eminence in English engineering education, but no Colonial representative took part.

Trade Schools and Continuation Schools.

Mr. R. Blair (London Education Officer) read a paper on the recent development of day schools for boys or girls following immediately on the close of the elementary-school career, the schools being so closely associated with the industry for which they are preparing their students that the preparation is a substitute for the earlier years of apprenticeship. He directed attention to the extent and peculiarities of London's needs, and his valuable remarks were supported by a large amount of useful statistics appended to his paper. He selected for detailed description the work of the Brixton School of Building. The paper is one to be read in full and kept for reference; we must content ourselves with noting that Mr. Blair attributes the success of the schools to the thoroughness of the investigation made into the conditions of a trade before establishing a school or class, and to the appointment of a consultative committee of experts. The striking success of the girls' schools was due to the high standard of devotion and enthusiasm of the staff.

Mr. Graham Balfour (Staffordshire) showed how complicated and varied were the difficulties in organising continuation schools, and the need for resourcefulness and judgment in dealing with each individual locality.

Mr. C. E. Bevan Brown (Christchurch, N.Z.) said that recently an Act had been passed in New Zealand allowing local authorities to make continuation classes compulsory.

A Criticism and a Hope.

Had the papers and discussions been the British part of proceedings to which the Overseas Dominions had contributed a similar share, we should feel that these conferences had made a good beginning. It is to be hoped that when the report of the private sessions appears it will reveal the fact of a useful interchange of experience and ideas between the delegates of the various parts of the Empire. So far as the public sessions are concerned, it cannot be said that a programme consisting solely of contributions from the United Kingdom fulfils even approximately the aspirations with which we regard an Imperial Education Conference. It has been stated in the daily Press that the Colonial Governments were not invited to make suggestions for the business of the conference. In face of the fact that the Board of Education had four years for preparation, this statement appears to us incredible, or, if credible, then discreditable. We hope that one result of the private sessions will be to evolve a method by which the various parts of the Empire can act in concert, so as to carry out in future those aims of the conference which were stated with clear insight by the President of the Board in his opening address.

G. F. D.

BIRD NOTES.

TO the April issue of *British Birds*, Messrs. Witherby and Alexander contribute an account of the visitation of crossbills to the British Isles in 1909. The birds made their appearance on Fair Isle on June 23, and before the end of that month were seen in the Shetlands, Orkneys, Outer Hebrides, Merionethshire, and Durham; while in July they were observed all over England except the extreme south-west, as well as in a number of places in Wales, and a few scattered localities in Ireland. The latest record of their being seen at sea was in the Shetlands early in August. The first nest recorded was taken on January 12, 1910, near Thetford, while the latest nests were seen respectively in Sussex and Kent on May 25, the height of the breeding season being in March and April. Nests were recorded from thirteen English counties. The dates of departure of the birds varied locally; in some districts all had gone by the end of 1909, in others there was little or no diminution in the numbers till well on in the following year, but, as a whole, the records indicate that the main departure took place either in February or in April and May. From a second paper in the same issue, it appears, however, that a few crossbills remained to breed in certain localities in the spring of the present year. A note is added in the latter paper on the thin-beaked Scots crossbill (*Loxia curvirostra scotica*), which breeds regularly over a considerable area in Scotland.

The Irish Times of March 31, as quoted in *The Field* of April 8, reports an enormous influx of migratory birds into Ireland, especially the south-eastern districts, during the last week of March. In New Ross on the night of March 29 the town was practically invaded by a vast swarm of starlings, while in Kilkenny on the same day the streets were strewn with the dead bodies of various species, including curlew, while much the same thing happened in Carlow on March 30. There can be little doubt that the influx and subsequent destruction were in some way connected with the abnormally cold weather prevalent at the time.

In *The Emu* for January, Mr. A. J. Cambell describes, under the name of *Erythrotriorchis rufotibia*, a new species of so-called Australasian goshawk, characterised by the rich rufous or chestnut brown of the shank of the leg. This bird inhabits north-western Australia; the other members of the genus are *E. radiatus* of eastern, northern, and central Australia, and *E. doriae* of south-eastern Papua.

To *The Selborne Magazine* for April, Mr. A. H. Macpherson contributes notes on London birds in 1910, in which reference is made to the visit of a great crested grebe to the Serpentine on January 29. To illustrate the article on account of this casual visit with a figure of a nesting grebe, is, perhaps, a little misleading.

