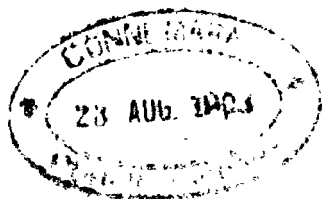


Official Report

OF THE

Nature-Study Exhibition and Conferences

HELD IN THE
ROYAL BOTANIC SOCIETY'S GARDENS
REGENT'S PARK, LONDON
JULY 23RD TO AUGUST 5TH, 1902



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Her Grace the DUCHESS OF SUTHERLAND.
The COUNTESS OF BECTIVE.
The Lady FREDERICK CAVENDISH.
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The Hon. ALFRED DOBSON (Agent-General for Tasmania).
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The Very Rev. the DEAN OF MANCHESTER (Chairman of the Association of School Boards).

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Mr. J. H. VOXALL, M.P.
Mr. J. C. MEDD (Hon. Secretary).
Mr. A. TAYLOR (Assistant Hon.
Secretary).

INTRODUCTION

Few words are needed in presenting this Report: it describes at length the leading features of the Exhibition, and the Conference addresses deal exhaustively with every aspect of Nature-study. As this was the first exhibition of the kind upon a large scale, the Committee have every reason to be gratified with the result. On all sides sympathy and support were generously given. Mention here can only be made of some of those to whom special thanks are due. By placing their gardens at the disposal of the Committee, and by their cordial co-operation throughout, the Council of the Royal Botanic Society contributed largely to the success of the undertaking. The plan of the Exhibition was designed by Mr. A. Taylor, H.M. Sub-Inspector, under whose direct control the final arrangements were made. The Committee were singularly fortunate in securing the services, as judges, of Mr. A. D. Hall, Director of the Rothamsted Experimental Station, Prof. Miall, F.R.S., of the Yorkshire College, Leeds, Prof. C. Lloyd Morgan, F.R.S., Principal of University College, Bristol, Prof. J. Arthur Thomson, of the University, Aberdeen, and Prof. Wallace, of the University, Edinburgh. These gentlemen were unwearied in their efforts to arrive at decisions which should be of permanent value in indicating the most appropriate lines of

study, and their task was one of peculiar difficulty owing to the very varied and miscellaneous character of the exhibits. In addition to the conferences, demonstrations with live bees were kindly provided by the Surrey Bee-keepers' Association, and were widely appreciated.

To the educational authorities of Nova Scotia, South Australia, New York, and Philadelphia the Committee were under a great obligation for their immediate response to the invitation to exhibit; and to Dr. Bickmore, of the New York Natural History Museum, in particular, much of the sustained interest in the proceedings is to be attributed. His constant presence and readiness to explain and illustrate his methods invariably attracted large crowds.

As Mr. Choate, the American Ambassador, prophesied would be the case, the effect of the Exhibition has been felt in many lands, and letters asking for information and advice have already been received from such distant countries as Hungary, India, and Japan. The Committee therefore are justified in hoping that a world-wide impetus has been given to the movement for introducing into education of every grade forms of instruction calculated to develop habits of observation, enquiry, and accuracy of thought. Nature-study is intended to serve as an introduction to, rather than as a substitute for, the study of books. Lessons on subjects foreign to the experience fall on dull ears, but books are read with eagerness when they deal with subjects already familiar. The fascination of natural objects for young minds opens, as it were, the windows of intelligence, and places the pupil in the attitude most favourable for the reception

of every form of knowledge. Moreover, there is no method so efficacious for cultivating that mother-wit which, although the common endowment of the human race, is often the most neglected faculty. Accurate observation and correct inference are the ministers of sound judgment, on which depend the manifold varieties of efficiency which make up the total of national welfare. In thus advocating the study of Nature the Committee are not aiming at the introduction of an additional subject to an already crowded curriculum. Rightly regarded, Nature-study is not so much a new subject as a more efficient means of imparting general knowledge. It does not necessarily extend the area of instruction, but supplies a deeper and more thorough tilth of ground already occupied but not always effectively cultivated. It will be noted that no attempt was made to define the scope of Nature-study. Definition involves limitation, and to define the scope of such a new and vigorous growth might prove a fetter to future development. The object of the Committee was to present and tabulate the various methods hitherto adopted and thus to render the experience of individuals available for mutual benefit and advancement. Nature may safely be trusted by her own process of selection to preserve and develop those methods which are best fitted for survival.

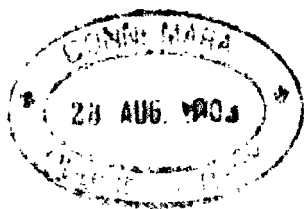
The report of the Executive is based upon material supplied by Mr. R. Hedger Wallace, and Mr. Wilfred Mark Webb, F.L.S., whose labours in the collection and analysis of details in regard to the schemes of instruction in operation at different types of colleges and schools deserve the highest praise. Mr. Lennox

Bird generously supplied the design for the Exhibition Medal, which was executed by Mr. H. W. Page. The South Kensington Branch of the Board of Education courteously designed and printed the Certificates of Merit.

JOHN A. COCKBURN,
Chairman of the Executive Committee.

JOHN C. MEDD,
Hon. Secretary.

January, 1903.



Reports

The Exhibition included the following Groups:—

- GROUP A.**—Agricultural or Horticultural Colleges and Schools, Experimental Farms, Agricultural Departments of Universities and University Colleges, and similar Institutions.
- GROUP B.**—Secondary Schools (Public and Private).
- GROUP C.**—Primary Day and Preparatory Schools, including Higher Elementary and Higher Grade Schools (Public and Private).
- GROUP D.**—Continuation Schools.
- GROUP E.**—Residential and Day Normal Training Colleges, Day Training Departments of University Colleges and Pupil Teachers' Schools.
- GROUP F.**—Schools for the Deaf and Blind.
- GROUP G.**—(a) Home Office Schools and (b) Workhouse Schools.
- GROUP H.**—Field Clubs, Horticultural and other Societies as well as individuals that encourage Nature-Study or Nature-Lore as a subject of education.
- GROUP J.**—The Colonies of Great Britain and the United States of America.

The Nature-Study Exhibition

JUDGES' REPORT

GENERAL

A careful inspection of the exhibition has given us two general impressions: (*a*) that a large amount of sound work in "Nature-study" is now being done in British schools, but (*b*) that a good deal of energy is being expended along lines which are not likely to yield the best return. We have therefore endeavoured to be discriminating in our awards, and have sought in our report to indicate briefly what appear to us to be the more profitable and the less profitable kinds of work.

It may be remarked at the outset that this is the first large exhibition of its kind in Britain, and that it includes specimens of a great variety of work, no small part of which has been accomplished by isolated teachers, who have had little opportunity of comparing their own methods with those of others. In affording suggestions to such teachers the exhibition method seems to us very valuable, and we hope that it may be followed up in future years.

A lavish distribution of awards has seemed to us undesirable, but we take this opportunity of pointing

out that many of the exhibits to which we have not seen our way to give medals or certificates have particular interest and merit when considered in relation to their individual circumstances—the character and locality of the school, the number and age of the pupils, and so on.

WORK OF SPECIAL EXCELLENCE

We shall first endeavour to emphasize the best kinds of work which we have been able to discover in the Exhibition, and thus to turn present experience to account for the benefit of future organizers of Nature-study.

(1) **Studies on Living Things.**—We are inclined to put in the very first rank of merit, successful and interesting work on living things. The collecting, preservation, mounting, and even study of a dead object, though it may be important when directed by a spirit of scientific inquiry, is in general of much less value than the study of the living.

The study of the process of nutrition in living green plants can, as we see from the exhibit of the James Allen's Girls' School, Dulwich, be carried on with great success under ordinary school conditions. The excellent water-culture experiments and the plan of the school gardens are worthy of special notice.

The exhibit of the Natural History Society of the Bootham School, York, preserves a record of seventy years of active, wholesome, and successful effort. Much of the work is very good in itself, and it is attended with special interest from the fact that several naturalists and men of science who occupy, or have occupied,

important teaching posts, were trained in this school. They no doubt received a stimulus to scientific work from the example of this highly successful School Natural History Society.

What we may call the note of vitality is also characteristic of the exhibit of the Philadelphia Normal School, from which much interesting information is to be gathered, especially, perhaps, as regards correlation of subjects. The dated drawings of seedlings in various stages of development, made direct from nature, are excellent examples of what can be done in school.

(II) **Seasonal Studies.**—We would commend the increasing prominence which is being given to seasonal studies, as illustrated by numerous floral calendars, records of birds, and the like. This seasonal method gives order, correlation, and naturalness to the work, and it seems to us of particular value when the whole range of seasonal phenomena—astronomical, meteorological, and occupational, as well as biological, is taken account of. It is also of importance that the same objects—whether trees or birds, the plants or animals in pond or shore-pool—should be observed with persistence through the different seasons. The simple device, followed in several schools, of making individual pupils vouch for particular records in the calendar or on the chart, seems praiseworthy. The danger which attends seasonal records is that the entries may become purely formal. An opportunity is lost when the occurrence of a plant or animal is noted without any enlargement of knowledge concerning the circumstances under which it lives.

(III) **Regional Surveys.**—We direct attention to the value of regional surveys—geographical and geo-

logical, as well as biological—of the district immediately surrounding the school or college, or of that traversed on excursions and in wider “school-journeys”. In illustration, the regional surveys, mainly physio-graphical, exhibited by the Wells Blue School may be noticed as examples of careful work. On a higher plane are the botanical surveys exhibited by Dr. Smith from the Yorkshire College, Leeds.

(IV) **Nature Diaries.**—There are numerous interesting exhibits of “nature books” or “nature diaries” at many different levels. We may refer especially to those from the Ambleside House of Education, and from the Sheffield High School for Girls. The method deserves encouragement, but a warning seems necessary. The observations should not be made in a routine-fashion; mere dates of occurrence are often unproductive and stupefying, and the introduction of quotations from books on Natural History, however excellent these may be, is contradictory to the aim of the method of strictly individual observation and record.

(V) **School Gardens.**—Encouragement should be given to the formation of school-gardens, especially in certain centres, and if the scholars participate in the gardening.* There are good illustrations from the Surrey County Council, from the Grammar School of Aberdeen, and from other schools. But against “28,000 school-gardens in France and 7000 in Russia”, Britain has not numerically much to show.

(VI) **Vivaria and Aquaria.**—We have been able to commend the exhibits of living animals by the Froebel Institute and the Cambridge Training Col-

* Professor Wallace dissents from this recommendation.

lege for Women Teachers, the formicarium from the Stepney Museum, and so on, but the keeping of live animals in schools seems to us rather a difficult problem. Unless it can be done really well—which implies no small expenditure of time and loving carefulness—it is better not done at all. In country districts nothing more than a very brief imprisonment need be aimed at. Even then care is needed to secure that the natural conditions of the animals' existence are approximately recognized during the captivity.

(VII) **School Rambles.**—Some exhibits, notably that from the Board School, Arnot Street, Liverpool, illustrate in a very interesting way the utilization of school excursions in education. The method secures the stimulus of more or less new scenes, the indulgence of the exploring instinct, the adding to the school museum or study-material by the pupils themselves, the study of things *in situ*, and so on. To select one precise point, it is evident to us that the lantern slides, illustrating geological features, made from photographs taken on one of the "school-journeys", are greatly to be preferred to purchased material, even if that happened to be technically superior.

And here we may notice as particularly worthy of commendation a few cases in which a practical problem, immediately real to the scholars—whether basket-making or a big alteration in the school buildings—has been utilized as a focus for individual scientific work on the part of the scholars.

(VIII) **Simple Apparatus.**—We wish strongly to commend a few exhibits, *e.g.* from the South-Eastern

Agricultural College, Wye, Kent, and from the Thornhill School, Wye, which show the utilization of very simple apparatus, and even home-made instruments, in demonstrating scientific facts of great educational value.

(IX) **Scope of "Nature-study".**—Apart from awards, we wish to commend those exhibits which have in some measure recognized that "Nature-study", both in educational theory and in the practical suggestions of the Education Department, implies an appreciative outlook upon the whole environment, and that not from a scientific view-point only, but from the æsthetic and practical as well. It is certainly not confined to herbarium-making and shell-collecting, nor even to the life of plants and animals throughout the year; it includes a complete regional survey.

Though we did not find ourselves able to make awards in regard to astronomical and meteorological exhibits, we wish to commend the inclusion of these and other aspects within the scope of "Nature-study". There were some interesting exhibits illustrating the use of a school-telescope, the study of the moon's phases, and so on, just as there were others that showed that educational value was being got out of the theodolite and the sun-dial.

While it is obviously important that the kind of study to which emphasis is given should be that most congruent with the immediate environment and with the teacher's previous training, we wish to emphasize the wide scope of "Nature-study".

LIST OF MEDALS

GROUP

- A. Surrey County Council. *Collective Exhibit.*
 B. James Allen's Girls' School, Dulwich. *Collective Exhibit.*
 Bootham School, York. *Collective Exhibit.*
 St. Paul's School, London. *Collective Exhibit.*
 Arbroath High School. *Decorative Work.*
 Bedales School, Petersfield, Hants.
 Church School Company, Streatham School. *Nature Calendar.*
 Tiffin's Boys' School, Kingston-on-Thames.
 C. Liverpool School Board. Arnot Street Board School. *Illustrations of School Excursions and Excursion Scheme.*
 Chislehurst Road Board School, Orpington, Kent.
 E. House of Education, Ambleside.
 H. Stepney Museum (Miss K. M. Hall, Curator). *Cases of Insects, a Formicarium, &c.*
 J. Philadelphia Normal School, U.S.A.
 Professor Bickmore, Ph.D., American Museum of Natural History, New York.

CERTIFICATES TO EXHIBITS SPECIALLY
VALUABLE TO TEACHERS

We wish also to call attention to the following exhibits which have struck us as valuable to teachers, and to which we have called attention by the award of certificates:—

GROUP

- A. Essex County Council Technical Instruction Committee.
The Monographs done by Normal Students.
 Horticultural College, Swanley, Kent. *Special Collections illustrating Dispersion of Seeds and Fruits.*
 B. Tiffin's Boys' School. *Photographs of Emergence of Dragon Flies.*
 Clapham High School for Girls. *Plant Studies from Nature.*
 Cheltenham Ladies' College. *Nature Note-books.*
 Streatham Hill High School. *Note-books illustrating Natural History.*

GROUP

St. Paul's School, Oxford. *Development of Foliage from Winter Buds. Preparations to illustrate Climbing and Protective Adaptation.*

E. House of Education, Ambleside. *Nature Diaries kept by Students.*

The application of natural objects to artistic design has been successfully studied in several schools, and here we would particularly mention the exhibits of the Leeds School Board and from Arbroath.

OTHER AWARDS OF CERTIFICATES

GROUP

A. Yorkshire College, Leeds. *Botanical Surveys.*

Durham College of Science, Newcastle-on-Tyne. *Collective Exhibit.*

Cheshire County Council. The Aldersey School, Bunbury. *Scheme of Work. Photographs.*

Hants County Council. *Collective Exhibit.*

Surrey County Council. *Collective Exhibit* from Evening Continuation School-Gardens.

Weybridge National School. *Relief Map.*

South-Eastern Agricultural College, Wye, Kent. *Collective Exhibit.*

Fife County Council. *Collective Exhibit. Printed Schemes of Work and Prospectuses.*

Glasgow Technical College. *Collective Exhibit*, especially the work from Mr. Scott Elliot's classes.

B. Girls' Public Day School Company. Clapham High School. E. Potter's *Botanical Drawings.*

Norwich High School. *Nature Calendar.*

Sheffield High School. Kindergarten Department. *Literature.*

Aberdeen Grammar School. *Photographs of Children at Work in Garden and on School Rambles.*

Sexey's Trade School, Bruton, Somerset. *Scheme of Nature-study and Time-table.*

St. Margaret's School, Bushey, Herts. *The Perfection of Life in Plants.*

GROUP

- Cheltenham Ladies' College. (a) *Model of District round Cheltenham*, by Miss Parkinson. (b) *Wild Flowers dried in Sand*. (c) *Painting in Brush-work of Natural Objects*.
- Cirencester High School. *Wild-flower Calendar, with Specimens*.
- Eton College. *Collections illustrating Local Fauna*.
- St. Paul's School, London. Master Dollman for *Collections and Models of Natural Objects*.
- King Alfred Society School, Hampstead. *Collective Exhibit*.
- Hampstead West Heath School. *Collective Exhibit*.
- Queen's Wood School, Clapham Park. *Collective Exhibit*.
- Hastings and St. Leonards College. *Map of District, showing Natural History Walks. Collections of Climbing Plants and Lantern Slides*.
- Wells Blue School. *Collective Exhibit*.
- C. London School Board. Church Street Infant School. *Collective Exhibit. Distribution of Flower-boxes*.
- Halifax School Board. Warley Road School. *Collective Exhibit*. The drawings specially commended.
- Leeds School Board. (a) *Collective Exhibit*. (b) Beverley Street Girls' School and Southern Higher Grade School. *Collective Exhibits*.
- Leicester School Board. Certificates to Moat Road Board School and Green Lane School.
- Liverpool School Board. *Scheme of Distribution of Specimen Boxes from the Liverpool Free Museum*.
- Cardiff School Board. (a) Severn Road Board School Boys. *Collective Exhibit*. (b) Severn Road Board School Girls. *Collective Exhibit*. (c) Gladstone Manual Training Centre. *Collective Exhibit*.
- Bryncoch School, Neath. *Collective Exhibit*.
- Hereford. Lord Scudamore's Endowed School. *Photographs of Children at Nature-study*.
- Wesley School, Padiham, Lancashire.
- Shorewell School, Isle of Wight. *Collective Exhibit*.
- St. Peter's National School, Stockport. *Collective Exhibit*.
- Thornhill School, Wye. *Work done by Pupils*.

GROUP

- E* Southlands Training College, Battersea. *Nature Note-books.*
 Cambridge Training College. *Collective Exhibit.*
 Home and Colonial School Society and Training College for Kindergarten and Lower Form Mistresses. *Collective Exhibit.*
 Lincoln Training College. *Collective Exhibit.*
 Salisbury Training College. *Collective Exhibit.* The models specially commended.
 Frœbel Institute. *Collective Exhibit.*
- F.* Association for the Oral Instruction of the Deaf and Dumb. Training College for Teachers. *Collective Exhibit.*
- G.* Baldovan, near Dundee. Home Office School. *Collective Exhibit.*
- H.* Cardiff Museum and Art Gallery. *Series of Geological Models*, by Mr. John A. Ward.
 Leeds Children's Natural History Club. *Collective Exhibit.*
 Goodrich Field Club. *Collective Exhibit.*
 Miss Ruth Thornycroft, Thornycroft Hall, Siddington. *Collective Exhibit.*
 Mrs. Brightwen, Great Stanmore. *Collective Exhibit.*
 Master R. H. Hall, The College, Wye, Kent. *Specimens of work done by a young boy at home.*
 R. Youens, 15 Tower Road, Dartford. *Drawings in Pencil and Ink of English Wild Flowers.*
- J.* Provincial Normal School, Truro, Nova Scotia, Canada. *Collective Exhibit.*

CERTIFICATES AWARDED IN THE
PRODUCE SECTION

- The Countess of Warwick's School, Bigods. *Descriptive Garden Produce.*
 Berkshire Technical Instruction Committee: Aldermaston and Littleworth Evening Schools. *Collective Exhibits.*
 Hampshire County Council Farm School, Old Basing. *Bottled Fruit, Poultry, and Dairy Produce.*
 The Little Mill Reformatory, Monmouthshire. *Fruits and Vegetables.*

Miss Weston-Smith, Student, Royal Botanic Gardens.
Some Garden Plants and their ancestors, descriptive.
 Blackheath Invicta Infants' Board School. *Photographs,*
Flowers, and Garden Produce.

We have recommended the following exhibits for special prizes:—

- Prof. Miall's Prize for the best exhibit from a Secondary School.
 The James Allen's School for Girls, Dulwich.
- The Rev. R. A. Bullen's Prize for the best exhibit from a School Museum. The Laira Green School, Plymouth.
- Mr. A. Taylor's Prize for the best account of how to organize a School Museum (confined to Welsh Schools). Miss C. Hill, The Training College, Warrington (formerly of the Girls' National School, Hawarden).
- Miss Phoebe Allen's Prize for the best collection illustrating dispersion of seeds and fruits. St. Paul's School, Oxford.
- Miss W. L. Boys-Smith's Prize for the most completely-filled Nature Note-book. Miss Dorothy Mitchell, The High School, Sheffield.
- Miss A. Hibbert-Ware's Prize for the best collection showing originality of Natural Objects. The Brothers Dollman, St. Paul's School, London.
- Mr. S. H. Leeder's Prize for the best photograph of scholars at work in School Gardens. Lord Scudamore's Endowed School, Hereford.
- The Editor of the *Girls' Realm's* Prizes for (a) the best collection of injurious Insects and Plants (open to Girls' Secondary Schools). Miss Marjorie Harrison, Hastings & St. Leonards College, St. Leonards. (b) The best painting of any Natural Object (open to Girls' Secondary Schools). Miss Lilian B. Swan, St. Margarets, Bushey, Herts. (c) The best collection of Fossils (open to Girls' Secondary Schools). The High School for Girls, Tunbridge Wells. (d) The best Drawing-book (open to Girls' Secondary Schools). Miss Daisy Wood, The James Allen's School, Dulwich.
- Mr. J. Martin White's Prize for the best scheme of instruction in Nature Study at a Training College. Miss Mitchell, The Training College, Salisbury.

Mr. J. Martin White's Prize for the best scheme of instruction in Nature-study for Acting Teachers or Pupil Teachers.

Mr. T. H. Kemp, The Pupil Teachers' Centre, Merthyr Tydfil.

Messrs. Ginn & Co.'s Prize for the best scheme of instruction in Nature-study at an Urban Elementary School. Mr. D. Cleary, Bitterne Park School, Southampton.

Messrs. Ginn & Co.'s Prize for the best scheme of instruction in Nature-study in a Rural Elementary School. Mr. W. J. P. Burton, Lea School, Matlock Bath, and Mr. E. A. Thomas, Orlestone, Board School, Kent. (Equal.)

Mr. J. C. Medd's Prize for the best co-ordinated scheme of in-school and out-of-school instruction in Nature-study at a Rural Elementary School. Mr. H. Boulton, Chislehurst Road School, Orpington, Kent.

Mr. D. Houston's Prize for the best specimen of Nature-study work from a Rural Elementary School. Thornhill School, Wye, Kent.

Dr. Kimmins's Prize for the best small collection of Dried Plants. The Sandown Higher Grade School, Isle of Wight.

Mr. G. H. Morrell, M.P.'s Prize for the best raised Cardboard Map made by a pupil at an Elementary School. Messrs. Lane & Palmer, Sydenham Hill Board School, London.

Mr. A. T. Simmons's Prize for the best account by a pupil at an Elementary School of a School Ramble. Miss Helen Dorothy Roake, Send School, near Woking.

Messrs. Barr & Son's Prizes for the best collective exhibits of Produce from School Gardens:

1. The Aldermaston Continuation School, Berks.
2. The Reformatory, Little Mill, Pontypool, Monmouthshire.
3. The Invicta Infant School, Blackheath.

SOME EXHIBITS OUTSIDE THE SCOPE OF THE AWARDS

The thanks of the organizers of the exhibition are due to certain exhibitors of objects which, though for special reasons not considered suitable for awards, have greatly increased the value of the exhibition.

Among these, the books on Nature-study and allied subjects shown by several educational publishers occupy the first place. We have also remarked the usefulness of Plasticine as a material for the modelling of a variety of natural objects. The stands show how much this substance has been employed in a variety of ways. The hermetically sealed "B and C" exhibits of mounted animals in spirits are very good of their kind.

SOME LINES OF WORK WHICH SEEM
LESS VALUABLE

The following occupations which are more or less frequently practised in the schools seem to us less valuable than others which are well known and quite practicable:—

1. The copying of diagrams and drawings from books.
2. The construction of theoretical diagrams to illustrate supposed operations of nature.
3. The pressing of wild flowers and the pinning of butterflies, when carried on without a special purpose.
4. The exhibition in class or school-room of specimens on which no work has been done, which suggest no special inquiries, and which have no relation to the district immediately surrounding the school.

(Signed)

A. D. HALL.

LOUIS C. MIALL.

C. LLOYD MORGAN.

J. ARTHUR THOMSON.

ROBERT WALLACE.

REPORT OF THE EXECUTIVE COMMITTEE

An association for promoting a Nature-study Exhibition was formed on February 1, 1902, at a meeting of some of those anxious to give practical effect to the recommendations of the Board of Education for the improvement of elementary schools, and to supplement the efforts of the county councils and other independent authorities towards encouraging the study of nature.

The scheme was warmly supported in many influential quarters, and the invitation to exhibit met with a response which exceeded the most sanguine expectations. Large though the space was which the Royal Botanic Society placed at the disposal of the association, it was really too small for an adequate display of all the exhibits, and some exhibitors may have felt a little disappointment that occasionally objects upon which they had expended considerable care were placed in somewhat inconspicuous positions. The fact, however, that the quantity of material sent was so great amply justified the inception of the association, and testified to the universal interest which this particular element in education now attracts. Striking evidence of this was also furnished by the co-operation of educationists in Canada, Australia, and the United States in what was essentially a private undertaking.

At the opening of the exhibition the membership of the association amounted to 286, and the total number of exhibitors was 379, distributed as follows:—Group A, 63; group B, 86; group C, 159; group D, 7; group E, 14;

group F, 2; group G, 10; group H, 32; and group J, 6. These figures are rather below the actual number of institutions represented, as in some cases collective exhibitors did not specify the sources whence their individual exhibits came. Group A, for instance, included certain schools which strictly fall within groups B or C, the exhibits from certain secondary and primary schools being included amongst those sent by various county councils.

The preliminary arrangements for the exhibition were in the hands of a General Purposes Committee composed of Sir John Cockburn, K.C.M.G. (Chairman), Dr. Kimmins, and Messrs. A. G. Legard, T. G. Rooper, C. Savile Roundell, A. T. Simmons, A. Taylor, R. Hedger Wallace, W. Mark Webb, J. Martin White, and J. C. Medd (Hon. Sec.).

Group A. This section, though a small one, was, in certain directions, very representative.
Character of the Exhibits. One or two of the County Councils, *i.e.* those of Cheshire, Hants, and Surrey, sent collective exhibits, embracing the educational systems of the whole county, and reference to their secondary, primary, and continuation school exhibits will be found in Groups B, C, and D, respectively.

The exhibits in this section may be grouped in five classes:—

AGRICULTURE

As was to be expected, much of the material shown in this section dealt with agricultural teaching and processes, pure and simple. The Agricultural College, Wye, for instance, exhibited collections "of *natural objects* bearing upon agriculture" which entail outdoor observation and must be submitted by students in connection with their examination for the diploma.

HORTICULTURE

This type of teaching was also well represented, exhibits having been sent from all the well-known centres.

The contribution, for example, of the Berkshire County Council comes entirely under this heading, and has been thus described:—

“The exhibit of this county council has not a very direct bearing on Nature-study. It is the result of the Conference on School Gardens.

“Nine groups of Continuation School Gardens have been started, and of these all but one sent an exhibit—that of Aldermaston (A. Higgs, Local Instructor) secured the first prize in the produce section.

“It is impossible to state better than Mr. Rooper did in his paper the great and many advantages of these School Gardens—the prevention of the knowledge of words being mistaken for the knowledge of things, the encouraging of a rural population, the study of living things, especially plants, the intimate connection of School Gardens with Agriculture, their development of the qualities of order, method, industry, punctuality, and general steadiness in young men at the most critical time of life.

