In 1895 the Sugar-planters' Association established an experiment station at Honolulu, and some five years later the islands were annexed by the United States. The enormous importance of these two events is reflected in the statistics for sugar production :—

	Hawaii	Maui	Oahu	Kauai	Total
1895	61,643	27,735	17,433	42,816	149,627 tons
1896	109,259	29 097	35,782	51,650	225,828 ,,
1900	115,224	57,347	53 625	63,348	289,544 ,,
1901	134,618	58,349	99,534	67,537	360,038 ,,
1905	126,405	100,434	123,095	76,314	426,248 ,,
1908	180,159	122,629	137,013	81,322	521,123 ,,

The increase during the fourteen years has been from less than 150,000 tons to more than 520,000 tons, and detailed statistics show that the produce per acre, as well as the total acreage, has increased.

Practically all phases of the sugar industry are dealt with at the experiment station. Varieties of canes are tested, seedlings are raised and examined, and the effect of change of variety is investigated, the object being always to obtain plants more prolific, better adapted to the local surroundings, and more resistant to the local diseases or insect pests than those at present grown. Considerable attention is paid to insect pests, which naturally do an increasing amount of damage as cultivation becomes more and more intense. Methods of working up the sugar are also studied, the chemical and milling problems involved are gone into, nothing within the power of the staff and likely to benefit the planters being omitted.

In consequence there is a constant tendency to economy in production; thus in the early years fertilisers were often applied without any reference to the specific requirements of the crop or the general deficiencies of the soil; now, however, these, and also climatic considerations, are taken into account, and the staff are able to give useful definite information as to the mixture of fertilisers required.

1 Tropical Life, No. 2, vol. vi., 1910. Bulletins of the Sugar-planters Associations, Hawaii.