Mr. V. Franz gives, in *Himmel und Erde* for March, an illustrated account of the bird-observing station at Rossitten, with figures of the modes of ringing birds' feet, and notes on some of the results which have been obtained by the system of bird-marking.

From a paper by Mr. Grinnell issued in vol. vii., No. 4, of the Zoological Publications of the University of California, it appears that the Californian linnet (*Carpodacus frontalis*) was introduced into the Hawaiian Islands about forty years ago, and that the males of the race now established there differ from the normal form of their continental brethren by the replacement of the crimson head and breast colouring by yellow or orange. This pale colouring of the cock Hawaiian linnet is paralleled sporadically by the linnet of the mainland in a wild state, and constantly in birds kept in confinement. As the change in the Hawaiian bird does not appear to be due to differences in temperature or humidity, change of food, or a diminution in the number of foes, it appears to be connected with deep-seated factors, one of which may be insularity of habitat. "A deficiency in capacity, of the germ, for the formation of the appropriate enzyme may have been intensified through close breeding until the condition was reached where the amount of enzyme produced in the feather anlage is insufficient to carry on oxidation of tyrosin beyond the yellow, or, at farthest, the orange stage.

R. L.

OPTICALLY ACTIVE ALCOHOLS.

THE January issue of the Chemical Society's Journal contains an important paper by Dr. R. H. Pickard and Mr. J. Kenyon on the "Dependence of Rotatory Power on Chemical Constitution." Hitherto much of the work that has been done in order to find out the influence on optical rotatory power of temperature, solvent, concentration, and chemical constitution has been based upon the observations of complex compounds, such as nicotine and derivatives of various complex acids and bases. These substances have the advantage that they can be purchased as natural products in optically active forms, but the complexity of their structure has rendered it almost impossible to draw any general conclusions from the vast array of facts that have now been accumulated. In the research now described the authors have endeavoured to reduce the problem to its simplest possible form by studying the properties of the series of secondary alcohols, $R_1CHOH.R_2$, of which the simplest member is secondary butyl alcohol, $CH_3.CHOH.CH_2.CH_3$.

Up to the present no fewer than fourteen of these alcohols have been prepared, and separated into their

optically active constituents by fractional crystallisation of the alkyl strychnine phthalates, $R.O.CO.C_6H_4.CO.O.X$, or similar salts, in which R is the alcohol radical and X is a suitable alkaloid; of these fourteen alcohols, only one had previously been obtained in an optically active form.

The labour involved in resolving so long a series of compounds can scarcely be appreciated except by those who have taken part in similar investigations, but in the present case the effort has been well rewarded by the production of material of unrivalled value for elucidating all the various problems involved in the study of optical rotatory power. The complete series of alcohols from $CH_3.CHOH.C_2H_5$ to $CH_3.CHOH.C_{11}H_{23}$ shows a perfectly regular gradation of properties, except in the case of the initial member, which shows an exceptionally large decrease of rotatory power with rise of temperature.

As illustrating the extreme sensitiveness of rotatory power to small changes of conditions, it may be noticed that ethylhexylcarbinol, $C_2H_5.CHOH.C_6H_{13}$, in complete contrast to methylhexylcarbinol, $CH_3.CHOH.C_6H_{13}$, or the methylheptylcarbinol, $CH_3.CHOH.C_7H_{15}$, with which it is isomeric, has a positive instead of a negative temperature coefficient, the rotatory powers of the isomeric alcohols being equal at 76°, but diverging when the temperature is raised or lowered. An even more drastic change of properties is observed on passing from phenylethylcarbinol, $C_6H_5.CHOH.C_2H_5$, to phenylmethylcarbinol, $C_6H_5.CHOH.CH_3$, or from methylbutylcarbinol,

$$CH_3.CHOH.C_4H_9,$$

to the isomeric methyl*iso*butylcarbinol,

$$CH_3.CHOH.CH_2.CH(CH_3)_2,$$

whereby the rotatory power is almost doubled in each case.