“With its exhibit, each School Garden was requested to forward copies of its time-table, scheme of cropping, plan of garden, boys’ notebooks, and photographs. All did not comply fully with these requests, but many interesting additions to the produce were sent.

“The gardens are carried on all over the county upon one plan under Mr. A. S. Galt, the County Instructor in Horticulture. In every school there is a standard plot for boys to work to, and an experimental plot where simple experiments are attempted.

“A competition in accordance with definite conditions, Mr. W. Iggulden, F.R.H.S., being judge, will be carried on in the week beginning August 18th, and all other factors being constant, the crops are very interesting experiments upon variations of geological structure, soil, and climate. The soils vary very much—being Coralline Rag, Kimmeridge Clay, Galt, Upper Green-sand, Chalk, and London Clay.”

Horticultural teaching has also been made a feature of the Surrey County Council’s educational scheme, and its progress may be judged from the following paragraph:—

“If, when the teaching of gardening commenced on the Continuation School plots in Surrey, any person had ventured to predict such results

as have now been achieved, he would have been regarded as an optimist or a dreamer.

"It is quite certain that the progress which has been made in the great majority of centres has exceeded all anticipations, while the average merit of the work has steadily risen year by year.

"Apart from the benefits which must accrue to the diligent youths who have acquitted themselves so well, a lesson of significant import has been taught on the amenability of the soil to increased productiveness, whatever its natural state may be.

"It has also been demonstrated in the most cogent manner possible that this can be effected by the intelligent, loving labour of youths (some of whom walk from 1 to 2 miles to their gardens), under the guidance of able, striving local teachers, who add tact and zeal to their knowledge, as powerful factors in attaining the object.

"Difficulties have to be encountered in all kinds of educational work. In conducting lessons on the land they are met with in various forms—such as of site, soil, and weather, youthful peculiarities, and sporting indulgences; but difficulties only act as stimulants to earnest men, and, with few exceptions, yield to well-judged persevering effort suitable to each case."

ECONOMIC ENTOMOLOGY

This subject was very largely taken up in the section, and when taught on informal lines it offers an opportunity for encouraging outdoor and even indoor observations on the part of children. In some cases the subject was theoretically considered from a very advanced point of view, but the actual collections shown were generally unimportant. The exhibition of "breeding-cages" pointed, however, to the fact that sometimes the students work out the life-histories of insects for themselves.

BOTANY

One of the interesting features in this respect was the original maps prepared by Mr. R. Smith and Mr. W. G. Smith for the regional botanical surveys of Scotland and Yorkshire shown by the Yorkshire College, Leeds. The College of Science, Durham, in its exhibits, specialized in economic agricultural botany and in agricultural bacteriology; the latter subject also formed the principal part of

the exhibit sent by the West of Scotland Agricultural College. Elementary botany seemed, further, to be generally taught at all the institutions in this group.

NATURE-KNOWLEDGE AND THE TRAINING OF TEACHERS

A series of "*experiments in progress, suitable for a Nature-knowledge course dealing with plant-life*" was shown by the Wye Agricultural College. The apparatus was made from the most ordinary materials, and required no special skill in handicraft.

As a rule much of the agricultural and horticultural teaching illustrated, was applied Nature-knowledge, from which teachers would be able to obtain useful hints, as, for instance, from the illustrative collections exhibited by the Biological Laboratory of the Essex County Council, and of which some details are here given. The series included specimens of—

- “(1) Weeds that interfere with crop-development.
- (2) Weeds that consume the crop more or less completely.
- (3) Weeds that interfere with crop-feeding by appropriating food-making constituents from the soil.
- (4) Weeds that interfere with crop-feeding by preventing the access of light to the young crop.
- (5) Weeds that diminish the cropped area.
- (6) Plants that interfere with the root-breathing of the crop by preventing free access of air.
- (7) Weeds that interfere with seed-produce by rendering the seed impure.
- (8) Weeds that lessen the nutritive value of the seed-produce of a crop.
- (9) Weeds that interfere with seed-produce by imparting to it poisonous properties.”

This county council also exhibited a series of prospectuses, pamphlets, and instruction-sheets illustrating the training of teachers, to which its Technical Instruction Committee has pre-eminently devoted itself.

It appears that the feature which has been specially developed in the biological training of Essex teachers is the practical work of the students themselves. This is carried on—according to definite instructions—in observational lessons and rambles which have almost completely superseded the set lecture. The following extracts with regard to the preparation given by the Essex County Council for Nature-study teaching are of interest:—

“The proposed rambles will enable teachers, anxious to give effect to the recommendations of the Board of Education, opportunities of gaining some helpful experience in the methods adopted in the *Study of Nature* in the field, and an insight into the way in which plants grow, especially in their relations with their environment; the influence of external conditions, such as light, heat, and moisture, upon their form; the mutual relationships between plants and animals; the influence of one organism upon another. . . .

“A type collection would naturally be arranged in botanical order, but duplicates might be used for special fascicles representing, for example, ‘meadow plants’, ‘corn-field weeds’, &c. The collection of such plants would give very pleasant recreation to boys and girls possessed of the naturalist’s spirit, and afford the teacher excellent opportunities for *unconventional instruction in Nature-study*.”

The work of the Derbyshire County Council was also represented in this group, and with regard to it the following remarks were made:—

“It is generally admitted that before much can be done in the rural elementary schools—day and evening—the teachers must be suitably trained, and as a beginning in this direction the work of Saturday teachers’ classes and summer courses in such subjects as Plant and Insect Life, organized by county councils, is important.

“The little collection of lantern slides, illustrating ‘The Story of a Piece of Limestone’, was sent mainly with the object of showing that many excellent geological illustrations can be found by a little search amongst the various sets of the dealers, supplemented by original local photographs which a good teacher will often be able to supply. It need hardly be said that photographs should only supplement and not be instead of actual field-work in this subject. With a large class the lantern is at times a useful aid, but I often find teachers using slides

which are mere copies of text-book illustrations instead of actual photographs, which are so much more valuable."

The collections illustrating the dispersal of fruits and seeds, shown by the Horticultural College at Swanley, belonged to another and generally useful type.

The County Councils of Cheshire and Fifeshire, as well as the Harper-Adams and Wye Agricultural Colleges, showed syllabuses of courses intended for teachers desirous of undertaking Nature-study in their schools.

Group B. The conditions under which most secondary schools are at present conducted make it difficult for Nature-study to permeate the whole of the school work. Therefore the exhibits in this section showed that the excellent results already attained in many schools are, with but few exceptions, the results of voluntary effort. The exhibits in question, fall into the following divisions:—(i) Science Teaching; (ii) Observational Lessons; (iii) Field Work and Nature-study.

SCIENCE TEACHING.

Many schools showed that practical work in Botany was undertaken, and this is done particularly well in those for girls. The following scheme of botanical teaching in Brighton and Hove High School may be taken as representing this type:—

SCHEME OF BOTANY TEACHING.

"Botany is taught throughout the school.

"In Forms II*b* and II*a* (the lowest) very simple object-lessons are given on plants useful for food or on some other branch of botany likely to awaken an interest in small children, and to appeal to their own experience and observation.

"In Forms III*b* and III*a* the study of the parts of a plant is systematically begun in the second half of the autumn term, and in the early spring easy vegetable physiology is taught, and at the other times of the year, when specimens are obtainable, lessons on the morphology of

the plant are given in a very elementary way. When the children leave the Third Form they are expected to have a good general knowledge of the parts of a plant and of a flower, and to be able to use the most simple botanical terms.

"In the three Fourth Forms (upper, middle, and lower) the pupils have lessons on Structure and Physiology in the latter part of the autumn term and in the early spring; during the late spring and summer they begin Classification and learn how to describe a plant in botanical terms. These lessons are graduated in difficulty in the three forms, so that a girl leaving the Upper Fourth Form should have a sound elementary knowledge of general Botany.

"In the Fifth and Sixth Forms the work is on the lines laid down in Professor Balfour's Lower and Higher Schedules, in preparation for the examinations of the Oxford and Cambridge Schools Examination Board.

"In all the classes a great endeavour is made to give the lessons as far as possible *on actual living specimens*, and except in the two upper forms, where the scope is limited by examination work, the specimens chosen are those which are obtainable in the near neighbourhood of Brighton, the flora of Sussex being both rich and varied.

"Each of the children is provided with a specimen, and they are trained as far as may be in the very limited time given to the subject to observe independently."

The exhibits from such a school as Bigods-hall, Dunmow, mainly showed "the kind of work that is looked upon as best suited for preparing a boy while at school for after-life on the farm". The apparatus for teaching plant physiology exhibited by this school was noticeable, so also were the "experiments showing plants growing in solutions", exhibited by the James Allen's Girls' School, Dulwich.

In some cases it seemed that the teaching of agricultural zoology was undertaken, while in others, as, for instance, in those of the Girls' Public Day School Company, zoology is a recognized subject of instruction.

OBSERVATIONAL LESSONS.

As a type of this class of work, what is done in the lower forms of some High Schools and Grammar Schools where

pupils are taught to draw, paint, and describe natural objects may be mentioned. At the Liverpool Girls' High School, for example, the Nature lessons and "lessons connected with Nature-study" are as follows:—

"NATURE LESSONS.

Plants.

- α Buds.
- β Seedlings.
- γ Specimens from the Children's Gardens.
- δ Plants in the Aquarium.

Animals under observation, e.g. the development of—

- (1) Tadpoles.
- (2) Silkworms.
- (3) Caddis grubs.
- (4) Newts: as well as
Snails, Birds, and Nest-building.

LESSONS CONNECTED WITH NATURE-STUDY.

Painting.

Stages of buds and seedlings.
Various flowers and animals used in the lessons.

Drawing.

Ordinary and Black-board drawing of the same.
Memory drawing of objects observed at museums and so forth.

Modelling.

Modelling of the same subjects and in illustration of Geography lessons."

FIELD WORK AND NATURE-STUDY

The exhibits indicated that in a few schools in this section Nature-study has received definite recognition as part of the general teaching. As an illustration, the following account of Sexey's Trade School, Bruton, may be quoted:—

"(1) 'Nature-study' is, and has been for the last seven years, a definite part of our curriculum, compulsory for all boys during school hours,

"(2) In the Lower Forms it is used to cultivate the powers of observation and expression. Definite Botanical teaching is relegated to the Upper Forms, following an elementary course of Physics and Chemistry.

"(3) One member of the staff devotes his attention exclusively to 'Nature-study', his whole non-teaching time being taken up with the preparation of lessons and the arrangement of specimens in the museum."

At the Coombe Hill School, Westerham, the object is:—

"to conduct the Nature-study of the school in such a way as to arouse interest in all natural phenomena and to foster the spirit of enquiry.

"The greater part of the work is carried on, as a matter of course, out-of-doors, and is therefore seasonal, for the children are taken direct to Nature, and are led to observe for themselves the modes of growth and the habits of plants; to follow the life-history of animal organisms; to note the changes wrought, as the year advances, in landscapes familiar to them; and to note the daily and seasonal alterations in the face of the heavens.

"The use of note-books is not adopted, as it tends to divert the mind from the subject in hand; and as the children are not likely to forget their own discoveries, notes are not needed, at any rate during the lesson. *Wherever direct information is given by the teacher, the faculty of association can be relied on to give the necessary stimulus to memory.* It has seemed to be worse than useless to systematize over-much in these studies. One has to take for subject-matter such objects as are at hand. The general direction of a term's or a year's course of study can be planned, and it is well, when possible, to explain beforehand what is to be noticed in a given (outdoor) lesson; but the children's taste, and enthusiasm, and wonderfully quick observation carry them beyond this, and much more is discovered, as a rule, than was expected at the outset.

"The exercise-books contain descriptions (written spontaneously by the children) of some of the work of the present year, while the diagrams test the accuracy of their observations and, in most cases, the retentiveness of their memory.

"Brush-work is resorted to as a simple and effective means of representing the beauty of which they become conscious in the course of their study, and the specimens in the exhibition were entirely their own work, and are treated by the brush alone. The woodwork (nesting-boxes, &c.) and baskets were included in order to show that the chil-

dren (girls and boys) are encouraged to make as much as possible of the apparatus required for their Nature-study."

The time-table of the Ruskin School Home, Heacham-on-Sea, showed that two-thirds of the work of a secondary school could be carried on out-of-doors. The Nature-study work of this successful experiment in education consists of "plant lore and rock lore and star lore, as far as possible gained at first hand, and opening eyes to the beauty and wonder of the worlds". The master sets himself "*to tell the children as little as possible, to make them see and think as much as possible, and to supply them with a key to all future problems, for to train children to reason in one subject is to train them to reason in all*".

A few further details of the methods adopted in this school may be added here, and are as follows:—

"First, then, plant-study (not botany as commonly understood) is depended upon for training in habits of keenest observation, carefulest recording, and closest reasoning. Plant-study in field and garden, together with the study of all the complex web of life inwoven with that of plants; the flower and insect, insect and bird, bird and 'beast', all to be studied on the spot with spade or note- and sketch-book in hand. Each child, if it so desire, may have its own little garden plot.

"Similarly, every child is encouraged, within reasonable limits, to keep and care lovingly for pets; and the study of these, in the marvellous adaptation of each organism to its environment, is co-related with what we can learn of ourselves in the study of our own bodies and of the wild life of the fields.

"It may be asked here: 'Is it possible to give children a good mental training in plant-study and the life of the fields?' It may be answered, that the gentle old Henslow trained the children of his village school thus, to such habits of order and neatness, and such acute powers of observation and reasoning, that they were sought far beyond the limits of his county, the girls as domestic helps, the boys for responsible situations of all kinds; and further, that plant-study is only the portal, and that the most healthy and natural, to the treasure-house of all the lore of all the ages.

"The plants lead downward into the study of the rocks (and every mine and quarry and building near yields its aid in this direction), and

upward to the study of the winds and clouds, and so again to the rivers and oceans. Each child writes its own geography, beginning with a plan of the room, the house, the garden, the local roads, hills, streams, and broadening, with the latter, till they reach and cross the sundering seas, where strange nations will introduce naturally to the study of their languages when the need arises.

“The study of geography, moulded by geology and climate, deepens to that of present social and political conditions, and these will be seen to be conditioned in turn by the remote past, to explain which we will turn to history, and, still keeping to the known and working towards the unknown, try to reconstruct in all its manifold aspects the past life of our parish. Here, again, the utmost advantage is taken of the proximity of a historic town, stronghold, or church. No matter at what point it touches national history, it may be dove-tailed into that of our parish; and forwards from that point to the present, and backwards to prehistoric man, it is only a question of suitable presentment of the material and some healthy (and wisely encouraged) curiosity on the part of the child.

“Geography also leads to commerce, and commerce to arithmetic, which shall deal with concrete problems from the first—concrete, as the only form in which the adult knows them; and problems, as developing the reasoning faculty rather than the merely imitative and memorizing powers. Every local map or plan made is a lesson in actual mensuration, every rabbit-hutch constructed, a combined exercise—first of geometry and then careful computation of material and cost,—but the *mental faculties of the young have no place for abstractions, and their reasoning powers can best be developed on the things they can see and handle.*”

In an intermediate position between such schools and those in which Nature-study is not organized at all, and depends upon the school natural history society, comes a larger number in which the educational value of outdoor observations, though dependent upon the voluntary efforts of the pupils, receives from the school authorities, encouragement and recognition. As a type of boys' schools in this connection Bootham School, York, may be taken, and its aims are quoted as follows:—

“The exhibit of Bootham School Natural History Society shows what may be done in leisure hours at a boys' boarding-school. The

work shown represents almost entirely out-of-school pursuits. The exhibit stands for a tradition which has been continuous in the school for nearly seventy years. This tradition lives from boy to boy, but is also kept alive and cherished by the old scholars, both individually and as an association, and further *by the hearty moral support of all the masters*, whether they are naturalists or not.

"Collecting has often paved the way to observing, and considerable stress has been laid on the keeping of natural history diaries, which has been encouraged by special prizes given among Allied Friends' schools. Original observations, continuously recorded in neatly-kept and illustrated books, have proved easy to encourage. In this way *we get a mind alert to see all that is going on around it—bird, and flower, and beast, and changing sky; a mind of omnivorous interest, reflecting like a mirror all it sees.* From older boys something more has been expected, and as a response to a handsome exhibition or minor scholarship of £10 offered by the Old Scholars' Association, a few boys have been found who are gifted with the instinct for investigation, and who think as well as see. In judging their diaries, evidence is discovered of a persistent attempt to probe the unknown, and to summon to their aid every method and every instrument which gives promise of assistance."

St. Margaret's School at Bushey may be taken as one for girls situated in the country, where the same idea is manifest, and the following particulars of its work are of interest:—

"CHIEF OBJECTS OF THE NATURE-STUDY OF THE SCHOOL

"(1) To train the students (ranging from 10 to 19 years of age) *to observe and love the forms of nature around them, so that they may obtain the fullest enjoyment from their natural surroundings.*

"(2) That the pupils may, as they frequently do, choose for themselves a 'hobby' in the study of flowers, mosses, mycetozoa, pond-life, and so forth.

"Thus the gap between work and play is bridged over, as shown by—

"(a) The exhibits from the 'Bushey Case' in the Museum. The pupils eagerly seek, during their walks, flowers, mosses, and mycetozoa, and are constantly on the look-out for dead birds, deserted nests, and eggs.

"(b) The Nature-study exercises. The students have cared enough for the subject to devote a great part of Saturday afternoons to illustrate from nature the given subject, *e.g.* 'The Trees of St. Margaret's'.

“(c) The paintings of mycetoza done solely in recreation hours.

“(d) The microscopic slides prepared by the pupils of fourteen, on a special evening of the week, when a few nature-lovers were allowed to sit up later than the rest of the school, as a great privilege. The specimens mounted were found by the pupils, when on a special ramble.

“(e) The paintings of climbing plants, which were entirely holiday work.

“(f) The four volumes of flowers mounted and illustrated by quotations from the poets, which were the work of a girl of fourteen who makes ‘flowers’ the hobby of her holidays and recreation hours.

“(g) The nature note-books, almost entirely done in recreation hours.”

As an instance of a suburban girls’ school, the scheme of work at Streatham High School may be described:—

“THE NATURE-STUDY WORK DONE BY THE JUNIOR FORMS

“(a) Recorded observations on the life-histories of various animals and plants.

“(b) Preparation of Nature calendars; the best observations, together with the name of the observer, being recorded on a wall sheet.

“(c) The making of observations on the distribution of wild animals and plants in the neighbourhood of Streatham; the observations and name of the observer being inserted in place on a map by means of a flag-label.

“(d) Observations and drawings of the various inhabitants, animal and vegetable, of the school garden.

“*The Nature-study work in Forms I and II is entirely voluntary and very popular, and usually about ten minutes at a time are devoted to it at the end of science and drawing classes.*”

FURTHER POINTS OF INTEREST

Many special features illustrated by the exhibits in this group call for passing allusion. School rambles seemed to be general and popular, and school gardens, in some instances, had been instituted and used to advantage. Arbroath High School showed how Nature-study drawings could be applied to decorative work, and drawings which entail continued observation were illustrated by the series

showing the life-history of a mouse, made at King Alfred's School, Hampstead.

The photographs of birds' nests and eggs, made by a girl at Roedean School, Brighton, and by a boy at Bedales School, Petersfield, showed how they had brought photography to bear upon their Nature-study. Sexey's Trade School exhibited a regional plant survey map, and the County School, Chippenham, a field-plan, with natural history data compiled by pupils. The Girls' Blue School at Wells may also be mentioned, particularly in connection with its outdoor study.

At St. Margaret's, Bushey, the "modern discovery case" affords a place for anything for the time unknown to the girl who finds it, and the "field-club table" is a resting-place for the results of a ramble. A wild-flower calendar, illustrated by specimens of flowers found in a single lane near the High School, Cirencester, differed somewhat from the other nature calendars exhibited, furnishing an example of simple but conscientious work in the immediate environment of a school. Nature diaries and note-books, as well as published journals containing out-of-the-way observations,—as in "Holly Berries" of the University College Preparatory School—formed a noteworthy feature of this section. The Ladies' College, Cheltenham, sent a collective exhibit, and this institution, besides undertaking such kindergarten, school science, and field-club work as has been described, provides courses of botany, zoology, and physiography for its Day Training Department students. All the latter give "nature lessons" in the practising schools which "encourages them to collect materials, to study the habits of animals, and to go on long expeditions into the country to find flowers and fruits, and to hunt in ponds for water-beetles, dragon-fly larvæ, and caddises".

Curatorial work was well illustrated by the Dollman Brothers' life-histories of insects, which formed part of the

exhibit from St. Paul's School. From the Eton College exhibit it could be seen how a school museum, by the help of simple but effective modern methods, may be used to illustrate types for practical teaching and to exhibit the local fauna and flora of a district, giving at the same time special attention to the more or less neglected groups of animals about which little is known to the ordinary observer.

Group C. In this group, which was by far the largest, the exhibits may be considered under the following heads:—

I.—Observational Lessons.

- A. Lessons on specimens gathered by the pupils.
- B. Descriptive lessons—Composition.
- C. Records.
- D. Drawing, Painting, and Modelling from natural objects.

II.—Nature-study.

- A. Physical Aspects of Nature.
- B. Animals and Plants under control.
- C. Field Work.

III.—Economic Nature-study.

- A. Horticulture.
- B. Poultry- and Bee-keeping.
- C. Agriculture.

I.—OBSERVATIONAL LESSONS

A very great deal of the work shown at the Exhibition represented formal lessons in this group as in others.

A. Lessons on Specimens gathered by the Pupils.
—Some of the lessons which must be included under the present heading were given out-of-doors, but the majority of

this type were given indoors as object-lessons. For instance, in the schools of the Leicester Board—

“The upper classes are taught Observation Lessons on Animal and Plant Life and on Minerals. The methods of teaching adopted are *the fostering of the children's own observation of actual objects*; the awakening of the discrimination of likeness and difference as the basis of natural classification; the arousing of the sense of wonder, surprise, and novelty at the adaptation of means to ends, and the relationships of each object in nature to all other objects and its surroundings.

“The principle adopted in the actual teaching is to insist upon the pupils finding out, for themselves as much as possible, the mere ‘information’ from which the inferences and generalizations are to be derived by the children with suggestive aids from the teachers.”

At Churchill Boys' School one of the many subjects taken up will serve as an illustration:—

“*Timber Trees.*—To observe the mode of perennation and growth of these trees, the boys collected winter buds in December, and observed the development of the leaves in spring, which when fully developed they gathered and pressed. The specimens of bark were likewise collected, and the seasoned wood obtained from the timber yard. An object-lesson on each tree is given when the observations have been completed. The points eventually fixed are: (1) Habitat, (2) Shape, (3) Mode of Growth, (4) Perennation, (5) Wood, (6) Uses, (7) Trees most suited to different situations.

“Occasional walks are taken, and these with a distinct object, *e.g.* to see tree-planting, to a quarry, to a lake, to hear birds.”

The head-master of Pailton School, Rugby, says:—

“(1) Let the children bring specimens they themselves gather of either wild flowers or grasses, and, in autumn, leaves and berries, insects, and so forth; (2) Base most of your object-lessons on these specimens, and also on *other things they see going to and from school.*”

The methods adopted at Rangeworthy School call for consideration and are as follows:—

“The children bring a specimen of something they have found—say a caterpillar—and a little conversation is allowed among them as it is

passed round the class. They thus find out for themselves where it was found—on a cabbage leaf,—what it will eat, what will happen if a bird does not have it, what it came out of, what it will become, what next will happen, and the last thing it will do before it dies.

“A mole is brought and handed round. It is well handled, fur stroked, eyes and ears looked for, bare feet noted. The place where it is found, its food, home, are all talked about while the object is before the children. Nature-study is going on all the time, *there are no hard-and-fast rules setting down one day or one hour to any particular subject*, but perfect freedom to choose from the specimens at hand the subject of a lesson. A bat is handed round, one remarks ‘webbed legs’, another ‘webbed wings’. The different parts of the bat are compared with those of the mouse and bird, and so on. Minerals are handled by the children, and they *tell* the teacher something they have found out by pressing, weighing, looking, or trying to break the stone or rock.

“In plant life the children sow seeds or watch the teacher sow them, notice their gradual growth, water them, and use the plant to illustrate the lessons on plants.

“Some collect specimens from their own gardens, some from the roadside. *Everything that can be taught by observation and by handling the actual object is so taught.* Walks in the lane and field are taken, when lessons on leaves, roots, stems are given, each child picking a specimen as the teacher names the part.”

At Culworth School near Banbury—

“Most of the work done in Nature-study *comes under the head of home-lessons*”.

To the teacher there it seemed necessary—

“To commence with something easy in which all the children could join, even the little ones. Each day the different things were brought to him to be named and classified, and at playtime they were examined.”

B. Descriptive Lessons—Composition. — In some cases exhibits showed that the pupils are required to describe their observations verbally, but usually these are made the subject of essays. A useful suggestion will be found in the following quotation with regard to St. Asaph National School:—

“ Walks are taken in the country, and a lesson is sometimes given in the open air on a certain subject agreed upon before the children set out for their walk, *e.g.* a lesson on autumn leaves—an ivy leaf—cowslips—a violet, and so forth. When the children return to school they reproduce in their own words an account of the lesson.

“ I make a rule once every month for them *to write an essay entitled the aspect of the country in June or March or August as the case may be.* I take them for a walk before they write the essay, and it is most interesting, on reading the accounts, to notice how observant some of the pupils are.”

C. Records.—This section may be subdivided as follows:—

- (1) Nature Note-books and Diaries.
- (2) Nature Calendars.
- (3) Nature Survey Maps.
- (4) Collections.
- (5) Weather Records.

(1) *Nature Note-books and Diaries.*—In some cases pupils kept books or diaries in which observations were noted down, and these compare favourably with those of secondary schools. Almost invariably, note-books were used where there were school gardens. At Swanton Morley National School, Nature Notes in previous years were written in the ordinary exercise-books. A suggestion of one of H.M. Inspectors (Mr. Harrison), that they should be entered *in a special book and a space left for next year's entries for comparison*, had recently been adopted; the books used were not, however, found to be large enough. In this last connection see Harrowden School, page 66. The Nature-study Note-books of Edith Knight showed in diary form the observations she had made in and out of school, and illustrate the scheme of Nature-study teaching at Orlestone Board School.

(2) *Nature Calendars.*—Selections from the children's observations were in some cases made by the teachers for

display in the school. A Nature-study calendar of this type, made by a little girl, was shown by Llangattock School. In some cases other names are used, as at St. Michael's-on-Wyre National School, Lancashire, where the term "Observation Sheet" is employed.

(3) *Nature Survey Maps*.—Maps may be made to form most useful records of Nature-study. The head-master of Bitterne Park School, Southampton, says:—

"The particular phase of Nature-study which my exhibits were intended to illustrate was the life-history of the plants and animals *which come under the actual observation of my scholars*.

"The natural aids which I found in field and hedgerow are set out, so far as plant life is concerned, in my floral map of the Woodmill River, and in the planting of my school garden with English forest trees and shrubs."

St. Michael's-on-Wyre National School sent a hand-drawn map with the school as centre, which was variously-coloured and annotated to show what facilities exist in the area taken, for the study by the children of plants, insects, and other animals.

(4) *Collections*.—Specimens when kept as records of actual observations made may prove exceedingly useful. The charts illustrating pond-life shown by the Orlestone Board School are a case in point.

