who wishes to see the scientific methods in vogue on the Continent brought to bear on the waste lands of these islands, should be without a copy of this illuminating address. It concludes with the statement that "the Belgian Government obtains on the capital it has invested in forestry a return varying from 4·9 to 5·5 per cent." In his retiring address as president (Proc., p. 10) he adds:—"Scotch forestry is in the toils of the serpent of red tape. In spite of our efforts to keep it free and independent, forestry is now entangled with a number of different departments, some of which in the nature of things can know very little, and perhaps do not care very much, about the subject."

Mr. B. Ribbontrop, who, for many years, was head of the Indian Forest Department, gives a summary of Dr. R. Albert's researches on the peat soils of north-west Germany.

The true character of the seedlings of Japanese larch raised from Scotch seed was discussed at last summer's meeting of the English Arboricultural Society. On one hand, the time (one generation) seemed too short for the environment to have altered so considerably the character of the seedlings. On the other hand, the alteration seemed to be too uniform for hybrids between *Larix europaea* and *Larix leptolepis*. Mr. A. Murray, writing from Murthly, where these seedlings have been closely watched from the first, now gives the opinion that they are not hybrids. It may be noted that a similar alteration has been remarked in the case of an Australian Eucalypt that had been one generation in southern France.

For extracting tree-stumps with gelignite, Dr. Lauder gives the following working formula:—For pine stumps, $\frac{\text{square of girth in feet}}{20}$ = cost in shillings of explosive; and for broad-leaved trees—oak, ash, elm, &c.—about double the cost of pines and firs.

THE MANUFACTURE OF ARTIFICIAL TEETH.

IN the *Bulletin de la Société d'Encouragement* for April last is an interesting and well-illustrated article on "La fabrication des Dents Artificielles Minérales," by M. Maurice Picard, of the firm of MM. Henri Picard and Co., read at the opening ceremony of the first factory established in France, at Versailles, in the presence of M. Lechevalier, the representative of the Minister of Commerce and Industry.

The making of artificial teeth has for more than fifty years been a small but important industry in England and America, where millions of teeth of many shades and shapes are annually manufactured.

This industry owes its origin and early development to illustrious Frenchmen. Pierre Fauchard, in his work, "Le Chirurgien-dentiste," 1728, first suggested the use of enamel. Duchateau in 1744 substituted porcelain for ivory, with the aid of the porcelain manufacturer M. Gerrard, of Paris. Later Duchateau, with Dubois de Chaumant, a dentist in Paris, who suggested the addition of pipe-clay, made great improvements in manufacture. The latter carried the invention to England, and obtained a patent in 1791 for fourteen years. In 1808 Fonzi, a dentist in Paris, fixed platinum pins into the body of the tooth, as a means of attaching the tooth to the artificial plate which holds it in position. M. Plantou manufactured artificial teeth in America in 1817.

Felspar and silica ground to an impalpable powder, to which is added a certain amount of kaolin, form the basis of all porcelain teeth. These are made into a thick paste, and tinted in a variety of colours with oxide of titanium. The paste is pressed into moulds in which are inserted platinum pins. These teeth are then fused in a furnace at a very high temperature. The factory in Versailles already manufactures 225,000 teeth each month.

Incidentally, one may inquire why such an invention should not have found, sooner, an industrial home in the land of its origin? The answer may be suggested, not in lack of enterprise, but in the facts that French people do not readily part with their natural teeth, and they have an innate objection to artificial teeth on plates.

We have no doubt that the refined foods of an advancing civilisation are leading to an increased destruction of teeth by dental caries. We have no evidence to prove that our neighbours' teeth, however, are better than our own, but they submit more readily to the conservative treatment which dentists are trained to give in the preservation of teeth, rather than permit the ravages of the *arracheur de dents*.

R. D. PEDLEY.

THE MUTATIONS OF OENOTHERA.

THE last decade has witnessed many remarkable advances in our knowledge of heredity and variation. The beginning of the present century may be said to mark the turning-point between the observational method of Darwin and the more intensively experimental method now pursued in the study of evolution. This change from observation to experiment in evolutionary study was participated in by many investigators. Among those whose work will ever occupy a prominent place in the renaissance of activity in scientific plant- and animal-breeding may be mentioned de Vries, whose theory of mutation, or the sudden origin of new species, has been a fruitful subject of investigation and discussion.

The views of de Vries, published in 1901, were based to a considerable extent upon his prolonged investigations with the evening primrose, *Œnothera Lamarckiana*. These now classic experiments showed that when this species is cultivated in large numbers, individuals appear sporadically but repeatedly year after year which differ from the type in nearly all their characters. These new types, or mutants, in many cases breed true, giving rise to new races, and the main facts of de Vries's observations have since been repeatedly confirmed.

It is safe to say that these remarkable and at that time unique observations have subsequently led to a more thorough and complete study of the evening primroses than has been accomplished in any other group of plants, not even excepting the garden pea of Mendelian fame. Numerous investigators have attacked the problem thus presented from many points of view, and much light has been thrown upon the general subject of mutations. This is particularly true of the cytological investigations, which have really furnished the key to the explanation of the mutation phenomena.

Since a fortunate discovery in 1906 indicated that various mutants differed in the constitution of their nuclei, the origin of these differences has been an absorbing subject of investigation. Two years later it was possible to show that a basis for changes in the nuclear constitution of different mutants exists in the germ cells, and that the process of mutation is probably in part a result of irregularities in chromosome distribution during meiosis or germ-cell formation. The chromosomes are the constituent parts of the nucleus, and their number is constant for each species, so this furnished the desired proof that, in some of the mutants at least, a fundamental change in the structure of the nuclei had taken place, and that the external changes of characters in mutation had their origin in internal structural changes of the cells and their nuclei.