THE TEACHING OF SCIENCE IN SECONDARY SCHOOLS.[1]

THE following notes on the subject of science teaching in grant-earning secondary schools in England are based on the reports and observations of certain of the Board's inspectors, who were instructed to pay special attention to this matter during the past year. While an attempt will be made to note the principal changes that have occurred in recent years, to point out certain directions in which improvements have taken place, and to direct attention to some existing defects, the time has not yet come when a detailed and systematic survey of the state of scientific instruction in English secondary schools could profitably be undertaken. Since 1902, when the schools of science or "organised science schools" of the Science and Art Directory became the Division A Schools of the Regulations of that year, the number of secondary schools recognised for grant has risen from 348 to its present figure, 841. The earlier portion of this period was one which saw a gradual transformation from curricula which were predominantly scientific and mathematical to curricula in which a more even balance of studies was secured; and the whole period of growth and transition has been characterised (quite apart from the effect of alterations in the Board's Regulations) by notable changes in the methods, and to some extent also in the aims, of science teaching.

Changes in the Board's Regulations.

A comparison of the Regulations which in 1902 applied to the 221 schools in Division A (consisting in about equal proportions of municipal schools and higher grade board schools on one hand and schools of the endowed-school type on the other) with the Regulations now in force will show the magnitude of the change which has been brought about in the conditions under which the teaching of science in this section of the grant-earning schools is carried on. Thus in 1902 not fewer than thirteen hours a week were assigned to the obligatory subjects—mathematics, physics, chemistry, drawing, and practical geometry—of which not more than five hours might be assigned to mathematics. Even in the 127 schools belonging to the "Division B" of the Regulations of 1902, nine hours a week, or alternately a third of the total number of hours of instruction, were assigned to mathematics and science, of which four hours, or alternatively half the required minimum for both subjects, were allotted to science. Moreover, the Board not only determined the time which was to be allotted to science in each year of the "course," but indicated the syllabus to be followed in the various subjects of the "advanced courses" taken by the "Division A" schools. At the present time the Board's Regulations impose no conditions as to the syllabus of work to be followed and make no specific requirements as to the time to be assigned to the different subjects of the curriculum. Side by side with the increased freedom which has been given to the schools there has, as a fact, been a considerable reduction in the amount of time allotted to science in schools of the "Division A" type and to some degree also in schools of the "Division B" type. In schools of the former class the time given has commonly been reduced from some seven or eight hours a week to four or five in the upper forms, while in the lower forms the proportionate reduction has been greater. This has entailed considerable modification in the syllabus of work and, in general, a lowering of the possible standard of attainment.

Subjects Studied.

In practically all boys' schools the subjects taken are chemistry and physics, while in the majority of girls' schools botany is the main science subject, a minority taking either physics or more often chemistry. It is usual both in boys' and in girls' schools to find the study of one or other of these subjects preceded by a course of "experimental science" in which the formal separation into chemistry and physics is deliberately avoided. A considerable number of girls' schools, however, still exist in which botany is the only subject taken, or in which the attempt is made to teach botany concurrently with "experimental science"—a plan which, owing to the limited amount of time available, is rarely found to work well.

Hygiene, taught as a science subject, finds a place in the courses of a relatively small number of girls' schools and of a certain number of mixed schools, the subject being taken by the girls only. The inclusion of hygiene in the course is, as a rule, justified primarily on ethical grounds, *i.e.* with a view to the inculcation of hygienic habits. It is perhaps scarcely necessary to observe that there are wide differences of opinion as to the extent to which it is necessary or practicable to give this ethical teaching a formal scientific basis. The number of schools in which other science subjects, *e.g.* geology, astronomy, and zoology, are taught is exceedingly small, though there is some incidental teaching of the two former subjects in connection with the work in geography, while zoology very occasionally appears, and then for examination purposes, in the courses taken in the upper forms. Nature-study, a conveniently elastic term which covers work of the most various kinds, is ordinarily included among the subjects taught in the junior departments of both boys' and girls' schools. The subject is best taught when it is in the hands of a teacher (not necessarily the teacher of science) who is an enthusiast on natural history. In too many girls' schools in which botany is the main science subject the mistake is made of limiting the work to a preliminary study of plant life supplemented, it may be, by the making of weather records. In a few schools the plan of closely associating the early work in geography with nature-study has been tried with encouraging results.

Courses of Work.

(*a*) The differences which exist, and still more perhaps the differences which ought to exist, between the curricula of different grant-earning secondary schools make it practically impossible to comment in general terms on the character of the science work attempted and the standard reached in the several subjects taken. The probable after-careers of the pupils, the facilities for teaching individual subjects offered by the school and its environment, and the time which it is found possible to devote to science teaching are determining factors on which the choice of sub-

[1] From the Report of the Board of Education for the year 1909-10 London: Wyman and Sons, Ltd.). Cd. 5616. Price 8*d*.