"These charts contain—

- (a) Mounted skins of newts which have been shed in the Orlestone Board School while the newts were actually under observation.
- (b) Skins of horse-leeches which have been shed in the aquarium before the class and have afterwards been preserved in spirits, being so extremely fine as to be invisible when mounted on paper. The date when these and the newt skins were shed are recorded in the pupils' nature-study note-books.
- (c) Skins of dragon-fly grubs moulted in the aquarium before the class.
- (d) A newt shedding its skin.
- (e) A newt about to shed its skin, and showing air-bubbles under the skin

- (f) A toad's skin shed before the class and mounted on paper.
- (g) A miscellaneous collection of great water-beetles, their grubs, water-boatmen, snail shells, caddis-grub cases, water-bugs, water-scorpions, and so forth.
- (h) A snake found in a pond on a Nature-study walk, and killed in the terrarium by a violet ground beetle."

From Radcliffe St. Andrew's School, Manchester, came a series of specimens illustrating the life-history of a frog, which would serve as an excellent reminder to children of the stages they had seen when rearing frogs from spawn. At Laira Green School, Plymouth—

"The children are incited to bring any natural objects which arouse their curiosity; these are put aside with the finder's name, and a delightful half-hour on Friday afternoon is devoted to brief chats on each. All suitable specimens are mounted and placed in cases [by the master], with the pupil's name as an encouragement. This system has been in practice for over twenty years."

(5) *Weather Records*.—The recording of observations upon the weather was undertaken by the children of some schools.

For instance, the methods adopted at the Red Lion Street Higher Grade Girls' School, Burnley, are as follows:—

"*Records*.—Sometimes we keep the *weather* record for some time. We did this continuously for three months (October, November, and December, 1901); sometimes we record other things.

"I have given notice that next week we shall make a *continued story* of 'the funny things the clouds do when you watch them'.

"These continued stories are very amusing, and they have a use too. They make the children very observant, and give them a bright and happy way of looking at life.

"*Whom and how we take these stories*.

"(1) Any few minutes which can be spared are used by the teachers, who ask what the children have noticed as they came to school. Children who wish to be ready with a good answer have specially noticed all sorts of things about the weather as they came to school, and are usually very ready to remind the teacher to ask the class for its 'story'. Those who have not noticed, have to get the best help they can for their answer from what they can see from the school windows.

“(2) In composition time I sometimes let the children write down their observations.

“(3) Sometimes I let a child write a special account as a reward to good work.

“(4) Sometimes, as a sort of reward also, I take a group into the play-ground, and we all observe the weather together, and see who finds out the most things, or who notices them first.”

“*Critique.*—I let the children tell the story in their own way. It will be noticed on looking through the papers that—

“(i) There are certain of the very obvious things which come before our senses mentioned by *all*.

“(ii) There is a characteristic statement in each (we who know the children recognize it at once as a rule), that is:—

“(a) Something mentioned which others have overlooked.

“(b) Something described in a characteristic way.”

At Llangattock the daily position of a shadow indicating the sun's height in the heavens is permanently marked on the floor of the school-room.

As an example of records of a more advanced type, and which are obtained with the help of instruments, the description of the charts exhibited by Hedge End National School may be given:—

“(1) *Barometer.*—Daily readings and records were kept by the scholars on charts exhibited on the school wall. Different colours were introduced to avoid a multiplicity of charts, and also to compare readily the weather during various parts of the year. The character of the day, and the direction of the wind, were also connected with the daily readings.

“(2) *Temperature Chart.*—Daily readings on the thermometer were recorded. With this were associated, in another column, records of the temperature of the soil, showing the close connection of the one with the other. These records, illustrating the work of the sun and connected with the daily state of the weather, show how nature and agricultural pursuits are affected during the various seasons of the year. The position of the sun is also noted according to the season.

“(3) *Length of Day and Night Chart.*—This chart was devised in order to show at a glance the growing or diminishing effect of the sun upon nature and the work of the agriculturists, at the various seasons of the year.

“(4) *Sun and Shadow Record.*—This chart was originated to show

the altitude of the sun at various seasons of the year, and how it actually causes the seasons.

“(5) *Rain-gauge Chart*.—The instrument was examined weekly and a record kept. Any special rainfall gave a good opportunity of finding out what quantity of rain had fallen in the parish, and whether it was normal, short, or abundant.

“At suitable intervals the whole of the charts were considered in conjunction, to show why Nature was backward, forward, or normal. These observations were not limited to ‘Nature-study’, but were frequently used in connection with geography lessons. As an experiment, the work leaves no doubt but that great interest and habit of observation have been keenly and regularly aroused, and that it has been made use of by the pupils in their reasonings both at home and at school. Any articles or paragraphs in newspapers or magazines bearing upon the above have been discussed by master and pupils. The children’s original observations outside the school have very frequently been worthy of record in the class note-books.”

D. Drawing, Painting, and Modelling from Natural Objects.—The way in which Nature-study is correlated with school-work, such as drawing, painting, and modelling, was well shown by numerous exhibits. From some of these it was also evident that the illustrations made by pupils were pre-eminently records of Nature-study observations. In this connection must be mentioned the Chislehurst Road Board School at Orpington, which exhibited coloured drawings illustrating the development and opening of flower and leaf buds actually observed in the school garden, and other pictures showing the characteristics of various creatures studied. At Crookesmoor Board School—a type of one situated in a large manufacturing town—the course has been made “one of pure observation of nature forms”, and when flowering-plants or some of the commoner insects are taken as a basis the treatment is usually as follows:—

- “1. Lesson on the object (leaves, flower, fruit), each pupil being supplied with a specimen.
- “2. *Diagrammatic drawing* illustrating the diagnosis. This each pupil makes with the help of the teacher.

- “3. *Drawing* with brush or pencil of the object, or some part of it, to show its natural form. If pencil is used, the drawing is usually (a) in the earlier stages flat-tinted, or (b) in the later, coloured naturally. *N.B.*—In some cases it is advisable to take this stage first.
- “4. A descriptive account written. This is done in one of three principal ways:—
- “(a) Under the teacher’s guidance on the black-board and copied out afterwards.
- “(b) By answering questions in writing, each question requiring a sentence for an answer.
- “(c) An unaided essay.
- “5. A *conventional drawing*, derived from the object or its application to a simple bit of design.
- “The chief features are correlation and the use of drawing and colour as a mode of recording observation.”

As an instance of what tiny children, in a town, can be got to do in the way of brushwork from nature, the work shown by the Goodrich Road Infants’ School, London, may be specially mentioned.

Similarly, clay models were shown, among other schools, by the Sale Township Infants’ School, Manchester.

Defective children are able to do very good work in plasticine, as indicated by the exhibit from the Melbourne Road School at Leicester.

II.—NATURE STUDY

A. Physical Aspects of Nature.—Under the heading of “Records” will be found some account of Nature-study work which deals with the weather, with clouds, with the sun, and with the seasons; the details need not therefore be repeated here. Naked-eye astronomy, it may be noted, came in for very little attention.

B. Animals and Plants under Control.—In this connection may be considered such aids to Nature-study as terraria, aquaria, insect-cages, germinators, and pot and bed

cultivations. At Laira Green School, Plymouth, there are both fresh- and salt-water aquaria. Orlestone School has already been mentioned in connection with pond-life studied in school. It has also terraria, in which the life-histories of familiar reptiles are worked out, and insects are also reared. This school may be taken as an example of one situated in the country. Dulwich Hamlet School and Goodrich Road Schools (for Boys), where moths and butterflies are reared, showed what may be done in town. Even if native insects are not forthcoming, silkworm eggs may be procured for a few pence from a dealer, as was done by the Kepler Board School, Leeds, where the life-history of the moth was observed.

Seeds, which are easily germinated, have been frequently made use of in schools, and bulbs, even those of the onion, have been pressed into service and their growth watched, as at the Queen's Road School, Leeds (Junior Department). It was made evident that many plants can be grown in pots and window-boxes to advantage, in cases where no garden is available.

As an instance of a school where the various standards have each a school garden, and use it for the growing and observing of plants, as an important part of their Nature-study, Chislehurst Board School, Orpington, Kent, might be singled out.

C. Field Work, being a very general term, may be considered under the following headings:—(1) Rambles, (2) Journeys, (3) Visits, (4) Natural History Societies.

(1) **RAMBLES**.—Rambles were most abundantly illustrated at the exhibition, and below are given a number of descriptions of these.

The following plan has been devised at Llangollen Boys' Board School:—

"1. *Open-air Work*.—Each class in rotation is taken out to the country

by its teacher about once in two months. In the case of the Upper Section each boy is supplied with a pencil, note-book, knapsack, knife, and small hammer. At intervals the children are rested, when they write in their note-books an account of the chief things which they have noticed during that part of the journey. This is done whether the children go out for a "Ramble" or with a definite object, such as to study the geology of the district, visit a place of historical renown, &c. Generally one of the Upper Class boys brings a camera and snap-shots the party at work. If the party has a long distance to travel, the children are taken (free of charge) in pleasure-boats along the Shropshire Union Canal, and in order to cover part of the cost of a railway journey the children subscribe to a fund, in which the money of each child is kept separately, and the necessary sum given out for the journey. Llangollen being an inland town, an endeavour is made once a year to take the Upper Classes to the sea-side on a Saturday. Generally, when the party, after a long journey, return to the school, tea is prepared for them, and the evening is finished off with an entertainment by the boys.

2. *Places Visited and Object.*

LOWER SECTION—Standards I and II (ages 6 to 8).

- (1) Farmyard, to study animals.
- (2) Forests, to study trees.
- (3) Fields and lanes, to study wild flowers.
- (4) Fields and lanes, to study birds and nests.
- (5) Garden, to study flowers, vegetables, fruits, fruit-trees.
- (6) Riverside, to study fish, water, pebbles, gravel, mud, clay.
- (7) Elevated points, to study geography.

MIDDLE SECTION—Standards III and IV (ages 9 to 11).

- (1) Farmyard, to study nature and habits of animals.
- (2) Forests, to study leaves and character of trees.
- (3) Fields and lanes, to study kinds and habits of birds and insects.
- (4) Fields and lanes, to study wild animals, poisonous and climbing plants.
- (5) Factories and mills, to study uses of farm, &c., products (corn, wool, hides, timber, &c.).
- (6) Garden, to study cultivation.
- (7) Elevated points, to study formation of physical features.

UPPER SECTION—Standards V to Ex-VII (ages 11 to 14).

- (1) Farms, to study farming operations, breeds of animals, crops.
- (2) Fields, to study grasses, crops, weeds, &c.

- (3) Factories, to study processes of manufacture and products.
- (4) Quarries and mines, to study geology, minerals, rocks, fossils.
- (5) Mountains and hills, to study formation, heights, natural phenomena.
- (6) Sea-side, to study marine objects, denudation, &c.
- (7) Historical places, to study Castell Dinas Brân, Chirk Castle, Vale Crucis Abbey, Old Manor House, World's End, Old Maids' House, &c.

3. *How the Visits are Utilized in School Work.*—In addition to the observations made by the teacher during the visits, and the notes made by the pupils, about four conversational or object lessons in school are based on each visit, from which the pupils write notes, and also make sketches and drawings, and, when possible, specimens are mounted in the note-books, while attention is called in the reading-lesson to additional information bearing on any lesson which has been taken during the year. Thus the school lessons are correlated whenever possible. Further, the Upper Section gets a series of lessons each year on one of the physical sciences, with experiments and practical demonstration.

The school is decorated with window-plants. The boys bring their own plants, or are supplied with some in the spring, when a lesson is given on the cultivation of window-plants. Prizes are then offered for the best plant grown by the autumn, each boy looking after his own plant, and taking it home with him during the four or five weeks' vacation in summer, and returning it when school reopens."

At Puttenham National School near Guildford—

"The actual method employed is that of a monthly stroll for purposes of observation, and lessons on plant-life of an experimental nature in school. Out-of-doors, in spring and summer, children are taught: (1) to recognize trees by their leaves, bark, and general outline; (2) to watch the buds open and their position on the branch; (3) methods of fertilization by insects, wind, or self. Daily notes of anything striking to the child, which he may have observed for himself, are entered in exercise-books, together with essays on the strolls, barometer and thermometer readings, and so forth.

"Very little time is given to collecting, the idea being not so much to get specimens as to cultivate observation and build up an intelligent mind in the scholar—to fit him to carry out his after-school work intelligently, and not to cram him with long lists of botanical names."

The following notes are taken from a synopsis of school

excursions made from the Red Lion Street Higher Grade School for Girls, Burnley:—

No.	Date.	Time.	No. of Children.	Place and Route.	Description.
1	15/3/1902.	Saturday morning, 9.30 to 12.30.	4 girls.	Newhall.	A pioneering excursion.
2	19/3/1902.	Wednesday afternoon, 1.5 to 5.10	11 girls.	Newhall.	This ramble was sanctioned by Mr. H. Holman, H.M.I.
4	26/3/1902.	9.30 a.m. to 3.30 p.m.	6 girls.	By Gawthorpe Lodge, Higham Lane, to Fence, then to Burnley.	An excursion to see the build of the valley, also to see what plants there are during early spring. Good for geography of the valley.
6	2/4/1902.	10 a.m. to 2 p.m.	7 girls.	Black Hill towards Ogden.	This ramble was good for seeing the valley in the opposite way to which it was viewed in Ramble 7. The difference is very marked. Good for botany.
7	3/4/1902.	9.30 a.m. to 8.30 p.m.	10 girls and 2 boys.	Neck of Pendle.	Picnic, but the geography of Calder and Ribble Valleys received attention, also nature of clouds; we walked through one. Good for botany in early spring.
13	28/4/1902.	Monday, 6 p.m. to 8.30 p.m.	7 girls.	Read Hall Plantation.	Very good for botany.
14	22/5/1902.	Saturday morning, 10 to 2.5.	5 girls.	Hurstwood.	Very good route for botanical specimens. The flora begins to be different from that of the parts we have explored previously.
16	19/10/1902.	4.15 to 7.30 p.m.	10 girls.	Worthorne.	Geographical and botanical excursion.

“Excursion 13 was taken after school in the evening, because I wanted a great many specimens for the week’s lessons. Excursion 14 was made on a Saturday morning for the same purpose. We have only had two rambles in school-time—the first and the last: these were sanctioned by the head inspector of schools in this district.”

Thirteen years ago geological rambles were introduced into the Lea School, Matlock Bath, and since then the interest taken in plants and insects has been gradually

increasing. "Outdoor school" has also been carried on at Stanbury, near Haworth, for a period of six years or more.

The exhibits sent by the Severn Road Boys' School illustrated work done upon rambles and of the following kinds:—

1. Collecting plants on wayside, field, meadow, and copse.
2. Examining geological formations and collecting specimens, as found in quarries, railway-cuttings, and sea-shore.
3. Objects of interest in the neighbourhood, such as bridges, viaducts, canals, and rivers (formation of beds, &c.).
4. Arranging plants into poisonous and non-poisonous classes.
5. Collecting leaves, bark, and fruit of the common trees in the neighbourhood.
6. Arranging, pressing, and mounting the same.
7. *In the fields*—amongst the various grain-crops—wheat, barley, rye, and oats.
8. Preparing geological and botanical specimens for the microscope.
9. Recitations bearing on Nature-study, illustrated by rambles and photographs.

The leading features in these Rambles are as follows:—

- (a) Scholars are taught to distinguish between flowers and plants of the fields, meadows, and wayside—wild and cultivated flowers, or garden flowers.
- (b) To distinguish between poisonous and non-poisonous plants.
- (c) To distinguish between the leaves, bark, and stems of common trees—the various kinds of plant, stems, and roots—modes of growth—work of stems—shape and uses—parts of a flower.
- (d) To notice the various shells on the sea-shore—sea-weeds, and animal life on the sea-shore.

The above constitute the main features of the work of the upper classes.

In the lower divisions the scholars are taught to observe—

- (a) Plants as growing things—how seeds grow—roots—walking, climbing, and extending—leaves, their shape, &c.
- (b) To propagate plants from cuttings—the simple parts of plants and flowers.

The methods employed in carrying out the above objects are briefly as follows:—

- A. In the senior division country rambles form the basis of all the Nature-study. Before a ramble commences, a lesson is given to the class, drawing attention to the following points:—
Plants to be searched for—pictures and photographs are shown of these plants—any dried specimens to hand are exhibited and examined, thus each ramble has a definite object in view.
- B. The specimens collected on a ramble are afterwards classified, pressed, mounted, and named.
- C. Another lesson then follows, and specimens are selected for the drawing lessons and for use with the microscope.
- D. Notes, drawings, and a map of the route are all roughly entered at the time in scholars' note-books."

As examples of other urban schools where rambles have been successfully introduced may be mentioned several under the Leeds Board, the Walton Lane School (Infants' Department), Liverpool—which has devised a scheme of Nature-study in connection with an adjacent park—as well as those at Cadoxton and Padiham, where geology is a feature of the excursions.

Bellenden Road Higher Grade School will claim attention in the next section, but some notes on the short excursions from this school are given here:—

"DAY OUTINGS.—These are taken less frequently than formerly, owing to the railway companies declining to take parties on Saturdays in June, July, and August. The permission to go in school time, lately accorded, is not taken advantage of to any extent—as only twenty boys can go with a master, and the other forty belonging to the class have to be accommodated.

LOCALITIES VISITED—

- Charlton (half-day). Geology and Natural History in Greenwich Park.
- Purley and Riddlesdown. Geology chiefly.
- Ashted. Natural History in the woods.
- Epping Forest. Natural History.
- Shirley. Formation of scenery.
- Zoological Gardens (half-day).
- Jermyn Street Museum (half-day).
- South Kensington Museums (half-day).

COST. Day outings—

Railway Fare	6d.	}	Lunch is taken.
Tea (at Caterer's)	6d.		
	1s.		

Every effort is made to keep the cost down to 1s."

(2) JOURNEYS.—Two schools sent in illustrated accounts of journeys which lasted for a week or more. Below are the outlines of the long excursions from Bellenden Road School, Peckham, to which the Arnot Road School, Liverpool—the other school which sent a similar exhibit—acknowledges its indebtedness "for the inspirations that have led to the remodelling" of the programme, to "the inclusion therein of many new items, and to the big advance in the aim and scope" of its holiday excursions.

"WEEK'S EDUCATIONAL TRIPS (Bellenden Road School).

Date.	1896.	.....	Malvern	.....	20	boys.
	„	„	Forest of Dean	.....	30	„
	„	„	Malvern	.....	34	„
	„	„	Chepstow	.....	36	„
	„	„	Malvern	.....	40	„
	„	„	Chepstow	.....	44	„
	„	„	Abergavenny	.....	40	„

Cost—about 21s. Boys save through the year, and poor ones are helped by friends of the school.

Objects.—(1) To study Nature at first hand.

(2) To develop habits of Observation (*Viva voce* examination each day).

Self-reliance (Boys find way about by maps).

Thrift (Careful account kept by each boy of his money).

(3) To encourage holiday travel *with a purpose*.

(4) To excite interest in the history of our country.

(5) To get exercise and fresh air.

(6) To promote good feeling between parents, teachers, and children.

The West of England is chosen because it gives scenery different

from anything near London. London boys see the *sea*, but *never* (or hardly ever) a *mountain*.

Lessons are given at school *before* going, and each boy has a hectographed guide."

The long excursions from Arnot Road School, Liverpool, extend sometimes over several weeks, but at the end of each, a batch of boys returns home and is replaced by another.

(3) VISITS.—The Leeds School Board exhibited an illustrated scheme under which some 7000 children visit the Leeds museum. (See also p. 68.) In connection with the Liverpool School Board the Liverpool Museums had on view several of the circulating cabinets which seventy-five schools and institutions receive in rotation free of charge. The director of the museums says in this connection:—

"That these efforts to interest school children in Nature-study are producing good results is strikingly demonstrated by the way in which school children avail themselves of holidays voluntarily to visit our museums—the fact of the occurrence of a school holiday being of late always unmistakably indicated by the invasion of the museums by school children, who evinced a growing interest in the exhibits."

Allusion should also be made to the fresh botanical specimens distributed by the London County Council to the schools of the London Board, and it may be mentioned that evidence of the good work done by the Kyrle Society, in respect to furnishing material for study, was also to be found in the exhibition.

Collections have already been considered under the heading of "Records", but they may be mentioned again here, as they also serve a useful purpose in showing children what to look for.

The head-master of Sutton Preparatory School says:—

"Nothing is better for the school-boy, of the kind with which I have to deal, in my opinion, than to take up the study of the British land and fresh-water shells, as they can be found in every parish and district, and do not involve a visit to the sea-side",

Series of specimens may be considered in connection with museums. Waterhead Board School, Oldham, made a feature of museum work with cases made from spoilt photographic plates.

The Cavendish Road School of the London Board showed a set of dried leaves which may be mentioned as illustrating what may be done with advantage in London.

(4) NATURAL HISTORY SOCIETIES.—Much of the work of the School Natural History Societies is, of course, collecting. The exhibit of Goodrich Field Club (of the Goodrich Road Higher Grade School, East Dulwich) might be specially mentioned as showing what town boys can do in working out the life-histories of insects. A cigar-box was devoted to each species, and where the caterpillar could not be sacrificed and preserved, it was replaced by a coloured drawing.

The Nature-study Club at Orlestone School is of another type, as it occupies itself more particularly with the keeping of living animals. Some schools also have camera clubs, as that at Brae Street, Liverpool. At Severn Road School, Cardiff, photography is actually taught in the school, and many of the boys at Bellenden Road School have cameras of their own. The excellent photographic records, with which the exhibition abounded, were not, however, except in a few cases, the work of pupils.

III. ECONOMIC NATURE-STUDY

Under this title may be considered exhibits which have reference to Horticulture, Poultry- and Bee-keeping, or Agriculture.

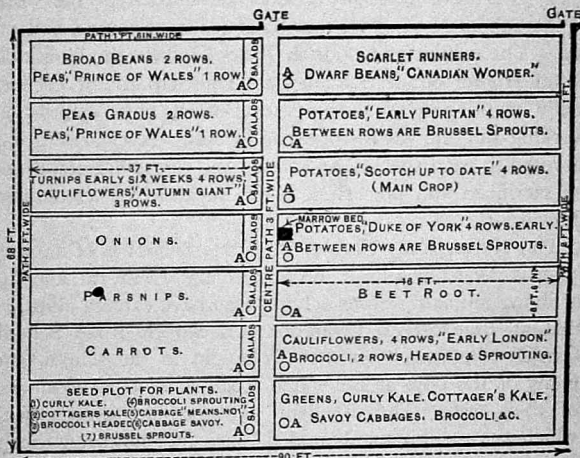
A. Horticulture.—Under this heading naturally come all school gardens, where gardening is taught as a definite subject.

Cottage gardening at Lord Scudamore's Endowed School,

Hereford, is thus described. Two or three illustrations may be given of the methods adopted.

"The Ground.—This covers about one-tenth of an acre, is on the school premises, and previously was part of the holding of the head-master and head-mistress, who voluntarily gave the ground for the use of the boys.

The Class is selected from the older scholars (Standards 6 and 7) at the beginning of the year, and the parents give a written promise to



keep their boys at school for the whole year's course. There is a great demand for a place in the class.

Hours of Instruction.—Two lessons every week are given to the work. Each lesson is of one hour's duration. Monday mornings and Wednesday afternoons are chosen, but in the busy springtime a little additional time is given, when necessary, out of school hours.

The Instructors consist of a class-master and the caretaker of schools, as well as a professional gardener, the latter being appointed only this year to help in the gardening.

The Tools are of a small make, suitable for boys, and cost about £2, although, I believe, some boys prefer to work with full-sized implements, even bringing from their homes the tools required.

The Plots.—The land receives two loads of manure (farmyard) every year, and is laid out into fourteen plots (one plot for each boy), each plot containing an apple-tree. These trees consist of seven varieties of dessert and culinary fruit.

The Crops.—(See the plan of Garden.) The seed has been kindly given each year by Messrs. Rogers & Co., seedsmen, Hereford.

Although each boy has a particular plot, he participates in the general instruction of the whole garden.

The Conservatory is the holding of the head-master, but is utilized this year for instruction in tomato-growing, three dozen plants being cultivated. The boys water the plants, and fertilize the flowers by means of a soft camel-hair brush.

Allied Lessons.—Oral and experimental lessons are given during the year on grafting, budding, pruning, and garden pests. These lessons are generally given on *wet days*, when it is impossible to work the garden.

Sale of Crops.—The produce is readily purchased by the parents and teachers, good measure, as a rule, being given to ensure a ready sale. The proceeds, together with the grant from the Board of Education, defray the expenses connected with the instruction.

General.—The Cottage Gardening is a great success, as evidenced by the intelligent and enthusiastic interest taken in the work by the scholars. It is very exceptional to find a boy absent from instruction."

The following account of the gardening at Lea School, Matlock Bath, may be found useful:—

"My teaching of Gardening commenced some twelve years ago, which was long before the subject was suggested by our educational authorities. The conditions surrounding our early efforts were not of the most promising nature. There was no lack of land in close proximity to the school, but it was of the roughest description, full of stones, shallow and poor, and situated on a steep hill-slope. I saw, however, that labour and patience would greatly improve matters; and the enthusiasm and delight of the boys, selected to form a class, helped to remove all difficulties. My own gardening tools, together with some borrowed from the boys' homes, were soon utilized; and in a few days the appropriation of ordinary playtime resulted in the turning in of a large piece of old turf, the riddance of a vast bed of nettles that had luxuriated in a particular spot for many years, and the building of rough dividing walls from the stones removed from the soil. Our turf, buried two spits deep, obviated the necessity for any manure in the first

season. I supplied a quantity of seed potatoes from my own stock, and with a levy of 3d. each from the boys, together with sundry surplus seeds of my own, we had no difficulty in raising a good crop of various vegetables the first season. The next year I obtained the gift of a quantity of manure, and with a subscription or two from sympathetic friends, we purchased a small stock of tools and sufficient seeds for sowing the ground. We had now got into good working order, and I divided our ground into small plots, each to be cultivated by one boy, and all on the same plan for sake of order and facility of teaching. I next saw the possibility of creating greater interest by stimulating the boys to competition amongst themselves. Prizes were offered for the best-cultivated and most-productive plots, and being secretary of the local Horticultural Society, I was, with the ready approval of the committee, able to affiliate my Garden Class with the Society. The boys, therefore, appeared as competitors in a special class at the next Annual Exhibition; and this arrangement was so effective that in a year or two the boys' exhibits were regarded as one of the main features of the show, and developed so amazingly that ultimately the boys' section required a tent to itself. Since the collapse of the Horticultural Society at Holloway we have made a still greater advance, and we now have an Annual Exhibition of our own, which, I believe, is regarded as one of the great events of the summer season in our district. And I should here say that the success of my efforts has in no small measure been due to the kindness of the owners of the land adjacent to the school, who some four years ago placed at our disposal a splendid piece of ground—which was most highly appreciated after the hard work experienced on our original plot—and to the kindly encouragement of our school managers and others.

“Since the recognition of the subject by Government, and the payment of a grant, we have easily covered the expenses of manures, tools, and seeds. The produce is, as it matures, to some extent shared between the boys and myself, though the whole of the selected exhibits, shown for competition, are retained and taken home by the boys. The enthusiasm of the boys is as keen as ever it was, and I have always more volunteers than I can admit. I have now two classes of fourteen each—one of seniors, who have had from one to four years' experience, and the other of juniors, who have entered upon their first year's work. Every senior has supervision of the work of a junior (or two in certain cases) on the same plot, and I find this arrangement is a good one. The lessons are given by myself to the whole of a class gathered round one particular plot; and the boys then go to their own plots and do exactly as I have done in their presence. Every operation is performed at the same

time on all the plots. This promotes order and regularity, and permits of more easy assessment of the rewards when the gardens are annually judged by a professional gardener in July. I do not believe in long lessons in any subject, and so I, as a rule, have lessons in gardening, half an hour in length, about three times weekly. The season, and the nature of the weather, will, of course, affect the time and the number of the lessons. Three separate half-hours are certainly better than two whole hours given at one time. This is a principle I have proved the truth of in all branches of school work. There must, of course, be promptness and despatch in such a limited time as thirty minutes; and thus the boys are taught to value time and the virtue of punctuality. The work is taken throughout the year; for even in winter there can always be found work in a garden upon the few fine days our uncertain climate affords us. Note-books and a diary are kept, and these furnish employment at times when the weather will not permit of outdoor work. Lessons are also given on the life-history of various insect pests; and the gardener's feathered friends and foes receive attention. On our ground the wire-worm, cockchafer grub, leather-jacket, and various caterpillars have occasionally given much trouble, the former more especially; and to rid the garden of wire-worms I know nothing better than the deft fingers and thumbs of some thirty boys, whose eyes are almost as keen for a sight of the enemy as that of its other implacable foe, the rook. In a single week during the early spring, and when our ground was comparatively new, we have killed thousands. As every wire-worm passes an existence of about five years, in which to work havoc amongst the crops, it can be easily imagined that such wholesale slaughter has often with us prevented disappointment and disaster. By such relentless methods we have almost eradicated the pest, where gas-lime and other vaunted remedies were more or less a failure.