The premutation hypothesis, formulated by de Vries to account for the origin of the mutations before the facts regarding their cell-structure were known, assumes that new units gradually accumulated in the germ plasm of the species previous to the beginning of the mutation process, and that these afterwards passed from a latent to an active condition, thus producing the mutations. But since the structure of the nuclei in these forms is now known, and the manner in which changes in that structure originate, this hypothesis has been superseded, and the conception of a mutation period is no longer needed.

Various writers have also suggested that the mutations of Œnothera were merely re-combinations of characters, such as occur in Mendelian hybrids. This hypothesis is also contrary to our present knowledge of the nuclear structure and behaviour in Œnothera, and furnishes another instance, like that of the sex-chromosomes, where nuclear studies throw light upon the nature of the processes of heredity and variation. By combining the study of nuclear and cell structure with that of external characters, it is evident that much further insight into the nature of mutation and heredity may be gained.

A specific case of the type of germinal change here referred to is that of *Œnothera lata*. It has recently been found that when combined with characters derived by inheritance from various other forms (*e.g. O. biennis, grandiflora and rubricalyx*), the characteristic foliage and habit of *lata* is always accompanied by the presence of an extra chromosome in the nuclei of the plant, making the number of chromosomes fifteen instead of fourteen. In other words, this type of foliage is constantly associated with the presence of an extra chromosome.

Mutations are by no means confined to the evening primroses, but are now known, through experimental studies, to occur in bacteria, fungi, mosses, and many flowering plants. And among animals, instances of sudden and inherited departure from the parent form occur in various groups from Protozoa to man himself.

The new characters thus appearing form a varied and motley array, differing often in most unexpected ways from their parent types. Many of these mutations appear "spontaneously," that is, from unknown causes. These are probably often an indirect result of previous crossing, change of climate, &c. Others have been directly produced by a variety of experimental conditions. The study of the causes of these germinal aberrations and the manner of their production is evidently destined to play an important rôle in future experimental evolution. The results already achieved point to a wide and important field of research in the application of these methods to horticulture, agriculture, and experimental breeding.

R. RUGGLES GATES.

OBSERVATIONS IN THE SOUTH MAGNETIC POLE AREA.

I BEG herewith to enclose what I trust will prove for the scientific world in general an important preliminary report by Mr. E. N. Webb, magnetician to Dr. Mawson's Australasian Antarctic Expedition, on the magnetic work, and particularly the absolute readings taken by Mr. Webb himself on a very fine journey made by him and Mr. J. F. Hurley, under the leadership of Lieut. Bage, in the direction of the south magnetic pole for the distance of 300 miles to the south-east of Dr. Mawson's base at Commonwealth Bay in Adélie Land.

You will see that a large number of very valuable observations have been obtained on the north-west side of the south magnetic pole area, and these, when considered with the observations—fewer in number but accurate—taken by Dr. Mawson himself on the occasion of the Shackleton expedition on our approach on the south-east to the south magnetic pole area, should now enable the position of the south magnetic pole in 1912 to be calculated with a degree of accuracy considerably in advance of anything previously attained.

I have ventured to add some notes in reference to the observations made by Dr. Mawson in the party—consisting of Dr. Mawson, Dr. A. T. McKay, and myself—of which I was leader in a journey to the south magnetic pole area in 1908–9. I send with it a plan on tracing cloth showing the route followed by the Australasian Antarctic Expedition, with the positions of the stations where Webb made his observations.

T. W. EDGEWORTH DAVID.

University of Sydney, May 26.

MAWSON'S AUSTRALASIAN ANTARCTIC EXPEDITION.

Preliminary Report on Magnetic Work, by E. N. Webb, Magnetician.

Early in December of 1911 the Australasian Antarctic Expedition, under the leadership of Dr. Mawson, left Australia to carry out a programme of scientific investigation on the Antarctic continent.

It was intended to conduct a magnetic observatory at one base station, and to make a magnetic survey of the coast between Cape Adare and Gaussberg. A large portion of this plan was successfully carried out. Through the kindness of Dr. Bauer, director of the department of terrestrial magnetism of the Carnegie Institution of Washington, D.C., the writer was trained during five months' field survey work in Australia, under Mr. E. Kidson, one of the department's observers.

Absolute instruments were lent by the Carnegie Institution, consisting of two unifilar magnetometers, one Kew pattern and one Lloyd-Creak dip circle, by Dover, Charlton, Kent, both fitted with 6 in. declinometer needles, and total intensity attachments.

Intercomparisons of all instruments with a set used by Mr. Kidson were made at Hobart before going south; also, the Eschenhagen magnetographs, comprising declination, horizontal and vertical intensity variometers, were set up under the direction of Dr. J. M. Baldwin, first assistant at Melbourne Observatory. Both the observatory and the field work at the main base were in charge of the writer. Field survey work was commenced at Macquarie Island, where determinations of the magnetic elements were made at two stations, one at the extreme north of the island, and the other at Caroline Cove. The average of determinations at the north end gave declination 18° 25′ E.; horizontal intensity, 0·13990; dip, 77° 47·8′ S. Leaving Macquarie Island, the expedition proceeded to Adélie Land, and at Commonwealth Bay in latitude 67° 0·0′ S., longitude 142° 39′ E., landed the main party. Here two magnetic huts were erected. In the larger, which was carefully constructed to resist wind and change of temperature, the magnetographs were set up with the frames on solid rock, and put in working order on March 21, 1912. Temperature-compensating systems were fitted to the H. and Z. variometers, and temperature effects have been almost entirely eliminated. Deflections were made once a fortnight for scale values.