about E.S.E. to W.N.W. The colours varied from bright green and purple to a deep red round the edges. The display continued all the evening, and at 10 p.m. it worked to the N.N.W., appearing to reach the northern horizon.

June 18, 9 p.m.—Barometer 29.658 in., temperature 27.8° F., wind S.W., 9. Snowstorms throughout the day with fierce S.W. gales. Brilliant aurora visible between breaks in the clouds.

Mr. Henderson reports:—

June 16, 8.40 p.m.—Very pale glow low down to the south.

June 17, 5.30 to 5.40 p.m.—Very vivid blanket form of aurora in the zenith, then a large red bank to the north-east very low and close, and red to the north; red fades and glow remains.

10 p.m.—Streamers and blanket form, and ring to the west and north.

The "atmospherics" heard in the wireless receiver varied in strength from 0 to 5 at intervals of about thirty minutes.

June 18, 9.20 p.m.—Sky nearly overcast, but bright glow visible overhead for a few minutes.

Although the auroral and wireless data appear to lack correlation, it may be of interest to note the circumstances under which the long and short waves (2000 m. and 600 m.) from Awanui, near Auckland, were received at Macquarie Island.

Of the six nights when both wave-lengths were recorded, the 600-metre wave was much the stronger on three nights when no aurora was seen; on two nights when the aurora was reported the longer wave-length was the stronger. On the remaining night the longer wave was again the stronger, but the sky was overcast and the moon approaching the full. An aurora, if there had been one, could scarcely have been seen in the circumstances.

H. A. HUNT

(Commonwealth Meteorologist).

Meteorological Bureau, Central Office,
Melbourne, May 24.

The Utilisation of Waste Heat for Agriculture.

In the cheap generation of electricity the great problem must be how to secure and utilise by-products. With steam-driven stations the chief by-product is an abundant supply of hot water from the condensers, which in this country is looked upon as a nuisance to be got rid of as easily as possible. Would it not be possible to make use of this low-grade heat for agricultural purposes, so supplementing our all too scanty summers?

Power-houses burning 1000 tons of coal and upwards per week are quite common, and something like half of the heat generated by the coal is absorbed by the condensing water. It might be possible to heat fields by running the warm water through ditches, or perhaps better results would be obtained by running it through pipes buried in the ground. By this means large areas of land might be stimulated to produce much greater crops than have hitherto been found possible. It may be urged that the majority of existing power-houses are not in agricultural districts, so that the proposed experiment is not possible except in a few cases. To this one may reply that, in the near future, many large stations will be put down to supply current in bulk to vast areas. With the high voltage used for them the location of the power-house becomes a matter of wide choice, and it would be possible to put them in agricultural districts if this should prove financially worth while. The views of readers of NATURE on this point would be of interest.

C. TURNBULL.

Electricity Works, Tynemouth, June 29.

SCIENTIFIC HORTICULTURE.¹

THE periodic reports of the experiments conducted by the Duke of Bedford and Mr. Spencer Pickering at Woburn are always sure of a warm welcome by scientific horticulturists. It is true that these reports often give rise to controversy, and sometimes disturb the tranquillity of established horticultural belief; but if horticulture is to be a progressive craft both controversy and loss of tranquillity are to be welcomed.

The present (fifteenth) report covers a wide area of ground and records the results of observation and experiment on many subjects of importance to the fruit-grower. Among these subjects are: the fruiting of trees in consecutive seasons, injury to tree-roots in planting, ramming the roots of trees at planting-time, modes of planting and pruning. The observations on the alternation of fruitfulness and relative unfruitfulness support in a measure the view commonly held by fruit-growers that such an alternation exists, although the authors are inclined to attribute it rather to the effect of external conditions—for example, spring frosts—than to an internal rhythm.

For our part, we are convinced that if the alternation is to be ascribed—as in fact it may well be—to external conditions, those conditions are more subtle and complex than the authors' hypothesis suggests. As to the fact of alternate fruitfulness and barrenness exhibited by certain varieties of apple there can be no doubt. One of the most striking examples was published some years ago by the Dominion Horticulturist (Canada), and was cited in the *Gardeners' Chronicle*. The numbers are so remarkable that they may be repeated here. A single tree of the apple *Wealthy* yielded the following amounts of fruit:—

Year	10th	11th	12th	13th	14th	15th	16th
Gallons of fruit	33	0	52	2	93	0	111
Year	17th	18th	19th	20th	21st	22nd	
Gallons of fruit	22	96½	1½	75	5	118	

Such a record establishes the fact of alternation of fruitfulness once for all, and it is the business of the scientific horticulturist to discover the explanation why certain varieties exhibit this alternation and why others do not.

Although we are far from being able to give a sufficient explanation of this alternate fruitfulness and barrenness, yet it is by no means impossible to see the direction in which the explanation is to be sought.

Kleb's brilliant investigations show that the nature and amount of the raw and elaborated food materials at the disposal of a plant determine the formation of vegetative or reproductive tissues. In such fruit-trees as the apple the blossom buds are laid down early in the preceding year. If at the period of their development there is a large demand on the part of the setting and maturing fruit for certain food materials, and if the supply

¹ Woburn Experimental Fruit Farm. Fifteenth Report. Pp. 83. (London: Amalgamated Press, Ltd., 1916.) Price 2s. 3d.