“School Gardens can only reach the highest measure of success where three conditions are present. These conditions are:—

- “(1) The enthusiasm and practical knowledge of the teacher.
- “(2) The close proximity of suitable ground to the school premises; and
- “(3) The adequate sufficiency and efficiency of the staff to permit of the master's temporary absence while conducting the classes in the garden.

Where these conditions are present, then, in my opinion there is no excuse for the absence of the subject from the school curriculum. And

even if there be some little difficulties and drawbacks, may not most of these be overcome if the chief essential—the land—be available?

“ If arguments are needed to impress the value of gardening in schools, then let me name a few:—(1) The importance of the subject as an aid to the formation of character by the inculcation of such virtues as method, neatness, order, observation, care, economy, &c. &c. (2) The intrinsic value to the boy, as a means of physical recreation and a source of never-ending pleasure, such as only a love of a garden supplies. (3) The provision of a hobby that may keep the future man from less-desirable occupations for his leisure time. (4) The means it affords for bringing the mind into closer communion with nature, an experience that results in deeper reverence for a beneficent Creator. (5) The opportunity it affords for closer touch between master and scholar—a most important matter. (6) The influence it exercises on the gardens and allotments of the district, especially when the teacher himself has established a reputation by open competition at horticultural exhibitions. (7) The home value in such cases as the incapacity or death of the father. Several of my old boys in Holloway are entirely cultivating the gardens of their widowed mothers. Lastly, the *national* value of the subject. The garden creates and sustains a love of home. May not this have an influence on keeping some of our boys from drifting to the cities? And thus the school garden may assist in preventing the neglect of the land and the physical deterioration of the race.”

South Kyme School, Lincoln, has a detailed scheme of gardening, and shares with that at Stratton, Cirencester, the distinction of having an evening continuation-school in which lads can continue their gardening work after leaving the elementary school.

It may be added that very many schools exhibited photographs of their gardens, such as those at Hereford, Wootton, Nettleham, Caterham, Stratton, and South Kyme.

B. Poultry- and Bee-keeping.—An illustrated scheme of poultry-keeping, carefully worked out, was sent in by Lymm National School, Cheshire.

That bees are not altogether neglected, and may form the subject of outdoor lessons, was shown by the photographs exhibited by Clifton Hampden School, Abingdon.

C. Agriculture.—At one or two schools agricultural teaching is carried on, for instance:—

“The exhibits sent from Rostherne were mainly in connection with the Cheshire County Council’s scheme for technical instruction. The boys of ex- and upper standards receive a weekly lesson in agriculture from the Head-master. The syllabus is as follows:—

- Pastures (permanent and otherwise).
- Grasses: their nature and characteristics.
- Sedges, rushes: difference between these and grasses.
- Useful (to farmers) and useless grasses.
- Useful and useless plants found in pastures.

The specimens sent illustrate this course of lessons, and were found and mounted by the boys. *Several of the lessons were given in the pastures and meadows themselves.*

The plants are also studied in detail in school.”

Patcham Board School may be quoted as a second instance, the exhibits of which showed:—

“Some rough specimens of objects used in illustration of a scheme of practical, useful, and inexpensive Nature-study by means of examination and simple classification of—

“(a) **Common Plants of Farm and Garden:** their life-history, as shown by specimens collected at different periods of the year from seed-time to harvest, with details of a few chief classes (woods, &c.) conveying as much information as possible on ‘How Plants Grow’.

“(b) **Animals of the Farm:** their structure (hoofs, teeth, skull, &c.), habits, and adaptability to their work, with proper treatment to secure best results. An acquaintance with insect life sufficient to illustrate the classification of some common ‘insect pests’—*e.g.* the wire-worm, aphides, ‘turnip-flea’, caterpillar, bean- and pea-beetle—and a knowledge of bee-keeping.

“(c) **Common Rocks:** their formation—(a) heat (granites), sediment (sand and slate), (b) by animal decay (limestones); and the formation of soils from the action of natural phenomena (frost and water) on the above rocks.

“*N.B.*—I. Various experiments are performed to illustrate the action of frost and water on rocks and soils, and how oxygen and carbonic acid are connected with plant and animal life.

"2. The specimens have mostly been brought by the pupils, and are made use of in the object-lessons, composition, and drawing from nature with black-lead or chalk.

"3. The majority of the scholars will be connected with the farm, dairy, garden (villa, nursery, or vegetable), and stable (as coachmen, smiths, &c.), and everything is done mainly to help the future practical study of agriculture, nursery-gardening, horticulture, and bee-keeping.

"4. The map and model (cardboard) of school district (South Down chalk) show the places of interest. No school journeys or brush-drawing have as yet been introduced."

General Remarks.—No heading which has been discussed afforded an opportunity of mentioning schools where (as at Clifton Hampden) class lessons are conducted in the garden. Again, some descriptions of the work done in Nature-study could not be conveniently quoted under any single title, and are therefore here given. For instance, at Frensham School, Farnham—

"The main object in teaching Nature-study is *to train the child's observation*. For example, with wild flowers, the child is encouraged to observe—the plant; its height, whether tall, short, slim, or bushy; how it grows, whether clinging, creeping, or standing erect; kind of soil it grows in; position of place where growing, whether sheltered, exposed, damp, dry, clay or sand; time of year when found. All these things the child can discover for itself; assistance is only given as regards the name. Even the family it has to try and think out for itself. I consider this a good plan for making the child's observation keener.

"With regard to insect collections sent by me, I am anxious to give my children a knowledge of destructive insects and harmless ones, therefore I am collecting these from time to time in order to show the children, that they may discern between them. Besides, in insect life there is such a grand opportunity of showing the wonders of nature, and it makes children see that all things are beautiful and wonderful. My scholars, some time back, would never allow a toad to live, or a common sand-lizard either, until I talked to them about them, and kept some toads in a cucumber frame in my garden, and allowed the children to feed them every day. Now I get numerous toads brought to school to examine and talk about. Also the girls will bring a lizard in their hands, without any desire to kill it."

The Wild Flower Albums kept at Harrowden School, Wellingborough, may be mentioned here:—

“The school managers provide two large blank books—Daily Graphic Albums. Each page is divided by the teacher into four equal spaces. In Book I the teacher pastes on each page four coloured pictures of wild flowers, published by Messrs. Cassell & Co. The corresponding page in Book II has four spaces to contain pressed specimens of the same four wild flowers.

“The scholars gather the flowers (either during a school ramble or in their own leisure time), press them, and on a stated day bring them to school. The teacher selects the best specimen of each flower, which is then placed in its proper page in Book II, and kept in position by gummed strips of paper.

“The children are particularly requested not to uproot the wild flowers, but to gather flowers and leaves only.”

The methods of teaching at Bracon Ash and Hethel Board School are briefly as follows:—

“A lesson is given at the beginning of each month, on the month itself—noting birds to be expected, flowers that bloom, work in the fields and gardens, weather, &c. At the end of the month comparisons are made with what has actually been verified and with anything that has presented itself which was not commented upon at the beginning. The children are encouraged to bring specimens of the first flowers seen, or anything which they may come across—the finder recording it in the Nature Note-book.

“The teaching is mainly conversational, but if anything special is found, or an opportunity presents itself, a lesson follows.”

The work at St. Peter's National School, Stockport, is thus described:—

“A school in the very centre of a town like the above, and with children of the very poorest, is rather at a disadvantage in the cultivation of Nature-study in the fields as it ought to be. Still we have other forms of nature to fall back upon. We have considered the physical geography and geology of the immediate neighbourhood. We have studied the course of the River Mersey, its meanderings, its formation and deepening of the river valley, its formation of river terraces, and alluvial deposits or flood plains, &c., and these we have shown in wooden blocks—the six wooden models exactly illustrating the River

Mersey just at its entry into the town of Stockport. Two other blocks illustrated the same river at the foot of the terrace at Vernon Park, Stockport, showing what will happen unless artificial means be taken to prevent the river forming a cut-off spur. The model and sketch of Stockport, also the photographs, illustrate the same feature. Two models, one with movable pieces, illustrate how a fault may be produced, and, having visited several faults in the district, these are of great value. A geological model of Kettleshulme valley, showing several faults, was made by the boys from the contour map, and coloured geologically.

“Almost every quarry in the district has been visited, and several coal-mines, and we collected specimens of the rocks and as many fossils as we could find. These visits to river terraces—where the boys found trees black with age and water, also hazel nuts at a considerable depth below the surface—and visits to quarries and mines were made the subjects of many interesting lessons both in the open air and also in the school-room. We have subjects to carry us on well into the winter months when rambles are impossible. The bringing in of a stone picked up in the street is almost of daily occurrence, with the usual question, ‘Please, sir, is this so-and-so?’ Very frequently these stones become the subject of a quiet little chat for a few minutes, and also as a subject for composition in the form of an essay.”

The Nature-study teaching at Utley Board School, Keighley, might have been divided up and considered under several headings. It has been thought best to allude to it here, in its entirety, as follows:—

“The ‘school rambles’ or ‘nature walks’ are carried out in the following way:—Each scholar has a note-book with previously-entered headings, such as Date, Time of Day, Weather, Wind, Trees, Plants, Flowers, Animals, Birds, Insects, General Remarks, &c. The blank lines under each are filled up in pencil as we go along. Anything unusual is brought up to the head teacher for identification, and carried back in one of the tin boxes supplied to the children. These rough notes are amplified in the composition lesson, when a full account of the expedition is *written*.”

“*Oral work*.—Short halts are made at places of interest, and the teacher has a talk with the children. In school, too, a child is brought out in front of the class and questioned on the walk (or the teaching) by his fellows, and the one who succeeds in asking a question he cannot answer takes his place. Marks are given to the one who survives most

questions. We call this a 'game'—'The Survival of the Fittest'. It is immensely popular with the lads, and co-ordinates the teaching of spoken English with Nature-study. The flowers and leaves gathered are used in the drawing lesson as a basis of design also.

"The animals, birds, and insects shown in the photographs have almost entirely been brought to the school by the children themselves, who take a great interest in the school after they have left it, and often send us interesting articles for the school museum, *e.g.* a flying-fish, a tortoise, &c., from other countries.

"The head-master's drawings in coloured chalk are used by the other teachers to illustrate their lessons. Some are after well-known pictures, and many are original.

"We have three aquaria and one vivarium in school, all managed by the children themselves. Sometimes we visit the local municipal museum, where a competent naturalist (Mr. Mosley) arranges a most useful *monthly* collection—on a table—of the flowers, plants, insects, birds, &c., of that month."

At Langport and Huish Episcopi Board School:—

"The chief idea in view in our scheme of Nature-study is that the boys should 'use their eyes' when out of school.

"The greater part of our work is done out of school, and is absolutely voluntary.

"Boys are told little or nothing of Nature-knowledge. If they are ignorant of the name, *e.g.* of a plant, they enquire of one another, failing which they ask their parents and friends. By this means parents are encouraged to take a direct interest in school work—indifference of parents to their children's education being a not uncommon feature of elementary education.

"My experience here has shown that the more intelligent scholars form small natural-history excursions of their own on the principle of the division of labour. Thus one supplies what the other lacks, either in knowledge or specimens.

"In the upper department of the school we have a Natural-history Calendar which the boys verify daily. They also collect specimens of wild flowers, and a large number of them bring over 50 each week. Nothing is taken without a name. They are required to bring a complete plant, except root. This latter exception was made because some of the more ardent collectors used to bring rare plants.

"In the lower group classes of observations are dealt with. Children

are asked to note, *e.g.*, all the birds they see during a set time: (a) name of bird, (b) colour, (c) song or cry, (d) flight, (e) habits, and so on.

"They also bring wild flowers as in the upper department.

"Our Nature-study then may be summed up as *an out-of-school recreation, strictly voluntary; practically all his knowledge must be 'found out' by the boy himself, the teacher being merely a director.*"

At the Churchill Boys' School, Chipping Norton—

"Occasional walks with the master are taken, and these with a distinct object, *e.g.* to see tree-planting, to a quarry, to a lake, to hear birds, &c.

"Aimless wandering is not encouraged; it tends to a loose carelessness and disrespect of fences and proper consideration of other people's property—and these walks are only occasional.

"Boys are strongly impressed against indiscriminate gathering of our wild flowers. The list of these up to this time contains 216 species.

"A list has this year been kept of the birds known here, giving the nesting-place, stating by whom found, with the date of discovery. The list contains 42 birds. The boys are 'on their honour' to destroy no nests and not to injure the birds in any way."

In the exhibit of the Gladstone Manual Training School, Cardiff—

"The particular phase of Nature-study which it is intended to illustrate is the correlation of subjects between the manual room 'wood-work' with the drawing and composition lessons of ordinary school routine, together with walks amongst the trees, methods of preserving specimens, and of observing the different qualities and textures of wood, trees and their fruits, for future reference and lantern illustrations during the winter months, when pleasing recollections of summer rambles and work may be called up in the minds of the children.

"By mounting the leaves between two glasses the child may hold up specimens to the light, particularly noting the prominent veins, and also the net-work of smaller connecting ones.

"An exact copy may be drawn and the actual specimen laid over for a test. The children will recall to memory the tree itself—formation of trunk, branches, fruit, &c., and should by these methods be enabled to write down clearly, distinctly, and fully, with pen-and-ink sketches illustrating the text, a vivid account of the walk."

Group D. The majority of the work from Evening
Character of Continuation-schools was shown in the
the Exhibits. collective exhibits of Group A.

At Pailton Evening Continuation-school drawing from nature is carried on in the way indicated below:—

“Materials used besides paper and pencil:—

id. box of Brown's crayons.

id. cakes of soft paints.

“These the pupils are eager to buy. Only those boys do this work who have shown an interest in leaves, fruits, and flowers. At the end of each year, twelve of the best drawings are selected and are put into a frame and hung on the school walls as a specimen of the year's work. There are five such sheets hanging in the school now.

“With reference to the night-school work, some eight years ago a great difficulty was found in getting pupils to form a class, in fact only five pupils were obtained. It was thought that if some recreative subject could be introduced it might be a means of augmenting the numbers, hence the choice of nature-drawing, and in two years a class of twenty-three has been obtained, and one hour's instruction each week is given, for which no pay or grant of any kind is received by the teacher.

“At the end of the session each pupil's work is exhibited, and quite a large number of people, especially the parents, attend.

“To sum up.—In order to get children to use their eyes in their daily walks—

“(1) Encourage them to gather the wild flowers and grasses and arrange them neatly.

“(2) Get them to collect specimens of insects, birds' nests, eggs, &c., and give lessons on them in the school.

“(3) Inculcate in their minds a taste for keeping plants in their house windows, and creepers on the house walls.

“(4) Illustrate as far as possible all nature lessons in the winter with lantern slides.”

Chemistry and drawing lessons are the features of Ewhurst Evening-school; here we are told:—

“Nature-study is taught by means of experimental lectures dealing with the chemistry of a plant. The scholars are encouraged (for the drawing lesson) to bring specimens of leaves, flowers, sprays of foliage,

and whole plants to be copied by the class in water-colours, thus making the drawing lesson a real Nature-study. The specimen chosen is pinned on to a sheet of drawing-paper on the black-board, with another blank sheet close to it for the teacher. The scholars have paints and brushes handed out to them, and both teacher and scholars copy as nearly as possible the specimen before them.

“The teacher paints with the scholars, explaining the mixing of the colours and the method of using and blending them, in order that the class can make as good a representation as possible. The teacher’s drawing and the best by the scholars, are then pinned on the wall and there left, making by the end of the course quite a showy and instructive group of Nature-study drawings.

“This method of drawing is so popular with the class that it is rarely there is an absentee for the lesson.”

At South Kyme—

“The Continuation-class is intended to supplement the work already done in the day-school, and also give scope for practical demonstration of the matter learnt in the Agricultural Class.

“Lessons on plant life, fruit culture, the soil, operations on land, and the use of implements can thus be well illustrated.”

“The students, after being taught collectively, are given a plot of land. Area, 75 square yards.

“The garden is part of the one used for day-school purposes, and in it—

(1) Digging, trenching, manuring, drilling, planting, &c., are carried on at the various seasons by each pupil.

The time of setting is noted by teacher and taught.

(2) Transplanting and pruning are also performed.

(3) Attention is given to the frames in which—

(A) Plants are reared from seed.

(B) Cucumbers planted.

“Lessons on potting and other similar occupations given to the class in unseasonable weather.”

Other Continuation-school Gardens have already been referred to at pp. 28 and 29.

Group E. There were fourteen exhibitors in the group set apart for training colleges. As is natural, the more informal Nature-study is here supplemented by systematic scientific work.

Character of the Exhibits. At the House of Education, Ambleside, the work "is entirely *training*, and not *teaching*". The Nature-study undertaken is described as—

"Nature-lore, which includes the acquiring of a familiar acquaintance with the natural objects—wild flowers and fruits, trees, bird and insect life—of this beautiful country; field work (in Botany, Natural History, and Geology), and the keeping and illustrating, with brush drawings, of a Nature Diary. The 'Nature-lore' Certificate assures a knowledge which should enable the governess to gratify the intelligent curiosity of children, or to introduce her older pupils to the delightful pursuits of the field naturalist. The 'Nature-lore' work is supplemented by definite scientific teaching in biology, &c., with the use of the microscope."

The exhibits from this institution chiefly consisted of—

"Illustrated nature diaries kept by past and present students, together with original notes on birds and on general nature rambles.

"The diaries show the leading idea in the nature-studies of the House of Education students, viz. observation of Nature herself—the succession of the flowers and the varying aspect of the seasons, &c., together with notes of class-lectures on various nature subjects. In the keeping of these diaries the individuality of the student is untouched, but from the very beginning of her college course each one is helped to take an intelligent interest in natural phenomena—an interest which almost always develops into that true love of nature which will communicate its living enthusiasm to the children.

"In addition to general field-work, the students take up botany for the South Kensington examination, and lectures are given to them on biology and geology. The aim of all Nature-study at the House of Education is not the production of 'specialists' in any one branch, but rather the sending out to the children those who, having themselves 'the seeing eye and the hearing ear', shall be intelligent guides of, and enthusiastic co-learners with, their pupils, the motto of the college being 'For the children's sake'."

Similarly at the Cambridge Training College for secondary teachers—

“ Incidental work forms a large part of the Nature-study. *Common objects of pond, garden, and field are studied in their natural surroundings*, and, if possible, brought home to be studied in greater detail in leisure moments.

“ Observations on the weather are made every day, and are recorded on charts.”

The systematic work at this College has been described as follows:—

“ Two hours a week are given to scientific work. During these, the students receive systematic instruction. The first two terms are devoted to experimental investigations on water and air. The students treat the subject from the point of view of a discoverer, and their work is supplemented by demonstrations of some more elaborate experiments and by accounts of work which cannot be attempted with the means and time at their disposal. In the third term biological work is done, treated in the same way.”

The special features of the exhibits shown by the College were:—

“ 1. Illustrations suitable for large classes. They are bold in outline and colouring. The black outline characteristic of wall-pictures is avoided by cutting out the painted object and pasting it on to the mount—this makes the picture stand out from the mount. In many instances parts of the picture are not pasted down and are painted on both sides, *e.g.* wings of butterflies, petals of flowers, &c., making the whole more real in appearance, more nearly approaching a model. Pictures ‘made to open’, to show things hidden, *e.g.* larva in mud, caddis-worm in case, internal structure, &c., are equally characteristic of the exhibit.

“ 2. Living animals that are easily found and reared in captivity with least cruelty. They have life-histories and habits so interesting that they form suitable material for nature lessons. The animals were shown in the common jam-pots in which they are kept at college.”

The opinions which guide the teachers at the Froebel Institute may also be given here:—

“ They ‘feel strongly that the study of natural history has been, and often is still, far too much studied from books instead of from the living

creatures'. In schools particularly, it seems so often to be thought that an aquarium or vivarium is too difficult a thing to keep going successfully.

"In their course of work they attach 'special value to the investigations made by the students themselves on the structure and habits, &c., of the animals they study'."

The exhibits from this Institute were intended to—

"Demonstrate how very possible and easy it is to keep many animals under more or less natural conditions, and yet in such a way that they are easily studied. . . . These can be obtained from the ponds by the students themselves, and can therefore be studied both in their own natural habitats and also subsequently in the aquaria in our own museum. It is this part of the work which arouses the keenest interest in the students, and which afterwards, when they themselves begin to teach, is of the greatest use to them. The small exhibit of books, &c., from the Froebel Institute School and Kindergarten was intended to show that the work is done on the same lines there, *i.e.* in trying to interest the children in the life all around them, and to lead them to observe carefully and accurately. The children keep the living plants and animals in their class-rooms for some time before the actual lesson on them, the chief aim of which is to collect together, and when necessary explain, the observations previously made by the children.

"In the three lower classes the lessons are entirely on living plants and animals kept by the children in school and at home. These classes each keep nature calendars. These are entirely their own unaided work, and show that the children are interested and are learning to use their eyes and to think about what they see.

"The next class sent to the exhibition an account of the experimental work in plant physiology which it had been doing, and each class sent representative collections, made during the holidays, of grasses, leaves, flowers, &c."

The Salisbury Diocesan Training College sent a detailed scheme of lectures and lessons on plant and animal life, showing how these are correlated with clay-modelling, black-board drawing, and brush-work. It must be also noted that at this College—

"Frequent excursions into the country take place during the spring and summer sessions, the students making detailed notes of their actual observations of phenomena and plant and animal life."

“Botany, zoology, and geology” form the course of instruction followed by the students at the Training College, Lincoln, the lessons on these sciences being followed up by observational walks under the direction of the lecturer, when the students are encouraged to make discoveries for themselves. The walks are conducted for the following purposes:—

- “(1) To note modes and places of growth of different plants.
- (2) To collect specimens of flowers, leaves, grasses, &c., for collections of pressed flowers, &c.
- (3) To note habits of different animals and insects.
- (4) To collect specimens for coming lectures and brush-work.
- (5) To note the strata of the district and to collect local rocks and fossils.”

In the biological studies at Darlington Training Colleges no distinction is made between theoretical and practical work, and importance is attached to the keeping of a record in the form of sketches.

The ten days' observations on seeds and seedlings sent by Bishop Otter College, Chichester, may also be mentioned here, likewise the plans, relief maps, and drawings in connection with observational work carried on, around the Home and Colonial High School and Training College.

Westminster Training College sent papers and books dealing with its school journeys, which were supplemented by the notes and accounts written by students.

Group F. In this group there were but two exhibits. The first was sent by the Training College for teachers for the oral instruction of the deaf, with which is associated a school for children. The leading features of the teaching at this institution are given below:—

“Nature-study not only develops the children's power of observation, and leads them to take a living interest in their surroundings, but in-

creases their vocabularies by teaching them the names of familiar animals, insects, &c., and their habits, food, and environment—in fact their life-history. Flowers, plants, stones, shells, anything and everything that comes under their notice, are treated as subjects of conversation and object-lessons, &c., and the teacher is not satisfied until the pupils know all about the object before them, and are able to converse and write about it in an intelligent manner.

“ We lead the children, by taking them out in the open air or by introducing nature into our school-rooms, to notice and converse about the things they see.

“ The nature of our teaching and the necessities of our children tend rather to the use of ordinary everyday language than to scientific or strictly botanical terms.

“ All the specimens exhibited have been collected by the pupils themselves, who take a great interest in Nature-study.

“ We much prefer to carry on this study out-of-doors with our children, making excursions to different parts for this purpose, but circumstances do not always permit of this end, and so we are often forced to do the next best thing, and bring the materials for Nature-study *into* our school-rooms.

“ We follow the intuitive method, taking as our lesson the subject in our children's minds at the time. For example, a boy or girl brings a butterfly to school, and, interest being aroused, the butterfly is taken as the subject for the day's lesson in Nature-study.

“ All the lessons are given orally by the teacher and lip-read by the pupils.

“ Lessons are always, if possible, illustrated by a real specimen, pictures being only used when really necessary.

“ Flowers, leaves, &c., are put into the pupils' hands and picked to pieces by them, as each part is touched on in the lesson. Seeds are germinated and plants grown in the class-rooms, so that the pupils may note changes and converse about them.

“ An aquarium has been formed, so that the habits of the inhabitants of a pond may be watched and studied.

“ Earth-worms, caterpillars, beetles, &c. &c., all have their places in the class-room, and form the topic of many a half-hour's discussion and conversation.

“ A note-book is kept in which each and all are expected to put down anything they may notice either in their daily walks to and from school, or on Saturday during any country expeditions they may make from home. Some of these entries are very simple and faulty; but we find they are helpful in encouraging our pupils to *observe their surroundings*.

"All take a part in this, some of the entries being made by pupils of eight or nine years of age, as well as by those of more advanced years."

The second exhibit came from the Oldham Deaf and Blind Schools, and the work there has been described as follows:—

"The surroundings of the town are not favourable to Nature-study, and the deficiency of the deaf, in language, prevents any attempt at the scientific study of natural subjects. In our drawing lessons and occupations an attempt is made to study colour from the natural flower (in brush-work), and the form in clay-work. The exhibits sent illustrate this, and the co-ordination which we attempt between the clay and colour work, and also the geography and other lessons.

"The children pay, throughout the winter, a small weekly sum towards a trip to the sea-side. This trip is made educational as far as possible. The children go in their classes, and the direct information gained at the sea, and from the towns and country through which we pass, is utilized in after lessons, especially in geography. The trip this year was to Morecambe, and the elder children gained much information about the tides, a mountainous country, &c."

Group G. Character of the Exhibits.

Most of the Home Office and Work-house Schools exhibited produce. Some, however, showed good work in other directions, notably in drawing and modelling from nature.

St. Mary's Industrial School, Croydon, sent note-books of observations, brush-work, and specimens connected with school excursions and rambles, as well as charcoal drawings of trees in the school garden.

The exhibits also illustrated—

"The manner in which the children are brought into connection with Nature-study in its different forms, and how they are taught to make use of it in various occupations of indoor work, *e.g.* moulding in leather, marquetry, pyrography; taking the designs necessary for these occupations as far as possible from nature.

"The children's exercise-books show the observations they are encouraged to make while on walks or rambles; while those bearing on

Nature-study from the garden, illustrate how the children are allowed first to actually note and examine for themselves, and then to apply the knowledge thus obtained to the lessons given them in the school-room."

It may be added that during the day's outing yearly taken to the sea-side the girls found time to collect quite a number of the commoner objects of the sea-shore, with which they illustrated their observational notes.

The work done at Baldovan Home Office School Dundee, was illustrated by injurious insects, barks and woods of trees, cereals and other botanical exhibits. The actual methods of teaching are stated to be:—

"(a) Lectures and lessons, given principally on Saturday evenings, illustrated by living and mounted specimens, and by diagrams.

"(b) Frequent visits, with teachers, to museums and gardens, with note-books, the jottings in which are extended in the school-room so soon afterwards as practicable.

"(c) General field-work, with teachers, embracing visits to stations, as marked on section of local map, where special specimens are to be found."

The photographs taken by the boys at the Poplar Union School showed that outdoor rambles play a part in the teaching.

The exhibits from the Morpach Industrial Board School consisted of specimens of the wild flowers that grow in its neighbourhood.

"They are collected and preserved in order to illustrate a course of lessons on plant-life taught in school.

"The collection is made during the long country rambles which the children take on Saturday afternoons, thus training their observation and giving them a keener interest in their walks, as well as a better knowledge of the life around them.

"We take 'Nature-study' here under the head of 'Elementary Science', but most of the lessons are given in the open air, where observations can be made upon the plants as seen growing.

"The children are encouraged to collect the finest specimens, and to press them for use during recapitulation lessons given in winter.

“The photographs represent—

- (1) Flower-collecting in the hedgerows.
- (2) An open-air lesson on flowers.
- (3) A lesson on stems.
- (4) Gardening under the supervision of a teacher.”

Group H.

Character of the Exhibits.

In this section there was a good number of exhibits, and much interesting material was brought together. The exhibitors ranged from such well-known organizations as the Agricultural Education Committee and the Children's Country Holiday Fund, through amateur naturalists' clubs like that at Eastbourne, university settlements and museums, down to private individuals, who were in the majority.

Perth museum, which led the way in this country with regard to natural history competitions for children, sent some of the prize-winning essays. A useful feature of this work is that the children are encouraged, after they have seen the specimens in the museum, to go out into the open air to observe the things alive, to draw, and to record under natural conditions.

Various cases were sent by the Borough of Stepney Museum, typical of the subjects used in “School Demonstration Lessons”. An observation nest of living meadow ants was also included in the exhibit. In the museum Miss Kate Hall has illustrated the life-histories of a number of trees, and of these the oak was chosen for exhibition. The specimens used included acorns in various stages of germination, as well as branches with summer foliage preserved in its natural form and colour for comparison with others plucked in winter. These were supplemented with photographs of the whole tree, looked at from the same standpoint in the two seasons. Sections of the wood and illustrations of the flowers went to complete the series. The

arrangement of the latter, and of the series of insects on natural flowers and leaves carefully preserved in natural colours, were such as would prove exceedingly valuable and attractive to the many children who attend the demonstration lessons provided in the museum, and who have little or no opportunities for coming into more direct contact with nature.

From Cardiff museum came some models intended "to illustrate the salient points of stratigraphical geology". Of these it is said that—

"The strata being represented by distinctive layers of wood, the exposed outcrops must be absolutely correct, whereas in the painted blocks this is not self-evident, being dependent upon the correctness of the artist."

Mr. G. Herbert Morrell, M.P., exhibited a contour map made by cutting up the sheets issued by the Ordnance Survey, and mounting the pieces so as to bring them to their proper elevations, as indicated on them.

Mr. George Abbott, of Tunbridge Wells, sent a remarkable series of photographs, showing how the appearance of local rock formations may be recorded. He further illustrated an inexpensive method of preserving, for ready reference, the specimens illustrating the various rock-beds met with in the neighbourhood of a school and collected by the pupils.

The life-histories of insects reared, preserved, and mounted by the boys of the Goodrich Field Club (of the Goodrich Higher Grade School, East Dulwich) deserve mention, and the interest taken by the boys in such work is shown by the following description of a complete set of home-made entomological apparatus, suitable to the wants of a young collector, and which can be easily and cheaply made under the guidance of the teacher. The set comprises:—

"The net, collecting-boxes, relaxing-box, cyanide or killing bottle (this alone made by teacher), setting and drying cases filled with boards

for setting, setting-needles, and straps for setting-pins, a store-box, and a breeding-cage for larvæ."

Mrs. Brightwen, who has done so much for Nature-study, sent series of specimens illustrating one or two definite points, in connection with which this well-known Nature lover makes the following remarks:—

"Many of our English trees produce their flowers at such an early period of the year, and so high up on the branches, that they are apt to be passed by unnoticed. I therefore exhibited the dried specimens of tree catkins in order to excite an interest in the minds of young people, and lead them to collect and dry similar specimens for themselves.

"About the end of January the hazel begins to show its catkins, a little later the alder flowers, and other trees follow in succession throughout the spring until the lime and the sweet chestnut complete the series. Some trees, being diœcious (having male and female blossoms on different trees), both kinds of catkin should be obtained. This is the case with the willows, poplars, and a few other trees.

"If the seedling of the tree can be obtained and dried, also the seed-pod or samara, and if a coloured sketch of any peculiarity of the buds or bark be made, such items will add much to the value of the specimen.

"Birds' skulls were shown in order to draw attention to the adaptation of the beak to the requirements of the bird. All the specimens were obtained from birds used for the table, such as game and poultry, or dead birds I have picked up."

As illustrating the usefulness of a series of specimens in recording, demonstrating, and inculcating interesting observations, those of clover-heads, also exhibited by Mrs. Brightwen, may be mentioned. In the first shown, all the blossoms, being unfertilized, stood erect, while in the following specimens they had gradually dropped after being visited by humble-bees, until only one, and finally none, occupied their original positions.

The Humanitarian League (children's department) exhibited leaflets and other literature which pointed out that—

"In the study of animal nature the life is [in its opinion] the first and the last point of interest and importance, the habits of the living animal

in its *natural* surroundings being the only subject of value or edification as a study”.

Another society, namely, that for The Protection of Birds, was represented, and exhibited with the following objects, to wit:—

“To acquaint teachers and others with the various ways in which they will find the Society a useful ally in promoting Nature-study. The primary intention of the society being to encourage the study of wild bird life and the preservation and protection of our birds, among children as well as adults, the co-operation of teachers is especially welcomed. Many of its publications are adapted for school use, and deal with the habits and utility of birds, while discountenancing wanton slaughter and profitless collecting. The lantern slides exhibited are specimens from the Society’s collection of over six hundred, from which selections for the illustration of lectures may be borrowed by any associate member, or by any school or natural history club affiliated with the Society.”

An exhibit of a suggestive nature may be somewhat fully considered. It consisted of a description by Mr. Sibert Saunders, of Whitstable, of marine aquaria which can be maintained without circulation or change of water. Striking photographs were sent as illustrations.

“These aquaria have been in operation for many years without change of water, through *careful attention* to the law that growing vegetation, produced and maintained by the action of light, absorbs the carbonic acid gas given off by the animals, appropriates the carbon to its own use, and gives off a fresh supply of oxygen for that of the animal organisms—which must, of course, be proportional to the bulk of water in which they are kept.”

The hints as to formation and management drawn up by Mr. Saunders are given below:—

“**The Tank** may be of any size, but must combine a large surface area with a comparatively small depth of water. A serviceable tank of small size would be about 24 inches long, 16 inches broad, and 7 inches deep. Larger tanks may be of greater depth, but should have a *false bottom* of slate, sloping from the front, and resting against the back at a point a few inches from the top. Rock-work being arranged on this, the

animals are accommodated with a graduated depth of water, and are well seen from the front, which alone should be of glass, the rest of the tank being made of slate.

“**Position.**—The aquarium should be placed against, or below, a window having a north or north-east aspect. Other aspects make it difficult to regulate the important conditions of—

“**Light and Heat.**—In any aspect, care must be taken to allow sufficient light to fall on the aquarium to stimulate the growth of vegetation without producing an excess of confervoid growths. Direct sunshine is best avoided. Excessive heat must be kept down by shading, and, if necessary, the use of wet cloths.

“**Stocking the Aquarium.**—Sea-water should be allowed to settle and become bright before being placed in the tank. Vegetation must exist in the water for some time before the animals are introduced. Plants of *Ulva* or *Enteromorpha*, attached to clean stones or shells, are best to begin with. Minute vegetation will soon be developed on the sides of the tank and on the rock-work. A few common and hardy sea-anemones (*Actinia mesembryanthemum*) may be placed in the tank and watched. If they remain healthy, other species may be added, together with various forms of marine life, preferably animals of sedentary habit. Fishes, crustacea, and annelids (except *Serpula*) are best kept in separate vessels.

“**General Management.**—Sea-anemones require feeding, say, once a week, with morsels of oyster, mussel, or raw beef, which must be placed on the disk of the animal. Uneaten or undigested food must be removed by means of a glass tube.

“The aquarium should be kept covered with glass to exclude dust and to check evaporation. When a film is observed on the surface of the water it should be removed by means of a sheet of paper, and the water agitated to assist oxygenation. The density of the water must be maintained by compensating for loss by evaporation, by adding a little distilled or pure fresh water from time to time.

“A daily inspection should be made, and all dead matter promptly removed.

“Any dulness in the water indicates insufficient oxygenation, and a syringe may be used. The secret of success is the preservation of the balance of animal and vegetable life, and if this is attended to, the aquarium will remain in health for an unlimited period without change of water.”

Amongst the exhibits sent by Mr. Robert William Fuller (aged 16), of Herne Bay, the map of the district, showing

places of interest from a Nature-study point of view, may be mentioned in the interest of teachers.

Group J. Some interesting exhibits sent from Canada, South Australia, and the United States were shown in this group. From the Provincial Normal School, Nova Scotia, came illustrations of work done by its pupils, such as comparisons between leaf-buds, made in simple language, together with the actual specimens. There were also collections of native woods and barks, with descriptive labels giving the characters and habitats of the trees themselves, forming outline lessons.

The South Australian exhibits were supplied by the Inspector-General, Mr. Stanton, and Mr. Grasby, President and Founder of the Boys' Field Club, Adelaide, who work under the motto—"The naturalist loves life". The proceedings of this club for the years 1893-1902 were specially compiled for presentation at the exhibition, and some idea of the objects of the club and the result of its activity will be obtained from the following extracts:—

"During the fifteen years of the club's life some 200 excursions and meetings have been held, including thirteen natural-history camps, each lasting from seven to nine days. Approximately, some 1500 boys have come under the influence of the leaders of the club for a longer or shorter time. . . .

"Nature-study teaches us that absolutely nothing can be lost, and that our effort, if earnest, cannot fail to have a permanent effect, although it may not be appreciable. We do not, therefore, look for recordable results; we merely wish to exercise an influence, and leave the rest to the Governor of Nature. We try to give our boys a wider outlook in life, that they may have interests outside the routine in which they may have to live, and we endeavour to lead them to take a more intelligent interest in the natural world by which they are surrounded. We endeavour to do this by suggestion rather than by direct precept. The training of natural-science students is a secondary consideration; but it is pleasing to be able to record that, as a direct result of the club's

influence and teaching, a number of our lads have taken up the systematic study of one or more branches of natural science, and, as young men, have become active workers."

The Federal Department of Agriculture, Washington, sent a collection of Nature-study leaflets, illustrating the work carried on at the various centres in the United States which are interested in the question.

From the Philadelphia Normal School came an improved edition of the exhibit shown at the Paris Exhibition of 1900, illustrating in particular the correlation that can be introduced between outdoor observation and the ordinary details of school work.

Professor Bickmore, of the American Museum of Natural History, New York City, exhibited in this group a unique series of photographs and slides in connection with his scheme of "Visual Instruction". These illustrated the use to which photography can be put in order to bring before us objects when they themselves cannot be seen or obtained, and to record the changes taking place in connection with movement or growth. Nothing could be finer than the exquisitely-coloured photographs showing the unfolding of the lotus flower, which, luckily, could be compared with the actual blossoms, then opening in the Victoria Regia House in the Botanic Gardens. Again, never before, in all probability, has a photograph been seen of birds, taken during flight, which shows the position of the thumb or bastard wings.

Supplementary Exhibits.

There were two exhibits coming under the heading of "flower cultivation".

Mr. E. F. Hawes, F.R.H.S., the chief instructor in the practical gardening school of the Royal Botanic Society, exhibited an interesting collection illustrating the students' work. The pictures representing the various operations of grafting were one of the features of

this contribution. Miss Weston Smith, a student in the same school, was the other exhibitor, and had collected together a series of garden plants and their ancestors, which served as an excellent object-lesson as regards the influence of man upon the rest of nature, and more particularly with respect to plants under domestication.

The last-mentioned exhibit and the produce sent by a number of the exhibitors in the various groups already noted were collected together in a special marquee. The results obtained by the Invicta Board School for Infants at Blackheath, which were exhibited here, showed how much can be done under urban conditions.

A supplementary exhibit which created considerable interest consisted of live bees and a bee tent sent by the Kent and Surrey Bee-keepers' Association, in connection with which demonstrations were given in the Gardens during several afternoons. Observational hives were also shown as part of the exhibits in several groups.

Trade Exhibits. In addition to the exhibits in the various groups already enumerated, there was a large Trade Section, which was very interesting, as in it a number of publishers and natural-history dealers exhibited. The Committee are under a great obligation to the well-known firms which so readily responded to the invitation, seeing that they provided a most extensive display, which greatly added to the practical value of the Exhibition.

There were on view books dealing with natural history, object-lessons in elementary science, and Nature-study, which were shown by British, American, and Continental publishers alike. Among the other exhibits were materials for modelling, preserved zoological specimens, and botanical material, fresh, dried in natural form and colour, and in alcohol. To single out individual exhibitors for special

mention would be invidious and out of place, as their exhibits were not entered for competition.

Summary. Taking the Exhibition as a whole, it may be said that it clearly showed the very great tendency which exists to present Nature-study in school as definite lessons. On the other hand, as a contrast to this, there came the informal field-work and the special cases in which Nature-study is either looked upon as an influence to affect the whole school-work, or forms a pleasant relief to the lessons set down in the time-table.

The practical effects of the Exhibition have already been considerable, and the Committee are gratified to notice how much attention has been directed, both at home and abroad, to determining the exact aims of Nature-study and its place in education.

Local exhibitions or conferences have been held, since the close of the Exhibition, at Cambridge, Liverpool, Aylesbury, Beverley, Dover, Stepney, Dulwich, Manchester, and the College of Preceptors. Other meetings have been arranged and will be held in the near future.

A Nature-study Section has also been organized in connection with the "Arts and Crafts" Exhibition to be opened by H.R.H. Princess Louise, at Hammersmith, in the Spring.

The Bath and West of England Agricultural Society has, moreover, suggested a scheme of a more permanent nature in accordance with which local exhibitions may be organized annually under the auspices of its Science and Art Departments, at its migratory shows. It is proposed that the first of these exhibitions should be held at the Bristol Show of 1903.

Several other conferences and exhibitions are being arranged in London, and all the evidence goes to show that

a genuine effort is being made to turn the lessons of the Exhibition to profitable account. At the same time, this activity points to the probability that in the future such work can be most conveniently carried on by local organizations.

JOHN A. COCKBURN.

A. G. LEGARD.

H. MACAN.

J. C. MEDD.

T. G. ROOPER.

(On behalf of the Executive Committee.)

The Conferences

THE OPENING CEREMONY*

The Duchess of Devonshire opened the Exhibition on Wednesday, July 23, in the Royal Botanic Gardens, London. The DUKE OF DEVONSHIRE took the chair, and among those present were Lord Balfour, Lord Avebury, Lord Northbrook, Sir Joseph and Lady Hooker, Sir William Hart-Dyke, M.P., Lady Lucy Hicks Beach and Miss Hicks Beach, Sir Henry Craik, Mr. H. Hobhouse, M.P., Sir George Kekewich, Sir William Abney, Sir Philip Magnus, Sir Joshua Fitch, Sir John Hutton, Sir John Hibbert, Sir John Cockburn (chairman), Mr. C. S. Roundell (hon. treasurer), and Mr. J. C. Medd (hon. secretary).

The DUKE OF DEVONSHIRE said:—In connection with the exhibition which is shortly to be opened, a series of conferences are to be held to-morrow and on Friday, and on Tuesday, Thursday, and Friday of next week. Therefore, by the end of next week I think those—and I hope they are a numerous body—who take an interest in this subject will have had very full opportunities of acquiring all the information which they can desire respecting this new departure in education, and especially in elementary education.

*The following report is reproduced by special permission from *The Times* of July 24, 1902.

I think, therefore, it will be unnecessary for me to attempt to explain at any length to you what will be so much more completely and adequately explained in the course of these conferences. I shall, however, have a few words to say upon the subject of the connection of this exhibition with this new educational departure.

But perhaps my chief business to-day as President of the Board of Education is to speak as to the manner in which this movement is regarded by that department. I need hardly tell you that it has our very warmest sympathy. It is frequently said, and I am afraid with a certain amount of truth, that education is at present not so fully appreciated in the rural districts as I am happy to say it has come to be in the great towns and urban districts. If there is any truth in this statement, the cause is, that we have not succeeded in bringing education in the rural districts into the same relation with rural life and occupations as it has been brought in the case of the towns and the urban districts. If the agricultural labourer does value education for his children at all, I am afraid it is only too often with the object of enabling him to escape from the country and from the drudgery of his own existence into the more excited atmosphere of the towns; and if that feeling has had any such effect upon the agricultural labourer, I do not think that we can wonder very much if some of the country gentlemen and many of the class of farmers have not hitherto viewed education, and educational progress, with any very great enthusiasm. We at the Board of Education have long felt conscious of the difficulty, which we have too often en-

countered in the rural districts, and we have been most anxious to find some means by which education, and more especially elementary education, should be brought into closer relation with rural life and with the occupations connected with the cultivation of the land, and that all classes connected with the land should be induced to feel that education is a thing which is not necessarily antagonistic to, but which ought to be conducive to, the interests of all who are engaged in the cultivation of land. We at the Board of Education, although we have long had this feeling, could not do very much in the matter until we obtained some external assistance. We can only prescribe the subjects and the course of instruction within certain very wide limits. The actual course of instruction must be left to a very great extent to the managers of schools and to the teachers in schools; and not unnaturally managers and teachers have been, like most of us, inclined rather to continue in the old grooves than to strike out into new directions and developments for themselves. Within the last three years we have received that external assistance and impulse towards a new departure of which we stood in need.

A very influential committee has been formed, and joined by a large number of members of Parliament, and by a large number of members of county councils, and its object is to draw up proposals to improve the character and adapt more to its surrounding circumstances the instruction given in the schools of the rural districts. The committee drew up certain resolutions, which were formally laid before the Board of Education and accepted with great pleasure and satis-

faction by the Vice-President, Sir John Gorst, and myself. We have also endeavoured to take some practical steps in the direction of these changes, but I have not time to do more than briefly indicate their character. We have introduced some changes into the Elementary Education Code, and the Directory for Scientific Education; we have altered in some respects the conditions of the Government grant to schools; and we have issued specimen schemes of instruction; and all these steps have been taken with the object, which we have endeavoured to describe in the circular we issued last year to the managers of elementary schools, of impressing upon them the importance of making education in the village school more consonant with the environment of the scholars than is now usually the case, and more especially of encouraging children to gain an intelligent knowledge of the common things which surround them in the country. The great difficulty which we have met with up to the present time has been the lack of a sufficient number of teachers who themselves had been trained in natural science, and who were sufficiently conversant with the objects of country life to impart this new form of instruction to their scholars. The department now requires that Nature-study, from a practical and experimental point of view, shall be taken as one of the subjects of the certificate examination. And I am happy to say that in this endeavour to extend the qualifications of our teachers we have met with the most cordial assistance from the great majority of the training colleges, and we have also received most valuable assistance from many of the county councils, who have established weekly con-

tinuation-classes, in which it may be possible for the teachers to qualify themselves to give instruction in these subjects. We hope that this new departure may do something, as I have indicated, to increase the interest which is felt in the schools of the rural districts by all who are connected with them, by the children themselves, by their parents, and by their employers; and we hope that it will give a stimulus to the appreciation of education, which hitherto, as I have said, has been somewhat lacking in certain districts of the country. But it must not be supposed for a moment that we believe that Nature-study need be exclusively confined to the rural schools. We think that, with some variations, rendered necessary by the varying conditions of life, and by the various diversities which exist in our country, this Nature-study may with great advantage be introduced into all schools, urban as well as rural.

But upon this point of the connection of the exhibition with this new educational departure, I would ask you to allow me to use the words of one who is much better qualified to speak on the subject than I am, and to read an extract from a letter which I have received from Mr. Medd, the hon. secretary of this exhibition, to whose disinterested and unwearied exertions the existence of this exhibition is almost entirely due, and who has, I think, expressed in this letter, in terms which I could not attempt to improve upon, the nature of the connection which this exhibition will have with the new educational departure and the manner in which it will illustrate the object which we have in view. Briefly, the exhibition came about thus:—

“For long, people in England and throughout the world had become wearied of an exclusively literary curriculum, which is bad for every child, as tending solely to the development of its mental faculties, and particularly bad for the country child, because it withholds all knowledge of the life around him. This has been fully realized by the Board of Education in the Code of 1900, the Specimen Courses of Instruction and the changes in the curricula of the training colleges. Much excellent work has for many years been done in isolated schools to familiarize children with the simple facts of nature, to develop their powers of observation, to awaken a spirit of inquiry, and to teach them less from books and more from things. But this work is comparatively unknown. There is no general agreement as to methods of instruction, nor as to what is practicable and expedient. There is a risk, too, that inexperienced teachers, attempting to teach subjects of which they have no knowledge beyond that of a text-book, may bring ridicule upon the whole movement, especially amongst the rural classes, and that the last state of the schools may be worse than the first. It seemed, therefore, that the time had arrived when an attempt should be made to collect evidence of what is being done, and to illustrate by some central exhibition the lines which ought to be followed. I consulted Sir G. Kekewich, who cordially approved. Sir William Hart-Dyke and Sir John Hibbert at once gave me their support; and in Sir John Cockburn, who was for seven years Minister of Education in South Australia, besides being Prime Minister and subsequently Agent-General for the Colony, we found a most able chairman of the executive committee. The manner in which the project was taken up was extraordinary, evidencing the intense interest in this particular question, and that we had hit upon the right psychological moment. The Royal Botanic Society most generously placed their grounds at our disposal—a fact which deserves recognition. In some respects the exhibition is unique. It is questionable whether any exhibition upon the same scale has ever been directed to one element in education—namely, the study of Nature. We shall show what is done at every step from the infant school up to such institutions as the Wye and Downton Agricultural Colleges on the one hand, and the Durham College of Science and the

Marischal College at Aberdeen on the other. Again, the scheme has the active support of influential members of every political party and every religious denomination. No less interest has been taken by the Colonies and the United States; the New York education authorities commissioned Dr. Bickmore, director of their Natural History Museum, to bring an exhibit, and to attend and speak; the Philadelphia Normal School has telegraphed for its collective exhibit to be sent from Charleston, where it is now on view, direct to us; Dr. True, of the Department of Agriculture at Washington, is endeavouring to procure every paper upon the subject issued by every agricultural college and experiment station in the United States; Professor Robertson, Commissioner of Agriculture at Ottawa, will send all he can at the expense of the Dominion Government from Canada, where, thanks to the generosity of Sir William Macdonald, the whole system of rural education will shortly be remodelled. Exhibits are also promised from Australia. Our object is wholly educational. We have two dangers to guard against. We do not want it to be thought that by emphasizing the value of the study of Nature we depreciate the value of literary culture, or that we have any desire to deprive country children of any educational advantages. At the same time, we do not want, by drawing attention to this particular subject, and hearing the views of scientific experts, to appear to be seeking to introduce some highly specialized form of instruction. Such an idea would be fatal. We are anxious to show that for every child of every rank and age, in every grade of school, urban and rural, Nature-study, quite apart from any possible bearing which it may have upon rural pursuits, or for its botanical or scientific importance, affords one of the most reliable means of developing certain faculties, upon the development of which education in its fullest sense and success in life must be based."

I conceive that the idea which underlies this movement and this new departure is, that while we know there is much, indeed a vast amount, to be learned from books, and while it would be foolish—I may say idiotic—on our part to neglect those stores of know-

ledge which have been accumulated and handed down to us by those who have gone before, yet at the same time there is also much which is to be learned not from books, but from the facts of Nature itself. While the study of books may too often be only an exercise for the faculty of memory, and may leave almost untouched the other faculties of the human mind, on the other hand the study of the facts of Nature, the intelligent observation and study of the facts of Nature, is a mental discipline which cannot fail to develop those powers of the mind which it is the object of all true education to discover, to cultivate, and to strengthen.

The exhibition was then declared open by the Duchess of Devonshire. A vote of thanks to the Duke and Duchess was proposed by Sir W. Hart-Dyke, M.P., seconded by Sir John Cockburn, and supported by Sir Joseph Hooker, who referred to his long connection with the botanical museums at Kew, and hoped that the county councils would take up the movement in favour of Nature-study, and pursue it under the ægis of the government. The Duke, in reply, congratulated the organizers of the exhibition on having the support of so eminent a man of science as Sir Joseph Hooker. A vote of thanks to the Royal Botanical Society for the use of their premises was moved by Lord Northbrook and seconded by Sir John Hibbert, and after Sir John Hutton had replied the proceedings terminated.

FIRST CONFERENCE, Thursday, July 24

CHAIRMAN: THE RIGHT HON R. W. HANBURY, M.P.,
PRESIDENT OF THE BOARD OF AGRICULTURE

Mr. HANBURY said:—The department over which I have the honour to preside is so closely interested in the subject of Nature-study that I am glad of this opportunity to give some of the views of the Board of Agriculture upon the matter. As the Duke of Devonshire said at the opening ceremony, the present system of education is one which appeals too much to the brain and to the memory of the child. We want to do more than that, and to bring the other faculties into operation. The object of those who are interested in the study of Nature is not to diminish the interest taken in the past and in distant objects, but to pay more attention to present things which are immediately before our eyes. Charity begins at home, and true learning begins at home, and it is only by knowing and taking an interest in things around us that we can appreciate distant objects. Above all, it is Nature-study which teaches us not to depend so much upon others and make our minds receptacles for other people's ideas. Nature-study encourages the use of the seeing eye and the hearing ear. I represent an industry which perhaps more than any other depends to a consider-

able extent upon the experience and information which are to be derived from the study of Nature; and unless the habit of observation is cultivated in early life, it is not so easily gained when the farmer and the horticulturist have to struggle against the difficulties inseparable from their callings. With regard to Nature-study and elementary schools, the curriculum has been improved since 1900, and especially of late. It is not, however, sufficient for the Board of Education to enlarge the code; what is needed is to encourage the managers of schools, particularly of rural schools, to take a special interest in the subject. Unless this is done, everything that has been accomplished will be thrown away. I hope that the Education Bill, now before Parliament, may tend to encourage more rational methods of instruction in rural and urban schools alike. The extension of Nature-study depends in a great measure upon the teachers, but the departments have it in their power to facilitate and promote it. During the last year or two the Board of Agriculture and the Board of Education have co-operated harmoniously in trying to promote the teaching of Nature-study in rural schools, and from my own experience I can testify to the interest taken in it by the children. Another reason why the study of Nature should be cultivated is, that it gives the child an interest in country life, instead of creating a distaste for the life around it. Much of the education given in country schools in the past created a horror of education among farmers and agriculturists owing to the immense amount of book-learning which was formerly required. But I am confident that by making education more practical

and useful than it has been, we can show the farmer that education is as necessary for their industry as for any other, and that the prejudice which has existed will be removed. This may tend to arrest the migration from the rural districts to the towns, and prove the means of our obtaining more strong young men from the country as recruits for the navy and the army.

THE STUDY OF NATURE

BY THE RIGHT HONOURABLE LORD AVEBURY,
D.C.L., F.R.S.

The subject on which I have been asked to address you is "The Study of Nature". This appears to imply that Nature is worth studying. It would indeed almost have seemed as if this was a self-evident proposition. We live in a wonderful and beautiful world, full of interest, and one which it is most important to understand, and fatal to misunderstand. Yet until lately our elementary schools were practically confined to reading, writing, and arithmetic; our grammar schools mainly, as the very name denotes, to grammar; while our great public schools even now omit the study of Nature altogether, or devote to it only an hour or two in the week, snatched from the insatiable demands of Latin and Greek. The result is, in many cases, the most curious ignorance of common things. So far as elementary schools are concerned you will be addressed to-morrow by Prof. Lloyd Morgan, and I will therefore address myself primarily to secondary schools.

We have all met persons who have taken a university degree, and yet do not understand why the moon appears to change its form, who think that corals are insects, whales fish, and bats birds, who do not realize that England has been over and over again below the sea, and still believe that the world is not more than 6000 years old. It may be said that ignorance on these points does not directly affect life, but at any rate the ignorance of the simplest laws of health does lead to most deplorable results.

No doubt both Oxford and Cambridge have admirable science schools. A man can study there with many advantages and under excellent teachers. But the prizes and fellowships are still given mainly to classics and mathematics. Moreover, natural science is not yet regarded as a necessary part of education. Degrees are given at these seats of learning, and now, alas! even at the University of London, without requiring any knowledge of the world in which we live. Our universities give excellent teaching, they prepare learned specialists, but are places of instruction rather than of education. The most profound classical scholar, if he knows nothing of science, is but a half-educated man after all—a boy in a good elementary school has had a better education. The responsibility rests, as it seems to me, mainly with the universities. The public schools tell us that they must conform to the requirements of the universities, the preparatory schools are governed by the public schools, and hence the tendency is to specialize the education of boys from the very beginning of school life. These are no peculiar views of mine. They have been reiterated by students of education from Ascham and Milton to

Huxley and Spencer, and they have been urged by one Royal Commission after another.

No doubt, there has been some improvement, but the recent blue-book on schools shows that science and modern languages are still woefully neglected. Mr. E. Lyttelton, whom all will admit to be a great authority, sums up the present position as follows:—

“Before 14 years of age,” he justly says, “specialization is most undesirable, but under present arrangements it is absolutely unavoidable, the constraining cause being the value set on classics for a classical scholarship and on mathematics for a mathematical scholarship, to the total exclusion of other subjects admirably well fitted for young boys. True, these subjects are asked for, and questions are set, but it has long been found out that the answers are either not marked at all, or so low, that it still pays to drop them altogether for the last eighteen months of the boy's preparatory school career. This means that a boy barely twelve years old will discontinue all but a modicum of mathematics and other subjects, and be pressed on in Latin verses and Greek sentences, and the construing of difficult classical authors, till by the time he is 13½ he is able to reproduce remarkably skilful bits of translation, but is contentedly ignorant of English and other history, and has no knowledge whatever of the shape, and size, and quality of the countries of the habitable globe, and perhaps more injurious still, does not know whether the Reform Bill came before Magna Charta or the sense of either.”

University authorities seem to consider that the elements of science are in themselves useless. This

view appears to depend on a mistaken analogy with language. It is little use to know a little of a number of languages, however well taught, unless indeed one is going into the countries where they are spoken. But it is important to know the rudiments of all sciences, and it is in reality impossible to go far in any one without knowing something of several others. So far as children are concerned, it is a mistake to think of astronomy and physics, geology and biology, as so many separate subjects. For the child, nature is one subject, and the first thing is to lay a broad foundation. We should teach our children something of everything, and then as far as possible, everything of something. Specialization should not begin before 17, or at any rate 16.

Everyone would admit that it is a poor thing to be a great ichthyologist or botanist unless a man has some general knowledge of the world he lives in, and the same applies to a mathematician or a classical scholar. Before a child is carried far in any one subject, it should be explained to him that our earth is one of several planets, revolving round the sun, that the sun is a star; that the solar system is one of many millions occupying the infinite depths of space; he should be taught the general distribution of land and sea, the continents and oceans, the position of England, and of his own parish; the elements of physics, including the use and construction of the thermometer and barometer; the elements of geology and biology. *Pari passu* with these should be taken arithmetic, some knowledge of language, drawing, which is almost, if not quite as important as writing, and perhaps music. When a child has thus acquired some general

conception of the world in which we live, it will be time to begin specializing and concentrating his attention on a few subjects.

I submit then that some study of Nature is an essential part of a complete education; that just as any higher education without mathematics and classics would be incomplete, so without some knowledge of the world we live in, it is also one-sided and unsatisfactory—a half-education only.

In the study of natural history again we should proceed from the general to the particular,—commence with the characteristics in which animals and plants agree, their general structure, and the necessities of existence. Animals again agree together on some points, as regards which they differ from plants.

A general idea should then be given of the principal divisions of the animal and vegetable kingdoms. In many respects, though animals are perhaps more interesting, plants present greater facilities for study. They are easier to find, to handle, and to collect. Specimens of the principal divisions can be more readily obtained and examined: the structure also can be more pleasantly demonstrated. Almost all children are born with a love of natural history, and of collecting.

Far be it from me to underrate the pleasure and interest of collecting. Such a collection as the present is most useful. Indeed collections are in many branches of nature-knowledge almost a necessary preliminary to study. But a collection is a means to an end, not an end in itself. It is like a library, necessary for study, but useless unless studied,—unless the books are read. Moreover, we have all access to the

great National Museum. Still, in many branches of science private collections are indispensable, but not, of course, unless they are used. Moreover, if I confine my remarks to natural history, plants lose half their interest when they are gathered, animals when they are killed.

In the streets and toy-shops many ingenious puzzles are sold in which children, and even grown-up people, seem to find great interest and amusement. What are they to the puzzles and problems which Nature offers us without charging even a penny? These are innumerable.

May I indicate a few subjects of inquiry, confining my suggestions to points which require no elaborate instruments, no appreciable expenditure?

Many people keep pets, but how few study them! Descartes regarded all animals as unconscious automata; Huxley thought the matter doubtful; my own experiments and observations have led me to the conclusion that they have glimmerings of reason: but the subject is still obscure. I have often been told that dogs are as intelligent as human beings, but when I have asked whether any dogs yet realized that 2 and 2 make 4, the reply has been doubtful, or in the negative. The whole question of the consciousness and intelligence of animals requires careful study.

Take again the life-history of animals. There is scarcely one which is fully known to us. Really I might say not one, for some of the most interesting discoveries of recent years have been made in respect to ants and bees.

Coming now to plants. Anyone who has given a thought to the subject will admit how many problems

are opened up by flowers. But leaves and seeds are almost equally interesting. There is a reason for everything in this world, and there must be some cause for the different forms of leaves. In Ruskin's vivid words "they take all kinds of strange shapes, as if to invite us to examine them. Star-shaped, heart-shaped, spear-shaped, arrow-shaped, fretted, fringed, cleft, furrowed, serrated, sinuated, in whorls, in tufts, in spires, in wreaths, endlessly expressive, deceptive, fantastic, never the same from footstalk to blossom, they seem perpetually to tempt our watchfulness and take delight in outstepping our wonder."

Some of these indeed have been explained, but for the differences in the leaves of ferns, for instance, seaweeds, and many others, no satisfactory suggestion, so far as I know, has yet been offered.

Look again at fruits and seeds, what beauty both of form and colour, and what infinite variety! Even in nearly allied species, in our common wild geraniums, veronicas, forget-me-nots, &c., no two species have seeds which are identical in size, form, or texture of surface. In fact, the problems which every field and wood, every common and hedgerow, every pond and stream, and last, not least, the sea-shore offer us are endless and most interesting. The late Lord Derby used to say, that considering the marvellous discoveries of the last hundred years, we could not expect so much progress in the future. To me it seems, on the contrary, that we may reasonably expect even more, and for three reasons.

In the first place, our instruments and apparatus are so much more elaborate and ingenious. In the second place, the students are more numerous. Even

now the harvest is plenteous, and the labourers are few, but yet they are more than they were. Thirdly, as the circle of human knowledge widens, the opportunities for research become greater and greater! Every discovery opens the way to others—suggests new ideas, and fresh researches. We seem, indeed, to be on the threshold of great discoveries.

There is no single substance in Nature the properties of which are fully known to us. There is no animal or plant which would not well repay, I do not say merely the attention of an hour, but even the devotion of a lifetime. I often grieve to think how much happiness our fellow-countrymen lose from their ignorance of science. Man, we know, is born to sorrow and suffering, but he is not born to be dull, and no one with any love of science ever could be. If anyone is ever dull, it is not only his misfortune, but his own fault. Every wood, every field, every garden, every stream, every pond is full of interest for those who have eyes to see. No one would sit and drink in a public-house, if he knew how delightful it was to sit and think in a field; no one would seek excitement in gambling and betting, if he knew how much more interesting science is; science never ruined anyone, but is a sort of fairy godmother ready to shower on us all manner of good gifts, if we will only let her. In mediæval fairy tales the nature spirits occasionally fell in love with some peculiarly attractive mortals, and endowed their favourites with splendid presents. But Nature will do all this, and more, for anyone who loves her.

Lastly, in the troubles and sorrows of life science will do much to soothe, comfort, and console. If we

contemplate the immeasurable lapse of time indicated by geology, the almost infinitely small, and quite infinitely complex and beautiful structures rendered visible by the microscope, or the depths of space revealed by the telescope, we cannot but be carried out of ourselves.

A man, said Seneca, "can hardly lift up his eyes towards the heavens without wonder and veneration to see so many millions of radiant lights, and to observe their courses and revolutions". The stars indeed, if we study them, will not only guide us over the wide waters of the ocean, but what is even more important, light us through the dark hours which all must expect. The study of Nature indeed is not only most important from a practical and material point of view, and not only most interesting, but will also do much to lift us above the petty troubles, and help us to bear the greater sorrows of life.

HOW THE COUNTY COUNCILS MAY ENCOURAGE NATURE-STUDY

BY MR. HENRY HOBHOUSE, M.P.

The principal work for County Councils in connection with this subject lies in the training of teachers for both day and evening schools. Their most urgent duty at present is to provide "nature-knowledge" instruction for elementary-school teachers who have not been through any scientific course in a training college, and who are often town-bred and unversed in country life. This instruction need not

involve a thorough scientific training; but the groundwork of certain sciences (*e.g.* physics and chemistry) should, if possible, be acquired, and as much botany and biology learned as time may permit. What is more important even than the acquisition of knowledge is the mastery of the best methods of inculcating habits of observation and inquiry in the pupils. Comparatively few lessons from an expert instructor would inspire an intelligent teacher with valuable ideas which he could carry out in his school.

What are the County Councils doing in this direction?

From the latest information I have been able to collect, I find that 22 County Councils have been conducting short special courses for teachers extending over a few weeks, usually in the summer vacations. Twenty-four Councils have instituted longer and more systematic courses ranging over several months of the year, the classes begin ordinarily held on Saturdays; while 26 Councils have arranged in connection with these courses outdoor rambles or excursions for teachers.

It is impossible to give a trustworthy estimate of the number of teachers receiving instruction in "Nature-study"; but I find that in 15 administrative counties taken indiscriminately no less than 620 teachers were attending the various courses last session.

As to subjects, I find that 25 Councils are giving instruction in horticulture, 20 in botany, 20 in "nature-study" or natural history, 14 in plant life, 9 in entomology, 7 in zoology, and a smaller number in biology, geology, physiography, and minor agricultural

subjects (such as poultry and bee-keeping), the use and making of apparatus, and drawing from natural objects. There are also a large number of courses that include chemistry and physics.

In almost every case the training is given at an agricultural college or central institution of an agricultural or scientific type maintained or aided by a County Council. But there is no reason why such instruction should not be given wherever suitable laboratories and teachers are available. In most cases the courses include practical work either in the laboratory or in the field and garden, or in both.

It will thus be seen that a large number—indeed the majority—of the County Councils of England are doing substantial work in training teachers in “nature-knowledge”. But a great deal more will have to be done before every rural school has proper teaching of this kind. It is not to be expected, even in the future, that every village schoolmistress will be able to give such instruction, and arrangements will have to be made by the new Local Education Authorities to provide peripatetic teachers for groups of small schools.

School gardens and school museums will also have to be organized for both elementary and higher schools. Very valuable work has already been done by Surrey and other counties in starting gardens in connection with evening continuation-schools. The supply of seeds and tools at reasonable rates, and the offer of prizes, have made these gardens very attractive, especially in the small towns and larger villages; and this system adds a practical side to the instruction in horticulture given in the winter evenings.

Good school museums are still very few and far between. They should be encouraged by grants and by offers of specimens which cannot be procured locally. Arrangements might also be made by the County Councils for the circulation of apparatus and diagrams among groups of schools; but these must always be supplemented by the use of the *natural* objects found in the neighbourhood by the students themselves.

As regards secondary schools, I would suggest that, besides providing them with gardens and museums, the attention of the governing body should be directed to the courses for "schools of science in rural districts" prescribed by the government directory. These courses include most valuable practical teaching, and might be made more popular than they are, if the schools taking them were encouraged (as is done, *e.g.*, in Somerset) by the County Council supplementing the government grants by special grants for experimental plots and instruction in horticulture.

Apart from the general educational value of "Nature-study", there are certain practical ends which may well be kept in view by county organizers. Take, for example, *the protection of wild birds*. This cannot be secured merely by the passing of county bye-laws and by the circulation of police notices. Extraordinary ignorance of the appearance, names, and habits of wild birds prevails in the rural as well as in the urban districts. County Councils might properly attempt to remove some of this ignorance by holding classes at convenient centres, to which farmers and gamekeepers should be especially invited.

No less practical an end is *the prevention of the*

diseases of animals—another subject which forms part of the administrative work of the County Councils, and on which many fallacious notions prevail. The protection of trees and garden plants from injurious insects, the effects of different soils and manures on the various grasses, the habits of bees, poultry, and domesticated animals may be also mentioned as practical forms of "Nature-study" teaching which should commend themselves to farmers, gardeners, and students alike, and might well be included in the field of work of every County Council.

THE FACILITIES FOR NATURE-STUDY

BY PROFESSOR GEDDES, UNIVERSITY COLLEGE, DUNDEE

The plan and scope of this exhibition, the range of these conferences, are in themselves sufficient evidence that Nature-study is not, as some have thought, a "new subject", to be squeezed into already overcrowded programmes. It is a notable symptom, a potent leaven also, of that thorough-going transformation of our codes and programmes which is now happily in increasing progress.

It is plainly a part of the current educational revolution, which some define as from static to kinetic, others from analytic to synthetic, others from formal to vital. It is the coming in of a new movement in science-teaching; one no less important than the chemical and physical one of a generation ago, with its laboratories, or than the more recent technical one with its workshops; one not competing

with either of these, yet destined to stimulate and vitalize both of them. For a freshened outlook upon nature naturally leads to a more vital activity in it; that is to say, it produces a greater fitness for occupations also. Nor have the older literary studies anything to fear: it is the child-naturalist who is soonest ready for the nature poets; and the adolescent truant, weary of grammar, may be brought back to Virgil by help of Wordsworth or Tennyson, Thoreau or Whitman, through Jefferies' meadows, or by watching the bees with Lubbock or Maeterlinck.

The modern revival of philology and the humanities on one hand, the recent demands of scientific and geographical instruction on the other, are thus no real "conflict of studies"; they are a return towards their completeness and harmony—a true and literal renaissance of the Renaissance, a renewal of that living interest at once in Nature and in Man which was the glory of Greece. The apparent maze of specialisms has to be threaded, the difficulty of overcrowding has to be met; the latter by better pedagogic methods, the former by the correlation of studies. For both these purposes Nature-study and geography are of special service.

Here, then, we are literally entering into the fruits of the teaching of Rousseau, of the labours of Pestalozzi and Fröbel. Here, literally and concretely, is that "Return to Nature" which the first prophesied, which the latter practised; and this, which the last generation has in considerable measure adopted and applied in the kindergarten, is now and here becoming fully, even officially, organized for primary and secondary schools also. The kindergarten and

the university laboratory, the child's outing and the students' field-work, are thus at length practically meeting; and the concrete problem before us here is how best to unite these two poles of educational progress. This must not be merely in transient, however brilliant sparks, like this exhibition and gathering, which has doubtless to become periodic and regional. Our problem is how to organize this unity everywhere, throughout educational life—how to get from this new contact of the poles of thought—this completed circuit of culture, naturalist and human—a continuous daily current, freshening and vitalizing the everyday work, the ordinary literary and linguistic studies of the school—its arithmetical, mathematical, and mechanical lessons also—and so enlarging the direct termly yield of each of these studies, in measurable, notable percentage, just as the electric current is beginning to do for agriculture.

The mere headings of our daily programmes are enough to show that our movement is wide and general, one affecting the education of both sexes, of all ages, and of all countries. Yet, if it is not to decline and decay, as did the scientific education of the Renaissance, its new astronomy and geography alike dwindling into the (sham) "use of the globes", we must be indeed sure that our Nature-study is really a study of Nature. We must know and utilize all our facilities for this, preserve them, develop them as fully as we may.

That Nature-study begins with the child's awakening to the beauty of the country, to an interest in its life and change, its common things, its everyday sights

and sounds, we are all agreed. Yet since we teachers cannot but seek for clearer definition, let me not only start with "observation as the most enduring of the pleasures of life", but insist that what we are to observe is not merely the detail of the changing feast of impressions, limitless source of object-lessons though this be. What we aim at is a yearly, a daily, broadening and deepening appreciation of that Drama of the Universe, of which we are (alike individually and racially) but the awakening spectators. This drama, in our temperate zone especially, is the Pageant of the Seasons; and at this we have a certain limited number of opportunities of assisting—how many, how few rather, the nearest astrologer (nowadays better known as life-insurance agent or actuary) will promptly tell us, wager with us, and win. The nature-teacher, then, who has been watching the nature-drama year in, year out, appreciating this and that scene and element more fully with each renewal, can thus at best say to his pupil: "In Nature's infinite book of mystery I can a little read"; he can help him to recognize these and those of the *dramatis personæ*, and when to expect this and that scene of the goodly procession, it may be even how to enrich it.

Passing from the nature-pageant to the recipient mind, let us define our study. It is the habit of observing and thinking for one's self, and at one's best, without books or helps, in presence of the facts, and in the open air. Our ideal of training is thus like the appreciative musician's—in full mid-stream of impressions to concentrate on and isolate any one melody or harmony, any one sequence or co-existence,

yet without losing touch with the whole. Nature is thus the ultimate teacher and examiner, no less than examinee.

In the school of nature even more than in that of books we may thus measure our progress, literally year by year, at once in expanding knowledge, yet in widening unattainable perspectives—in developing skill of observing, power of interpreting, yet also in an increasing sense of the riddle of evolution, the unfathomed mystery of life. But the practical teacher, his official heads and organizers and critics also, his children and parents too, demand some tolerably definite guidance, some general method of gradation, say rather some inclined plane of progress, leading on year by year to this higher and fuller vision, this stronger and clearer grasp. Yet how shall we do this, avoiding as we must that formulating, codifying, freezing, fossilizing process which has befallen too many living educational movements ere now? Two methods here suggest themselves; both simple, almost trivial—for the first is but the observation of the child's progress, the second is but the recalling of one's own. Yet after all, the latter is the history of the individual best known to us; the former an abridged recapitulation for the race.

Here in this exhibition we have taken the work, not of professed naturalists, but of little children, and set it in the midst, and we visit it to learn from them. For the rest, let each teacher examine himself. Let him ask, What have been my own facilities for Nature-study at different phases of life and study? How may I now repeat these and increase them for my pupils? What have I personally seen and enjoyed?

What have I wondered at, questioned, and interpreted for myself? Then let us put these positive personal experiences together. We shall thus learn not merely much of what we have individually missed and lost, but how we may unite our respective advantages, and thus make up a more full and generous nature-curriculum for ordinary schools and ordinary children than even most professed naturalists, perhaps any, have ever had. Let me try then to open such a pooling and co-operation of personal experiences by the very briefest summary of my own, which have been going on happily year by year since early childhood, and this generally with the diversified interests of the old-fashioned geographer-naturalist, of the general educationist, rather than with the intense and lifelong concentration of the specialist upon any single group of phenomena. Yet to appreciate the essentials of many aspects of nature, to seek for their respective bearing on education and on social life, is in its way a special inquiry also; and the one which most concerns us here.

Let each of us then examine himself, and try to recall such autobiographic details as he can, of nature-awakening in childhood, then of widening experience in later boyhood or girlhood, with also too often its deadening and starving and stunting also. Next let us call up the intellectual, emotional, artistic, poetic arousal and uplift of adolescence; and then, and only then, such advantages as we may have had in higher education or in later life. Personally, then, my own autobiographic record runs back through many of the great aspects of Nature to homely and simple ones. It is good to have been among the

great mountains, to have roamed in the tropical forest, to have seen the icy and the coral sea, and to have watched and wondered at their Protean strangeness and beauty of life: it is good also to have had experience of museums and laboratories, libraries and herbaria, of zoological stations and botanic gardens; and this not only for themselves, but for their help and preparation for the fuller appreciation of each of these great nature-scenes in turn. Yet let no one say because he has not had all or any of these experiences (much less the means of giving them to his pupils) that he and they cannot be naturalists. Fortunate though the trained naturalist is in his relative wealth of opportunities, any nature-impulse and nature-appreciation he personally may have goes far back beyond these university and maturer experiences: it is ultimately a question of early, indeed earliest facilities of Nature-study in everyday life and experience—in boyhood—in childhood itself.

In so far as I may be a professor, an examiner, my laboratory and library, my garden and museum experiences are all of value, their geographic variety also. But in so far as I may be a *naturalist*, that is, a nature-student, I have often found my match, my master, among those who have had no such higher education or facilities at all. Grateful though I am to many teachers and masters, impulses and guides to Darwin, to Huxley and Hæckel, to Lacaze and Dohrn, to Dickson and Flahault—among the truest naturalists I have ever known there have been also at least three fishermen, two or three gardeners, a village mole-catcher, a town-shopman, an artisan, an

old soldier, even a city labourer. And in so far as I could personally still feel myself a naturalist at all among such masters, it was because of a child-experience more or less like theirs—because long before the experiences of zoological stations, of tropical seas, indeed as far back as I can remember, I have lain beside a little wayside pool and watched the water-measurers dancing on the surface, the caddises creeping on the sandy bottom six inches below. My botanical interests similarly go back, far beyond any of the greater scenes of Nature, to the nearest bit of woodland—a path among tall firs opening upon a little glade. Before ever seeing the great European gardens of science and of art I had learned the vital essential of anything I may now know or practise or teach of gardens, by trotting at my father's heels with a tiny barrow and helping him now to plant his potatoes and his primroses, or again to fight the weeds. I have had a good microscope and no lack of material this many a day; but never have I been richer or happier than with my first poor instrument, and a few small bottles of dirty water. And though I have not chanced much to cultivate entomology or mineralogy or palæontology, I feel myself even now ready for rapid initiation into any of the learned guilds, since in each I have had the true novitiate and know the "Open Sesame". That is, I have chipped out for myself quartz crystals from the quarry, agates from the cliff, fossils from the bed, and have captured at the right age my own box and a half of butterflies.

In this generous ministry of nature to the growing brain through each and all its sensory gates lies the

real stuff of Nature-study, of art-study, of much other study also. As for art and music, so for Nature; better no teaching than that without the "feeling of the subject". And if it be said that of such simple rustic experiences too many are and must be starved, let us answer that no child need be wholly starved. Even the poorest and townliest can have at least a window pot, can at times see something of the clouds and sky, can watch the sparrows, can see and sketch the passing horses, can attain to an intimate friendship with the nearest kitten. A "nature note-book", such as those initiated in teaching, I believe, by Miss Hodgson of the "House of Education", and now admirably carried on and individually worked out with not only scientific but artistic excellence under many of our best teachers around us, should henceforth also go without saying. Even with the Pageant of the Seasons no trifling acquaintance can be obtained when we interest the town child in the greengrocer's shop and the fishmonger's as much as in the confectioner's and toy-maker's. Even in this vastest of cities, apart altogether from its museums, its botanic gardens, its matchless "Zoo", there is a larger flora and fauna than most of us realize. Nowhere recently have nature-studies been more actively prosecuted or more successful than in the relatively poor nature-environment afforded by the vast city of Chicago; perhaps because in America of all countries "Where there's a will, there's a way".

To note, and map, and make the most of the characteristic excursions of our neighbourhood, park and garden and roadside; to know the meadow and wood and moor, the hill and dell and sea-shore, with

their characteristic seasonal aspects, their correspondingly changing web of life—thus begins the higher natural history for older pupils. This is no longer the mere collecting of specimens; it is not even the best of observing or recording of living things viewed singly. Beyond the "nature note-book" of his earlier years, the pupil advances to the work of "*regional survey*". This is fundamentally, therefore, a topographical, a geological, a botanical survey. Witness these admirable beginnings of a "Botanical Survey of Scotland" initiated by the late Robert Smith of University College, Dundee, and now continued by his brother, Dr. W. G. Smith of Yorkshire College, Leeds. Of this the first sheets, to be seen in this exhibition, will be found of no small value and suggestiveness to teachers. For such maps alike best suggest the various possibilities and facilities within reach, and the methods of utilizing them; they show how to record the results of our own survey, and how to stimulate the personal investigations of others.

Familiarity with our own regional elements once acquired, how we may next use it towards building up ideas of the larger world, of its landscapes and its vegetation, even of its occupations and its people, will increasingly suggest itself in the experience of every teacher. Thus Nature-study passes into geography, and this into the better understanding of history and literature.

Nature-study being primarily the Art of Seeing, for this there are facilities everywhere. How to find and how to use the school and city outlook, how to see and fix the changing beauty of things in sketch, and photograph, and memory, are all matters for special

studies such as those we see around us; and these all go towards building up the artist's outlook. These in turn prepare for an easy and instructive beginning of the meteorologist's outlook also. In the nearest gutter, in the shower, or by help of a tap and a sand-heap, we can trace or reproduce the wearing down of the earth—the geologist's outlook. With a few flower-pots and bulbs and pinches of seed we have true key-notes to the botanist's season-drama. Facilities for Nature-study then, there are everywhere; and the child needs only a little encouragement and guidance to make true and vital use of them—use which will increase year by year with his growth.

But of all the facilities which teacher and school board can provide, which central authority can encourage, let me plead for the school-garden. The school playground and bath, the workshop and cooking-room, the museum and laboratory, have each and all duly passed through the usual stages of development—first "fad", then luxury, then convenience, and finally necessity: the urgent need remaining is thus that of the school-garden. It is but a few years ago since French educationists, formerly so satisfied with their school premises and all else according to code, took this matter up, and now, in the 33,000 communes which make up France, there are 28,000 school-gardens. Russia has followed fast with 8,000 or more. In Wurtemberg and other parts of Germany, in the other Continental countries, in the United States also, this progress has rapidly begun. Yet this country has probably not yet a hundred in all her schools put together.

Even in the most spacious and undeveloped suburbs

of our great cities one still sees improvident school boards building vast and spacious schools, sometimes even beautiful ones, yet with only a paltry little railed and concreted "play-ground" (call it rather prison-yard, shoving-yard, *Hooliganeum*) bereft of life and beauty. I call such suburban boards improvident, and that doubly so: first, because the small temporary money-saving to the rate-payer affected by inadequate open space is very dearly bought by the loss to the children in health and happiness, in intelligence and morals; and second, because at the present rate of progress of educational requirements this extra land will yet have to be acquired, and necessarily at far greater expense. Yet even in the most limited, the best paved or asphalted, the most utterly sunless of play-grounds, there are ways and means of introducing flower-corners and flower-borders—as photographs at this exhibition clearly prove—while the usual fears of their destruction by play, or of interference with it, are both disproved wherever the experiment is made. Of the moral as well as intellectual and æsthetic advantage also, much might be said.

Grant us, then, this small fulcrum for our Nature-study efforts. Regular open-air excursions may now be taken for granted, with elementary nature note-books, also advancing towards regional survey; museum visits, school and individual collections also. Aquarium, vivarium, bee-hive, and formicary are all obviously practicable, as this exhibition also shows. But similarly it proves the possibility and the usefulness of the school-garden. On these elemental bases of nature-experience, and utilizing also the help of

such naturalist experts, such field-clubs and societies, such museums and libraries as may be available, we teachers will soon learn and teach each other, both independently and in gatherings such as the present, how better and better to arrange year by year for our pupils and ourselves, higher and fuller facilities for Nature-study.

SUMMARY

The vital points of this paper are:—(1) That Nature is a moving unity, a Pageant of the Seasons; not an abstract syllabus (and concrete ash-bucket) of "object-lessons", or even dissected "types"—subordinately serviceable, even necessary, though these may be. (2) That the essential strategic point for the nature-teacher is to awaken and develop in the child the wonder and joy of Nature before the intellectual analysis of it, and thence (3) to continue artistic and scientific education as far as possible in harmony, without undue isolation of either. (4) That for the beginner the Nature Note-book—for the more advanced pupil the maps and notes of an extending Regional Survey—will be found of the utmost practical benefit in utilizing and gradually systematizing the facilities of Nature-study, and in training the pupil for the various specialist outlooks, for studies of all kinds, even for corresponding occupations also.* (5) That foremost among immediate practical possibilities (taking excursions, &c., now for granted), and hence the essential desideratum—to be secured for country and suburban schools without delay, for town schools as far as possible—is the school-garden; always provided this be designed by or for art-teacher and nature-teacher together, so as to show to the full the living and seasonal beauty of its chosen plants; and be not a "cats' grave-

* See the writer's paper "Nature-study and Geographical Education" in *Scot. Geog. Soc. Mag.*, Oct., 1902.

yard" of labels, however orderly. The introduction of a flower-border, however small, into the present desert "play-ground" (more accurately prison-yard, shoving-yard, *Hooliganeum*) is pled for on all grounds, moral and technical as well as intellectual and æsthetic.*

THE SEASONAL STUDY OF NATURAL HISTORY

BY PROFESSOR J. ARTHUR THOMSON, MARISCHAL COLLEGE, UNIVERSITY OF ABERDEEN

My friend Professor Geddes has defined Nature-study, from the individual point of view, as the habit of observing and thinking for one's self, and at one's best, without books or helps, in presence of the facts, and in the open air. I take it that this is a good indication of our ideal in this direction, both for ourselves and for those whom many of us have the responsibility of teaching. We aim at seeing, understanding, enjoying, and practically learning from the whole natural world around us.

The mere statement of this aim makes it superfluous to speak of the advantages of Nature-study. I suppose we are all fully persuaded that Nature-study is a fundamental discipline, though it may not be the supreme one, and that, if it is rightly prosecuted, it tends to the culture of the senses, to brain-stretching, and to the development of those artistic emotions which form no small part of the joy of life.

The ideal of Nature-study is obviously a worthy

* Cf. *Introductory Course of Nature-study*. Syllabus of Cambridge Summer Meeting, 1902.

one, the advantages are obviously great, but I must confess to some misgivings on the subject—partly based on twenty years of experimenting. These misgivings have led me to restrict this brief paper to an illustration of that method—the seasonal method—which I have found to give the most encouraging results.

Allow me very shortly to hint at the nature of my misgivings.

I am afraid lest in our enthusiasm for Nature-study we under-appreciate the difficulties of the problem and the danger of doing the business badly. The danger is a very real one; for while the teaching of grammar, for instance, may be very bad indeed, one never hears of serious ill-effects, whereas bad education in nature-lore means a distortion of the child's outlook on the world. Given a man or woman with the mood of the naturalist—a country school-master who knows and loves the birds, a country school-mistress who knows and loves the flowers—then the course of Nature-study, now compulsory, is sure to be healthful. But given a teacher, who through over-work, or preoccupation with other disciplines, or lack of early training, is only coercively, not organically, interested in nature-lore, then I should fear that the results will be very bad indeed. To a certain extent this badness is the Nemesis of trying to educate too cheaply, of expecting too much from an underpaid teacher with a niggardly allowance for class-material, but this is surely curable; to a certain extent it must be the result of asking a teacher to instruct in a subject which he has never really learned, but this is being rapidly cured; to a certain extent it is the

result of codifying what should be the culture of natural inquisitiveness, but here again I think the prescriptions of the Education Department show great wisdom, allowing much latitude as to choice of subject, and advising that the Nature-course should be congruent with each particular environment.

My misgiving as to the possibly, and already, I fear, actually bad results of Nature-study in schools has led me to read this short paper, in which I join with others in recommending a method of Nature-study which I am convinced is the most natural, the most likely to win and sustain the interest both of the pupils and of the teachers. I mean the seasonal method, a course of studies following the march of the seasons which dominates the life around us and has us also in its grip.

A seasonal course of natural history is happily familiar to many. It has found its most famous expression in Gilbert White's *Natural History of Selborne*, echoes of which we find in Professor Miall's *Round the Year* and other admirable books. Whether we take Howitt's homely *Book of the Seasons*, or a somewhat technical naturalist's year-book like Russ's *Kreislauf des Jahres*; whether we put ourselves under Mrs. Brightwen's gentle guidance in her *Rambles with Nature Students*, or read *The Country Month by Month* by Mrs. J. A. Owen and Prof. G. S. Boulger, or follow the bulletins that come from Cornell, we find in all the seasonal order of treatment, and we have that satisfaction which is always associated with a method that is *natural*.

In *Spring*, emphatically the season of beginnings, of renascence, of young things, the pupils should study

water-babies, like tadpoles and larval gnats, and land-babies, like caterpillars. They should see, if possible, the re-population of the shore-pools and the ponds; they should hear, and have specimens to illustrate, the story of the elvers and the niners. It is not in the least difficult to hatch the eggs of the salmon and to watch the growth of the young fry from week to week. In a hundred different ways the fundamental fact of growth can be made real, though its mystery must remain unsolved. I may refer, for instance, to the exhibited drawings of the mouse or the bean-plant day after day.

Then there is the spring study of birds, recording the arrivals of the many migrants, getting to know them better before they become very numerous, the observation of nesting industries, the recognition of some of the songs, and the study of the habits of chicks and other young birds which can be got and kept without any cruelty. There are several good bird-records in the exhibition.

The objects of convenient spring study are practically endless, and there are problems at every turn; so that each lesson remains not as something finished, but only as a beginning capable of great development, one of the most important psychological conditions of successful teaching.

At all costs there must be some realization of the appropriate emotional tone. In our northern climate winter sets a spell upon life; but is not April the month of reawakening and rejuvenescence? The earth opens and the seedlings lift their heads, drowsily nodding (see some charming drawings in the exhibits); the buds open and the leaves unfold (see many credit-

able bud-studies); the flowers open and the newly awakened insects visit them: it is *the* time of opening—of eggs and of the womb, of the song of birds and of the heart of man. I see in the exhibition a rough, but, to my thinking, very admirable youthful drawing of the chick escaping from the egg.

I mean, in all seriousness, that unless in our studies we can do something to regain the vividness of outlook of simpler times—expressed, for instance, in the story of the return of Proserpina or in the reawakening of the Sleeping Beauty—then we are, in our Nature-study, in great part missing the mark. We are losing what is perhaps most important of all—what the artistic mood calls “a feeling of the spring”. I was interested to see from one of the London schools an infant-class chalk illustration headed “The Story of Persephone”.

In *Summer*, which is the period of greatest animal activity, there should be some study of the animal industries—of hunting, fishing, and so on; of the making of dwellings and shelters, leading on to an architectural climax in the bee-hive and the termitary; and of the many storing industries, from squirrel and beaver to bee and ant, which lead our thoughts on to autumn. Collections of wasp-nests and the like can be readily made in the country; even in town a school ant-hill is readily procurable from dealers if the hard-driven teacher has not time to make one for himself. A few lessons on a real ant-hill will be obviously worth many miles of talk. Even when the school board or the governors think they cannot spend the money on such luxuries as ant-hills, there might be one for each centre, which could be carried from

school to school with a guard of honour from among the children. I may direct attention to the Liverpool School Board's method of having travelling collections. In summer, too, it would be most appropriate to discuss such curiosities as carnivorous plants, such fundamental facts as the interrelations between flowers and their insect visitors, or such interesting enquiries as the importance of animal industries to man—illustrated, for instance, by earth-worms and bees. In connection with industries, I may refer to the numerous exhibits of bees at work, which, if kept within due limits, seem to me useful in places where the more natural hive-life cannot be readily studied.

In *Autumn*, the fall of the year, when school work recommences, we have to deal with the problem of restlessness before settling down to steady work, and this would be the appropriate time to study the autumnal restlessness in various animals—for instance, the autumnal gossamer showers which Jonathan Edwards, as a boy of thirteen, enquired into and understood so many years ago. This would be the time to return to the perennially interesting problem of migration, whether in the birds who are now leaving us, or in other cases, like salmon. It goes without saying that merely informative statements about the migration of birds are not what we want; but some of the bird-records in the exhibition show that this level is being transcended.

A return should be made to the storing of food-supplies by animals and in plants—the great fact that connects the abundance of summer with the scarcity of winter.

Caterpillars on the search for suitable refuges,

chrysalids already dormant in their quiet resting-places, snails with their shells sealed up in the recesses of the dry dyke, frogs buried in the mud of the pond, and so on, may be found to illustrate vividly that to many animals autumn is literally the evening of the year, when they go to sleep and await the good morning of another spring.

Here, again, there should be cross reference to the study of plant-life—to the withering and fall of the leaves, to the autumn fruits and the scattering seeds; and inter-relations should be again illustrated by the way in which earth-worms use the fallen leaves, or by the rôle of birds and other animals in the dispersal of seeds. Of these facts there are in the exhibition three or four very praiseworthy illustrations.

My particular examples might be multiplied indefinitely; my point is, that by a few real and well-illustrated studies we have to try to get our scholars to recognize and feel the various notes of the year's curfew—notes of decay, of rest, of preparation, of promise, and much more.

To put my point concretely, I feel strongly that there is something wholly condemnatory of our methods when school children, living by the banks of a river rich in salmon, grow up unaware of the broad facts regarding the migrations of these fishes. I feel strongly that there is something seriously wrong when school work fails entirely to shed light, for instance, upon one of the most impressive sights which tens of thousands of country children see on their way to school in autumn—the innumerable multitude of spiders' webs and threads made conspicuous on hedgerow and heath by the morning

moisture. The day is surely past when we are content with leaving this marvellous impression simply as a riddle in the child's mind, which school at least will never help to solve. And my further point is, that the children should be led to face this and similar problems, *when the facts are there*.

A critic has told me that my sketch of a seasonal course, which I published as an appendix to a very different kind of course for adults in our northern university, is pretty, but impracticable. I venture to deny the critical part of this comment, for I know of seasonal courses which have been conducted, wisely and well, with the slenderest resources in the way of grants for material, indeed with none at all. I do not mean that the seasonal method is at first *the easiest*; it is only psychologically that it follows the line of least resistance. A much *easier* plan is to give lessons on such material "as comes to hand", whether relevant to the times and seasons or not; a still easier plan is to have no material at all, except perhaps diagrams, which are apt to be deadly dull. The seasonal course requires preparation, but it is bound to improve as year follows year. I think the emphasis on seasonal studies is one of the most striking general facts of our exhibition.

After all, what I am insisting on is nothing very ambitious—that *we should have the real things before our scholars' eyes at the right time*. And in autumn it is not much to ask—a handful of leaves of vine, virginian creeper, bramble, and bird-cherry; a plate of autumn fruits, and some tubes with dandelion down and splitting broom-pods; the nuts from one of the squirrel's many stores; the rowan-tree midribs from

one of the earthworm's burrows; a shelf of birds' nests whose tenants have crossed the seas; an empty wasps' nest; and a skein of gossamer, to see how long it will last.

With these to begin with, we have material for many pleasant studies, and problems for a lifetime of thinking and research; but without these, or their hundred-and-one analogues, our natural-history lessons will certainly be seasonally inappropriate, and are likely to result in little more than vanity and vexation of spirit.

Refraining from further illustrations, I wish to sum up the strongest arguments in favour of the seasonal method of study—arguments which have been strengthened by what I have seen of school work in this exhibition.

In the first place, the seasonal method is doubtless racially primitive. Before all books and schools the children faced the problems of their surroundings as they came, reasserting themselves with insistence year after year in the ceaseless seasonal pageant. One cannot read a paper like Professor Chamberlain's *Primitive Nature-Study*, or a book like Mr. Frazer's *Golden Bough*, without being impressed with the grip that the march of the seasons had upon simple minds and undulled senses, without being a little ashamed, to take a small obvious case, when we contrast some of the picturesque Indian names for the months, instinct with reality, with our dull names, say, for the four months after August.

In the second place, though I cannot at present elaborate the point, the seasonal method of study is in harmony with the earliest education of the child,

during its first five plastic years, when it gets its first impressions—how deep and lasting, who shall say?—of the spring flowers, the summer heat, the harvesting, and the birds in the snow. I firmly believe that there is profound biological and educational truth in Walt Whitman's poem of "Appreciations": "There was a child who went forth every day, and what he saw became part of him for a day, or a month, or a year, or a stretching cycle of years". As Blackmore says in one of his novels: "It's the thousand winks of childhood that widen into one clear dream of age".

In the third place, the seasonal method of study is in correspondence with the grip which the seasons have upon us all—physiologically and psychologically—especially in the country. Our life is rhythmic, and it is punctuated by the seasons. The trajectory of our year's life is not uninfluenced by the curve of the biosphere around us, and by the still wider sweep of the cosmosphere which is around all. "As is the world on the banks," as Matthew Arnold said, "so is the mind of man"; and the impressionable child mind is at any given time most likely to be educated along lines which are in harmony with the actual aspect of nature around it.

In the fourth place, the seasonal method of study—primitive for the race and for the individual, justified physiologically and psychologically as sound, works well in practice. It has the particular advantage of being always relevant to what the pupils are seeing and feeling out of school. It facilitates the most desirable co-operation of the class after hours and on holiday rambles in securing appropriate specimens for actual work. It links itself naturally to concurrent

studies in other subjects, *e.g.* in physical geography, where the pupil learns how "the seasons" come about, or to studies in folk-lore and poesy, which are saturated with seasonal influence. And I am not ashamed to say that I attach some importance to the fact that the games of the children are in some measure seasonally conditioned.

I have presupposed—and it is still a big postulate—that the studies I have just hinted at must be very objective, and that they must be socratic or heuristic rather than directly informative. But there is at least one other great desideratum—that they be vital, and to be vital they must be more or less seasonal.

My general conclusion is, that lessons in natural history—which means lessons in the beautiful, the marvellous, the dramatic, lessons as to growth and progress, as to industry and struggle, as to loving and living—will, if taught by one who knows, up to the limit of his or her teaching, and is unafraid to confess ignorance, who has also a healthy reverence both for the known and the unknown, cannot but be an educational discipline of the highest value. But this value will have its virtue enhanced when the teacher is one who has and can communicate what Meredith calls "a love, exceeding a simple love, of things that glide in rushes and rubble of woody wreck".

I cannot sit down without saying that I have been greatly delighted and encouraged by what I have seen in this exhibition, or without expressing, if I may be allowed to do so, my congratulations to the secretary and the executive, on the success, both actual and prospective, of their admirable undertaking.

LOCAL MUSEUMS AS AIDS IN THE
TEACHING OF NATURE-KNOWLEDGEBY MR. HENRY COATES, F.R.S.E., PRESIDENT OF THE
PERTHSHIRE SOCIETY OF NATURAL SCIENCE*(Abstract)*

My object in bringing before you the subject of local museums is to endeavour to show how such institutions may best be made useful both to teachers and scholars in the pursuit of Nature-study. I am well aware, of course, that the primary aim of this new addition to the education code is to lead the pupils to observe natural phenomena for themselves, at first hand, in the field. At the same time, I need not remind those of you who are naturalists, or teachers of natural science, that there is no subject in which the assistance of museum illustration is of greater value than it is in the study of natural science, provided always that the museum illustration is of the proper kind.

We were reminded yesterday by more than one speaker that one of the most important features of Nature-study ought to be its local character; that is to say, the pupil ought first to be taught to comprehend the topography, the geology, the fauna and flora of his own district. It is just here that the value of a properly-equipped local museum comes in. Those of you who take an interest in museum matters will doubtless remember how constantly the late Sir William Flower, Director of the Natural History Museum, insisted on the importance of having good local museums in all the principal provincial centres,

and even in comparatively small country towns. His reason for this was twofold: first, because it is impossible for these smaller centres to compete with the metropolitan museums in acquiring complete general collections, and, second, and more important, because it is the first duty of these centres to make known the natural products of their own districts. As yet comparatively few centres have followed the advice of Sir William Flower, but I feel confident that if the local educational authorities, both managers and teachers, make the want sufficiently felt, it will be supplied in time. I would hope also that, in course of time, the state may recognize the educational value of local museums in such a way as to make some provision for their maintenance, either out of the imperial or local funds provided for educational purposes.

The remainder of Mr. Coates's paper was taken up with a detailed description of the plan of arrangement of the Perthshire Natural History Museum as a typical local museum, and with a description of the various ways in which that museum had lent its aid to the schools of the county in furtherance of the teaching of nature-knowledge. In particular he described the scheme of essay competitions for school children which had been in operation in connection with the museum for some years, the subjects prescribed being suitable for the teachers to take up in their nature-knowledge teaching. The museum had also supplied a want in the lending of specimens to the schools, in providing books on natural history subjects, and as affording means of demonstration for teachers' classes.

In conclusion, he pointed out that while it is impossible for every elementary school to have a museum of its own of such proportions as to be of any practical value, it ought to be perfectly possible for at least every county to have a thoroughly-equipped local museum.

SECOND CONFERENCE, Friday, July 25

CHAIRMAN: THE LORD STRATHCONA, G.C.M.G., HIGH
COMMISSIONER FOR CANADA

LORD STRATHCONA said:—No study is of greater interest than that of Nature, and the habits of observation acquired by this study, together with the consequent brightening of the mental faculties, cannot fail to be of the greatest benefit to the young. On the other side of the Atlantic, and especially in Canada, we are fortunate in having in Sir William Macdonald one who has devoted himself to promoting education in all its best forms, and has given for higher education in Canada a sum of not less than three-quarters of a million sterling. He has, moreover, also given a large sum for the purpose of promoting Nature-study, and, happily, he has had associated with him in this object Professor Robertson, Commissioner of Agriculture for the Dominion, a gentleman who has already done much for the agricultural interests of the country. Both in the United Kingdom and in Canada we have been content for many years to go on in the old grooves, hardly realizing how much circumstances have changed, and I fear we have not devoted sufficient attention to the necessity of awakening the interest of children in the knowledge of things

around them. Admirable improvements in this direction have, however, now been made in Canada. The question was taken up even earlier in the United States, and it is a matter for congratulation that Dr. Bickmore, who has done so much for the education of his own country, is present at the exhibition, and will take part in the conferences. In Canada education rests with the provinces and not with the federal government, and of late the provinces have been actively at work on the whole course, from the elementary schools up to the universities. I am glad to say that the system which now prevails is held to be not inferior to that of the mother country, and the universities in Canada can take their place abreast of those in England. In our different provinces, thanks to the great assistance rendered by Sir William Macdonald, we have been able to attach technical shops to many of the schools, and we have also introduced instruction and training in agriculture. Model farms have been established by the government in each of the provinces, and these have proved of the greatest benefit to farmers in teaching them what are the best grains, the best vegetables, and the best fruits for production in the very varying conditions of the Dominion. Even within the last three or four years the study of Nature has brought about considerable improvement. Young as well as old are taking greater interest in their work, and Canada is now producing foods equal in quality to any produced in England.

NATURE-STUDY IN ELEMENTARY
EDUCATION

BY PROFESSOR C. LLOYD MORGAN, F.R.S., PRINCIPAL
OF UNIVERSITY COLLEGE, BRISTOL

To the question, "What are we to understand by Nature-study?" I would reply, "A process by which simple natural objects and events acquire *meaning*".

Those who are interested in the early stages of genetic psychology, those who endeavour to trace the first steps which intelligence takes towards a practical knowledge of its environment, are impressed by the fact that the method by which experience grows is the acquirement of meaning. The newly-hatched chick sees here a brown looper caterpillar, there one ringed with orange and black. Instinctive tendencies prompt it to peck at both. The one is found to be palatable, and is promptly swallowed; the other proves nauseous, and is rejected. For the future, just in so far as memory in its simplest form holds (and in these matters and in this form it holds with remarkable tenacity), each has acquired meaning. The appearance of the one means "nice"; that of the other means "nasty". The environment is so far differentiated in accordance with its meaning for the palate. The essential feature of this process, which I have illustrated by a very simple example, is that meaning is acquired by the bringing together and correlating of the data obtained through different senses. Sights or sounds have no meaning until they remind us of a wider experience than is gained by seeing or hearing alone:

Now, this acquirement of meaning is an essentially practical process, and is effected by what we may term investigation, that is, the application of all the available senses to the object, so as to test in all possible ways its nature, and to ascertain its meaning for future guidance. Watch any young animal and you will see how large a proportion of its waking hours are occupied in gaining a practical knowledge of its surroundings by persistent investigation, through which the several objects acquire fuller and fuller meaning, so that the behaviour of the animal towards them may be suitably adjusted. And to this end, that the application of the process shall be thorough and persistent, there is inbred in all animals capable of intelligent progress that curiosity which is the mother of investigation.

But in no animal is this inbred spirit of curious investigation more firmly implanted than in the human child, and in accordance with the definition I gave at the outset, Nature-study, as a factor in elementary education, may be regarded as the application of rational guidance to a process which has its foundations deeply laid in the instinctive tendencies of animal life.

Of course, we who believe firmly in the value of Nature-study, and who desire to organize means for its further development, must expect to be regarded as faddists; we shall no doubt be asked: "What is the use of it?" To my mind a more satisfactory form of the question is: "What is the good of it?" Use so often demands an answer in terms of *£ s. d.* Sir Andrew Ramsay was wont to tell of a parent who brought his son to study geology at the School of Mines, and who

said: "Now mind you, professor, I don't want my boy to learn about stratified deposits or fossils, about upheaval or denudation, about limestones or sandstones, crystals or minerals, or any such useless stuff. I want him just to be taught how to find gold and silver, copper, and other precious metals or gems—in paying quantities, sir, in paying quantities." That was the good man's fixed idea of the use of geological study. It was to open up a short cut to affluence. Now, whatever may be said for or against the strictly utilitarian value of Nature-study, we must contend that the good of it rather than the use of it is the primary question. We must base our claim for its further and fuller recognition on its educational value from the general and not merely the technical point of view.

The Board of Education fully recognizes the fact that Nature-study in primary schools should not be organized on narrow, technical, or utilitarian lines. In the introduction to the recently issued specimen courses of object-lessons on common things connected with Rural Life and Industries (1901) this is made perfectly clear. We are told that "In arranging plans of instruction for rural schools, it is important at the outset to emphasize what should be avoided. It is not desirable to attempt a definite course of instruction in the principles of agriculture, or to teach the art of farming. The aim of primary education being general and not professional, it is as undesirable as it is impossible to attempt to provide a special form of training in primary schools." What, then, is the end in view when Nature-study is given in rural schools? It is, in the opinion of those who drafted the introduction to specimen courses, "that children

who live in the country should, when they leave school, find themselves in sympathy with their surroundings, and should be able to take an intelligent interest in the pursuits and occupations which are open to those whose lives and homes are in the country". Or as Sir George Kekewich said in Circular 369, under date June 25th, 1895, such object-lessons "make the lives of the children more happy and interesting by opening up an easily-accessible and attractive field for the exercise of brain, hand, and eye. It gives the children an opportunity of learning the simplest natural facts, and directs their attention to external objects, making their education less bookish. It further develops a love of nature and an interest in living things." With the general tenor of these remarks we are presumably in complete sympathy. The value of Nature-study lies not chiefly in the imparting of a particular kind of information; it consists not so much in what is taught as in fostering an attitude of mind, an attitude of observational alertness, of enquiry into the meaning of familiar facts in garden, field, and hedgerow, of susceptibility to the subtle influences of Nature in her winter sleep, her vernal awakening, her summer maturity, and all the cycle of her changing moods.

I said just now that the value of Nature-study does not chiefly lie in affording a particular kind of information. If we compare human education with the practical training of animals for their life's work, one salient distinction stands out boldly. With animals things acquire meaning only through direct and first-hand experience; but with children this direct experience may and should be supplemented by infor-

mation conveyed through the medium of language. The danger is, however, that what should be a supplement should become a substitute. One cannot too strongly emphasize the fact that the only means, in the early stages of education, by which things acquire real and valid meaning in primary experience is actual investigation, using this term as inclusive of the employment of all the senses through which experience is gained. Description, as the supplement of this investigation, is in adaptation to the needs of social beings who communicate with their fellows. But information as merely a substitute for investigation is of little, if any, educational value. I take it that our advocacy of Nature-study embodies a protest against mere information; but we must none the less be alive to the fact that there is a real danger of its degenerating into mere talk about natural objects on the part of the teacher and an attitude of passive receptivity on the part of the pupil. That we should regard as not the substance but the shadow of genuine Nature-study.

The movement which we are here met to foster and develop forms part of that reform of educational procedure which has now been in progress for many years. The introduction of the teaching of science has been the new leaven. But Nature-study, though it should afford an introduction to science, and though it should be under scientific guidance, must be regarded as independent of, or at most preparatory to, the generalizations of science which the youthful mind cannot as yet grasp. We have to realize the patchiness of the child-mind; not only its limited store of experience, but the fact that the several items of

this experience have not coalesced into that correlated and interrelated system without which even the beginnings of science are impossible. And herein lies a second danger, against which we must be on our guard—the danger lest the teacher, who is, let us suppose, a scientific botanist, should grow impatient of fostering the powers of observation and affording facilities for simple investigation, and should endeavour to inculcate general laws and principles beyond the comprehension of the child.

How far technical terms are to be introduced must depend on the tact and judgment of the teacher. There is no more difficulty for the child in the terms pistil, stamen, or petal than there is in the words honeysuckle, dandelion, or buttercup. If the child recognizes a pistil, there is no valid reason why he should not be taught to call it by this name to which the more comprehensive technical significance will in due time become attached. But a whole battery of technical terms, suitable to a botanist by profession, may seriously overload the youthful digestive organs.

Among those who advocate the desirability of laying firmly, in the early years of life, the foundation of a more adequate knowledge of the phenomena of the world in which we live, there are two sections. The constituent members of the one section urge the value and importance of those Nature-studies which we are here met to encourage. The constituent members of the other section lay special stress on the value and importance of elementary experimental work in physics and chemistry. And unfortunately the views of the two sections are to some extent at variance. Granted, however, that both afford a valuable mental

training, and that each should find a place in our educational system, I am of opinion that Nature-study belongs to an earlier stage, experimental work in physics and chemistry to a later stage, of that mental training. It is urged by the advocates of physical science that the experimental course is more nicely under control, more exact and quantitative, and lends itself better to systematic treatment. But it is precisely on these grounds that I think it should follow Nature-study, which is freer, more superficial, less exact, and less systematic. For the natural course of psychological development is from simple observation to experimental work, which is observation under controlled conditions; from the qualitative to the quantitative; from the more superficial to the deeper aspects of nature; from the relatively unsystematic to the relatively systematic. Furthermore, the concepts which lie behind even the simplest experiments preparatory to a right understanding of chemistry and physics are exceedingly complex; and until these concepts begin to take something like definite form, the real significance of what they are doing is not sufficiently obvious to attract and hold the interest of little folk. While, therefore, I would not be understood to say anything which might seem to imply that I undervalue the importance of careful and accurate weighing and measuring and the conduct of simple chemical experiments at the appropriate stage of mental development, I am convinced that it should be supplementary to and not a substitute for that Nature-study which we advocate.

A word or two may here be said, in passing, with regard to the application to Nature-study of the

heuristic method, that is, the method by which the learner is, so far as possible, allowed to draw his own conclusions and to learn for himself instead of being merely told by the teacher what he is to learn. The extreme advocates of this method contend that it is the method of research, and imply that it should also of necessity be the method of education. I am not prepared to accept the implication, at any rate in its extreme form. I readily admit that the teacher of tact and judgment should give free scope to the child in drawing his own conclusions, and do all in his power to encourage originality. But originality is a rare gift, while imitation is almost universally found in children. And the two have a closer relation than is commonly supposed. So far from being antagonistic, we may even go so far as to say that imitation is one of the surest stepping-stones to originality. Putting aside, perhaps, a few cases of rarest genius, we shall find that most men who have made their mark in letters, art, or science have passed through an imitative phase as a definite stage in their development. We must not carry the heuristic theory to extremes, but must remember how potent is the influence of example, how great is the value of wise demonstration.

Now, if Nature-study is to be regarded as affording varied material for investigation under skilful guidance, and, through practical investigation, for the acquirement of serviceable meaning, it must be regarded surely as of primary importance in the early stages of education *for all classes*. In the case of children of the upper and middle classes, whose school life generally begins later than that of the children of the

masses, it is to the mother or the governess we must look to undertake the first stages of Nature-study. Her task is, in many respects, easier than that of the elementary teacher, since she can give more detailed attention to her fewer pupils. She can more fully utilize Nature-study in fostering the individuality of each child. No two children will see the same thing in quite the same way. For what they see depends not only on what is before the eye, but also on what is behind it; and what is behind it is determined by past experience. It is so easy to make a class of children repeat our description of a thing parrot-wise, and so difficult, where there are a number of children, to give their individuality in observation and description free scope, that the governess with her few pupils works at a distinct advantage. But how rare it is to find a governess who is in any adequate degree fitted to guide children in these matters. How rare it is to find parents who weigh such qualifications in the balance in the selection of a governess. I am so fully convinced of the supreme importance of training the faculties of observation and the habit of sensory alertness in the early plastic and impressionable period of childhood—I hold so strongly the belief in the desirability of cultivating the sensory memory and storing the mind with faithful images of natural objects and scenes—that I am disposed to claim for Nature-study a foremost place in the early stages of education *for all*; and I regard no governess as fitted for her work who is incapable of guiding her pupils in the paths of natural observation and of inculcating by example a spirit of careful and patient investigation. And these Nature-studies may be profitably asso-

ciated, on the one hand, with clear and simple expression in the mother-tongue, and, on the other hand, with faithful and accurate representation in drawing. For I am convinced that Nature-study must be so prosecuted as not only to be a stepping-stone to science, but also as a means to literary and artistic culture. Rob literature and art of all that is the outcome of Nature-study, and how incalculably the poorer they must appear.

At the stage to which we have so far reached, the essential thing is the adequate training of the teacher. This has already been alluded to by several speakers at this Conference, and will receive further consideration at the hands of Professor Miall and others. Provision is now made in the syllabus of training colleges for some preparation in the subject. But at present there are very few teachers of eminence—Professor Miall and Professor James Arthur Thomson among them—who have given the matter the patient thought it requires, or endeavoured to work out practical courses of instruction. What we may call the stereotyped courses of academic instruction in zoology and botany do not meet the requirements of the case. I will not, however, further trench on ground which will be occupied by others. I will only say that the training of teachers in the future must be adapted to the new requirements. But in the meanwhile there is a large body of teachers, already in the practice of their profession, whose period of formal training is past and over, who nevertheless feel that they have opportunities of observation in rural districts of which they are unable to take full advantage, not through lack of inclination, nor through lack of interest, but

through lack of guidance and the need of a stimulating influence. For them short courses of well-illustrated lectures, even without direct contact with natural objects, may be of no little service. They may there be told what to observe, how to observe, or how to extend the observations they have already made. They may gain information as to how and when suitable material for examination and study may be obtained. Their interest in nature may be stimulated and their eyes may thus be opened, so that they may see what they have passed a thousand times unnoticed and unperceived; for not all that falls on the retina is seen, and there is no quickener of the mental vision to be compared in its efficacy to genuine interest. Fortunate, indeed, will they be if they catch from the lecturer some sparks of the enthusiasm which gives freshness and charm to what the mere dullard might call trivial and commonplace matters. But they must remember that the educational value of such lectures will really depend upon the extent to which the teachers who attend them utilize the guidance they receive in making observations for themselves, and seeing in garden, field and hedgerow, in pond and marsh, or by the streamlet's margin, what the lantern-slide or the lecturer's description has only taught them to recognize. They must remember that in the absence of a direct first-hand practical acquaintance with natural objects and processes they can get no real knowledge *of* them, though they may be able to retail a certain amount of information *about* them. And I have already contended that information should only play the part of valet to his lord and master—investigation.

Let us take every means in our power to open the eyes both of teachers and children, that they may be no longer blind to the beauty and interest and varied meaning of nature. Then we shall not hear such remarks as were overheard in a rural district a short time ago. Two children met at the school door, and one was describing what she had seen in the village street. To whom the other regretfully said: "But I came across the fields, and so there was nothing to see."

HOW TO BRING CHILDREN INTO TOUCH WITH NATURE

BY MRS. FRANKLIN, HONORARY SECRETARY OF THE
PARENTS' NATIONAL EDUCATIONAL UNION

It gave me great pleasure to hear Professor Lloyd Morgan so strongly emphasize the fact that we should try to seek the *good* that can be derived from Nature-study, and not the *use*. It makes me somewhat sad to notice how so many great authorities look upon Nature-study either as a means of developing observation, or as an introduction to science.

If Nature-study is treated as a handmaid to something else, she will remain content humbly to wear her cap and apron, make her bow, and *be* nothing else. Nature-study is one thing, science is another; though each has its place in education, the one should not be confused with the other.

I also feel that Professor Lloyd Morgan's remark, that information *about* things is not science, is one that cannot be too much reiterated. So many people

act as if, for example, they thought that teaching the life of Botticelli or Giotto was teaching a child how to draw. Speaking as a parent, I should like to put in a plea for that much-neglected individual. Professor Lloyd Morgan spoke of the power that was in the hands of the governess in the early years of the children's lives; surely there is a greater power in the hands of the children's parents. Still, it is only too true that they in their ignorance very frequently crush out in their children the innate enthusiasm and desire for knowledge. As an example, let me quote the following conversation overheard on a coach. A lady and three gentlemen, obviously cultivated people, passed some willows in flower. Said the lady: "What are those?" Said the first gentleman: "I don't know." Neither did the second gentleman. "The local name is palm," said the third gentleman; "I don't know their proper name." "But", said the lady, "what do they turn into?" Third gentleman, who was the best informed: "Oh! they turn into trees, very nice trees." Lady: "But have they any leaves?" Third gentleman: "Yes, nice green leaves." Lady: "The children say that they were told at school the other day that all trees have some kind of flower; is that true?" Third gentleman: "Well, you might suppose so, but of course it isn't so." Lady: "Oh! I thought they couldn't have understood what they were told. I shall tell them what you said."

Parents are too much inclined to think that it is in their province to pick and choose exactly what children should learn. When one looks upon education as the science of relations, and that I consider is a very inspiring thought, one realizes that the children's

feet are set in a vast room, and it is not for us to cramp them, it is not for us to say what portion of knowledge, these heirs of all the ages should be deprived of. They have affinities stretching towards every relation, and surely not the least towards nature. Believing, as I do, that it is in the parents' hands to do much to prepare the way for the teaching that the children will afterwards get in the schools and to help them to know and love nature, I should like to give a few practical hints as to the way I feel this may best be done. To begin with, one must have enthusiasm and love for nature, and this need not be forced or put on, for I hold that there is hardly anyone who definitely tries to come into touch with nature who does not become an enthusiast and a true nature-student. Such enthusiasm is not sentimentality; it is a reverent admiration of what is outside and beyond us, and there is nothing which is so easily caught by the children and which can give them greater joy. Then I think we should be prepared to give the children the common names of the flowers and birds, &c., they meet. I was glad to hear Professor Lloyd Morgan emphasize the desirability of not going round a name, but giving the children the actual name when asked for. The names of flowers, and even the scientific terminology, are not more difficult than "Elizabeth" and "Caroline", the names of many of the people the children meet.

I know there are people who consider that if we readily give the children the names of natural objects, they will be satisfied and remain content with knowing nothing more. But is this found so in experience? We are always anxious to know the names of the

people whom we come across. If we go to a dance, or a theatre, we immediately notice any individuals whose names we know, even if they are only the people who live round the corner. They stand out as individuals, as entities, and become, as such, more interesting. Moreover, knowing their names do we not notice gradually their clothing and general appearance? And is not this a natural introduction to knowing more about them? So with regard to natural objects, a flower whose name has once been identified stands out in a field as a friend to be recognized when met again. I remember one child herself remarking on this, and saying how curious it was that she had always passed unnoticed by a flower which she never failed to see after having once been told its name. A little boy of seven, when out on a country ramble, noticed a sedge. He came home and asked his teacher to tell him its name. She could not recognize it from his description, so he drew it on a blackboard. He had sufficiently mastered its shape and form to draw its portrait sufficiently well for it to be identified.

Gradually, too, children who have gained an intimate relation with nature will themselves classify the various flowers; they will group together those that shut up at night, those that turn towards the sun, those that are fertilized by wind or insects, &c. &c., and this sort of thing is true science. Still, I would entirely endorse what Professor Lloyd Morgan said as to the inanity of withholding the knowledge gained by those who have gone before us, and of considering it necessary for each child to start as if he were the first in the world and had to discover everything for

himself. There is a happy medium which the wise parent should know how to reach.

I once came across some cultured, educated young women who had spent all their early days in a beautiful country home in Surrey, but to whom a sprouting acorn was an unknown treasure. They were most interested in it when they saw it; it was not that they did not care for such things, but for want of a little wise guidance they had grown up in complete ignorance of nature. The children's natural love of order and classification, which I think is innate in most human beings, will also lead them to enjoy the more truly scientific classification of objects as the years go on.

Another means of helping children to see is to encourage them in what Miss Mason, in her book *Home Education*, has called "Sight-seeing". Let them look well at a view, and shut their eyes, and then describe what they have seen. If several of a party do this, there is a great joy in comparing the different descriptions, and the children's power of narration is helped as well as that of sight-seeing. As Ruskin says: "Thousands of people can talk to one who can think. Thousands of people can think to one who can see, and seeing clearly is poetry, prophecy, religion."

Also, when we are out on a country walk we can let the children go ahead on a "voyage of discovery", and, returning, describe some tree or flower they have met. The accuracy of the description will be tested by the power of the adult companion to guess what the object was. Still, the mother must not forget that, especially for the young child, a judicious leaving-alone is a fruitful means of helping a child to

come into relation with nature. We should not think of talking all the time that a child is with us at a theatre. Why should we always intrude ourselves when he is trying to learn some of nature's secrets?

Then, for town children especially, one should not neglect such trivial aids to Nature-study as the gathering of tree-twigs with leaf-buds, germinating acorns and chestnuts, and the rearing of frog spawn, &c. To watch the unfolding of a leaf and flower in a tumbler in the nursery is a good introduction to the joy of seeing the bursting leaf-buds in the gardens on the children's walk.

I am not a very great advocate of too much collecting, though I think for the quite little ones it forms a help to remembering names, and there is great training in neatness, &c., in arranging the specimens. If collections are made after the children are seven or eight, I think it is well to adopt some definite method, as is well exemplified in some of the best collections in this exhibition. Also, it is advisable for different members of a family party to collect a special genus; this adds much to the interest.

I have dwelt specially on flowers and trees, but I think we ought to be equally careful to introduce children to an intimate and living knowledge of birds, insects, and, in fact, all natural objects. In some such way as this the mother will be using these early years, which are so specially her own, in giving children a joy in nature that will become a possession for life, and meanwhile they will have learnt to observe, not by having their powers of observation deliberately trained, but *by* observing, just as we learn to walk by walking.

Perhaps everyone here will remember the stress that Sir James Paget is said, in his *Life*, to have laid on the value of the early taste for botany which had been given him by his mother, and to which he considered most of his subsequent success was due. I venture, too, to think that in several cases the excellence exhibited by some of the collections here is due as much to early home influence as to the teaching at the schools.

THE TEACHING OF NATURE-KNOWLEDGE IN URBAN SCHOOLS

BY MR. H. MAJOR, INSPECTOR TO THE LEICESTER SCHOOL BOARD

I shall probably best meet the views of those who have promoted the installation of this exhibition of Nature-study objects if I confine my necessarily brief remarks to the subject as already carried out into practice in the schools under my supervision, and as illustrated by the exhibits sent up from Leicester. I would make a further limitation by confining my remarks to work done in the standard departments, leaving some more expert hand to deal with infant schools. The exhibition shows that it is in the direction of these standard classes that the greatest weakness exists.

Nearly twenty years ago I was thoroughly persuaded that the education given in elementary schools was too oral, too aural, and too little visual. Names of things, rather than their properties and mutual relations, were the be-all and end-all; ears rather than

eyes were the ultimate court of appeal; and memory rather than reason was made the avenue to the temple of learning.

I felt that the first step to remedy this deficiency would be to fall back upon observation, and this the observation of the *child*. I began, therefore, by appealing to the world of nature, and specially (in the earlier stages) to the world of life.

But the teachers of that time were themselves weak in nature-knowledge, even of the limited regions of botany and zoology applicable to instruction in school. I therefore drew up model lessons for the teachers on animals and plants. These finally took the completer form seen in the Leicester School Board syllabuses in elementary science.

In these model lessons the living or preserved animal or plant forms the illustration as well as the subject of the lesson, and the object, or specimen, is one generally brought by the children themselves for the lesson.

For instance, the development of the frog from the egg is exemplified in our schools by the hatching out of frog spawn; and the subsequent stages of tadpole and young frog life are dealt with in the actual and concrete. Similarly the germination of mustard seed, acorns, chestnuts, beans, wheat, &c.; and the growth of stems from crowns of parsnips, carrots, &c., are made illustrative of vegetable processes of life in general.

In the mineral kingdom the rocks of the school neighbourhood and district give concrete representations of igneous and sedimentary rocks; and the meaning of limestones, sandstones, and clays, and the

original properties of coal, are illustrated by actual museum specimens, mostly of the children's own collection.

The *methods* by which these nature lessons are dealt with are elaborated in *Newmann's Object Lessons in Nature-Study*, in which the admirable treatment given in the *Teachers' Leaflets* issued from the Cornell University in the U. S. A. is introduced into English schools. Here, as the audience knows, pedagogy is brought to a very high state of proficiency: we may be content in England to learn something (and it can easily be made a great deal) from our transatlantic confrères on this subject.

There is another department of nature-knowledge which in Urban schools can be greatly improved by English teachers. I am deeply convinced that the subject of geography should be based on physiography and elementary geology, and that the principles of the latter are capable of being illustrated to classes of even very young children. Natural phenomena of rain, brooks, rivers, ponds, pools, and lakes and hills lie ready to the teacher's hands, and are of great interest and educative value to the child. A delta formation can be amply explained and illustrated in the open air by appeal to the track left on a slope by a rain-stream, with the detritus deposited on a roadside traversed in its course; or by the similar deposit on the edge of a pool subsequently dried up.

With regard to this mode of illustration, I would strongly insist that children, in their *own* sand-trays and with their *own* hands, should turn plains into hills, mainland into islands, peninsulas into islands, gulfs into bays, and conversely. It is only in this

way that they can intellectually get round, by *feeling* all round, the items dealt with. A flat drawing or ground-plan may be useful afterwards as a *memoria technica* of the subject, but the object itself is at first the lesson itself.

In examining classes in nature-knowledge I examine from the object as much as possible, and begin by drawing from the class what are the obvious (visible, tangible) properties of the object, before falling back upon mere information tacked by the teacher (and always necessarily loosely tacked) on to the object. Knowledge is to very little extent real knowledge unless it has been acquired by the knowledge-seeker himself. It is *his* eyes and hands, not his teacher's, that must gather up the materials of thought, reason, comparison, discrimination of likeness and difference, and, above all, inferences.

It does not matter so much *what* we teach, as *how* we teach it. Chess is almost as useful as Euclid to strengthen reasoning-power.

The greatest weakness of elementary instruction is that it is the echo of a book—a small cram-book very often, and I deeply regret that these small cram-books are again coming to the front as of old. And yet the multiplicity of real natural objects that are close to our hands is almost boundless. There is really an embarrassment of riches if teachers were trained observers instead of book-worshippers. A roadside heap of stones, gathered for road-mending; a pebble from stream or sea-shore; a grass plant; a bird's egg or nest; a stickleback or "gold-fish" in a glass jar; and a thousand other objects, are what alone are necessary for illustration of natural laws and processes of life.

Only, the objects should be *types*. In the animal world the "classes" should be first dealt with, and that from the higher to the lower through the Vertebrata. In the Invertebrata there can, of course, be only a selection, as of insects, spiders, and decapods, with such few exceptions as the snail, earth-worm, &c. Throughout there should, of course, be a certain natural sequence. Each lesson given to a lower standard should lay the foundation on which to erect a larger structure in a higher standard. The same object should be approached from different stand-points. For instance, the "cat" should be approached from the "claws", from the "teeth", &c., to illustrate the adaptation of means to end, and the harmony of parts, and the connection between structure and function.

If asked the question: "What has been the experience in Leicester of such courses of Nature-study as are here sketched out?" I should reply:—

1. The courses have been educative to the *teacher*. There are exhibits in this building that prove this statement. One is a very admirable one of Insect Life in Leicestershire; two others are exhibits of the Rocks of Charnwood Forest (with photographs) and of Leicestershire, excepting Charnwood Forest.

2. The children exhibit the greatest interest in these nature subjects. They make good collectors, and many a case of hopeless dulness with the book has been converted into enthusiastic love of the larger book of nature by means of these object-lessons in Nature-study.

3. Finally, I would wish to recommend the linking of such lessons with the other work of the school, as

is done in infant departments. Specially can this be done in the three subjects: nature-lessons, geography, and drawing. The exhibit of drawing copies drawn up for the Leicester schools, and sent as a part of our exhibit, will show how we have attempted to do this. It will be seen that they largely consist of nature subjects, especially of plant forms.

THE TEACHER AS OBSERVER

BY MISS MARY SIMPSON, OF THE YORKSHIRE COLLEGE,
LEEDS

When the title of this paper was suggested to me my first thought was, surely all, or nearly all, the difficulties connected with nature teaching would disappear if once the teacher had learned to be an observer. What different lessons we should have! How living they would become! The wall-diagram would grow musty for want of use, and the object-lesson text-book, with its ready-prepared lesson, would lie neglected on the shelf. The constant question would cease to be: "What book can you recommend?" but the teacher would himself begin to try and work out life-stories, and arrange them in chapters so simple that the children could in their turn spell them out for themselves too. Surely, then, the nature-lesson would always be upon some common plant or some common animal, simply because it would always be upon something the teacher had observed for himself. We should no longer have lessons on monkeys and elephants and kangaroos, on

palm-trees and banyan-groves. No, the observant teacher has no need to go in for sensationalism, he will know something of the wonder and beauty of a blade of grass or a common caterpillar. How little hope there is for our nature teaching until we rely less on books and turn more to nature! If we wish to do our work successfully, we must become observers; there is really no other way—nothing will do instead.

But the average teacher, who is very busy with other school-work, and who has had no special training in nature-study, is not naturally a good observer, and knows very little of nature and her ways. Yet the command has gone forth: "These nature-lessons must be given!" and so another subject is demanded of the already hard-pressed elementary teacher—a subject the real, living knowledge of which can only be gained by direct observation. One would think that, if the teacher is suddenly asked to give these lessons, some help would be provided in the preparation of them. But I think it is fair to say that, to the great majority of teachers, absolutely no real help is given; they are simply requested to make bricks without straw, and one is amazed at the courage with which they set to work to do it. No wonder, then, that careful observation and simple experiment play all too small a part even in the lessons of those who are really interested in Nature-study. No wonder we still mistake the skeleton of dry bones for the living thing. No wonder that tabulation and technical terms are still held in high reverence, and that to have a collection is too often considered the chief end of Nature-study.

How can things be improved? How is the teacher

to become an observer? How can the book-learner be converted into a Nature-student? Happily this is not really a difficult problem. The only trouble is that it needs time and money. The practical courses in Nature-study which are being carried on in some districts ought to become much more general,—classes where the knowledge gained by the teacher is the result of direct observation. At the end of such a series of lessons the teacher will have learned the value of knowledge acquired first-hand, and the interest of original discovery. I know there are difficulties connected with the arranging of such classes; so many teachers live at a distance from any college or technical school where perhaps work of this sort is carried on. But if it is inconvenient for teachers to come in to the centres of learning, cannot the learning be taken out to the teachers?

In some of the rural districts in the North Riding of Yorkshire we have found it possible to have classes for practical work in an ordinary school-room. Indeed it is interesting to find out how many subjects can be treated, and how much work can be done, with the simplest apparatus,—a few dissecting-instruments for each student, drawing-books, note-books, and now and then some simple home-made model to make clear a difficult point of structure, that is all. In taking such lessons, I have tried to avoid dealing with any point which cannot be actually seen by the student or demonstrated by simple experiment. Week after week we have met for our work. Each teacher has had his or her own specimen. We have no lecture at all, simply two hours' observation, drawing, and making notes of the things observed. So I

like to think that the teachers in those classes learned, to some extent at any rate, to become observers. I hope they realized that to know a name was of very little moment, but that it was worth a great deal to know something of the life behind the name. Not only is practical work in the class-room necessary in order to learn how to observe carefully, but we must have out-of-door work too. I am sure that these two kinds of work should be carried on side by side, one incomplete without the other. The importance of this field-work cannot be over-estimated. We may learn the truth in the class-room, but it is out in the open that we see the beauty of the truth.

Early in the year I was taking the structure of a winter bud with a class of teachers. After dissecting a horse-chestnut bud, we put some twigs in water and placed them in a warm place in order to tempt the leaves to unfold before the spring-time. Week by week we noted the gradual opening of these buds, the separation of the scale-leaves, the first appearance of the folded foliage-leaves all wrapped up in their woolly covering, the gradual casting off of the hairy coat and the straightening out of the crumples. At last one teacher said: "But that's not how they open on the trees, is it?" His question was answered when a week or two later we went into the woods to study unfolding buds.

Dr. Arnold says: "What we know and love we cannot but communicate". We learn to know the plants in the class-room, we learn to love them when we study them in their own haunts, amid their natural surroundings. It seems to me a teacher cannot give a very dull lesson on a plant or animal if he has

studied the structure in the class-room and the life out-of-doors. Not many weeks ago I was out with a class of teachers. It chanced to be one of the few warm days we had in early summer; there was scarcely a breath of wind. We came across a willow-tree covered with fruit. Happily for us the little, green, pod-like fruits were opening in the warm sunshine, and out floated the plumed seeds—hundreds and thousands of them, making quite a white mist as they were carried quietly away by the gentle breeze. What an interesting talk we had on seed-scattering, especially as we had just found the winged fruits of the wych-elm! What a satisfactory introduction that was to the subject, so much better than any diagrams, so much better than any chapter in a book, so much better even than specimens carried into the class-room.

But this out-of-door work, to be of real value, should be carried on as thoroughly and systematically as the work in the class-room. Not just an odd walk now and then, but definitely planned excursions, continued, if possible, all round the year, and on each excursion some definite piece of work should be done. Drawing-books and note-books should be part of the equipment of each student. Of course, in arranging for these excursions, one comes across the old difficulty—want of time. But as Thring says: "Great interest will make up for want of time". After one or two excursions I often find the teachers have plenty of time, and at the end of the walk the question is: "When will the next be?"

In connection with these courses for Nature-study which are not connected with the regular work of

a college or university, I should like to make one suggestion to those who have the arranging of them. Cannot these courses be continued practically round the year, perhaps beginning in March and ending in November? As far as my experience goes, they are often planned for the winter months only. When April comes and things begin to grow, then the Nature courses come to an end. I know that many County Councils arrange for summer-holiday courses, but the number of teachers who are able to attend these must always be limited. They entail rather elaborate preparations, and a good deal of work has to be got through in three weeks. It seems as though, especially in rural districts, these courses, often begun during the winter, might be continued on summer evenings when the teachers are not quite so busy, and when field-excursions can be undertaken with very little difficulty. If it were possible to arrange for these courses to last round the year the teacher would have the opportunity of carrying on continued observations. He would be able to note the trees, the flowers, the animals in spring, summer, autumn, and winter.

Surely a teacher who had gone through such a course of practical lessons in the class-room and in the fields would have learned, to some extent at any rate, how to become an observer.

TREES AS A MEANS OF NATURE-STUDY

BY MR. JOHN EVANS, H.M. SUB-INSPECTOR,
BOARD OF EDUCATION

I. WHY TREES?

In selecting "Trees" as the subject of a few remarks, I trust I shall not be misconstrued as attaching importance to the need of specialization in Nature-study work, or of emphasizing the fact that one subject is more important than another. On the contrary, my constant advice to teachers is: Teach what you *know* best, having due regard to the *possibilities* of your own neighbourhood. One subject is as good as another to secure the object in view—cultivating the powers of observation and interesting the children in their surroundings.

The study of trees, though a highly fascinating subject, is, I am afraid, a somewhat neglected branch of nature-knowledge. How many there are who can identify with ease a primrose or a buttercup or a daisy, yet who are utterly unable to distinguish an *oak* from an *ash*, or a *beech* from an *elm*!

In the short time at my disposal this afternoon I can only touch the mere fringe of the subject, but I hope to be able to show the enthusiastic teacher that a study of *Trees* furnishes us with material for *observation* and *discrimination*, for *comparison* and *judgment*, and that it exemplifies the application of certain *important principles* that should be kept in mind in pursuing a course of Nature-study.

II. ALL THE YEAR ROUND

In the first place, I wish to point out that trees supply us with material upon which we can work all the year round, and they are almost as accessible in towns as in the country. This is an important consideration. Indeed the study of trees is no less interesting in winter than it is in summer, for the "bare boughs show us the true inwardness of the tree as the naked twigs stand silhouetted delicately in nature's etching against the pale gray-blue background".

Thus in *winter* we can study best the endless diversity of architecture—the ground-plan, as it were, of our forest denizens.

In *spring* and *summer* we have *buds, leaves, and flowers.*

And when the *autumn* comes we have the *fruit,* and our eyes are feasted by the glorious display of tints as the leaves fade and fall off one by one at the north wind's touch.

III. OUT-OF-DOOR

The kind of Nature-study that we would advocate is mainly the "out-of-door", in the pure air, in the healthy breezes, untrammelled and unconfined, beneath the blue vault of heaven.

Now, trees will compel us to go out of our classrooms into the parks and open spaces; they will compel us to go out of our towns and villages into the lanes and meadows, to wend our paths through the woods, by the river-side, or along the pine-clad slopes of hills and mountains.

We shall thereby grow to greater perfection, intellectually as well as physically; and, as Thoreau was wont to say, we shall become more imaginative; our thoughts will be clearer, fresher, and more ethereal; our understanding will become more comprehensive, and the chords of our hearts will vibrate in truer unison with the great Giver of life whose finger and handiwork we can everywhere discern.

IV. KNOWLEDGE AT FIRST HAND

Again, it is highly important that we should acquire our knowledge of nature *at first hand*, as it were, by direct contact with nature itself.

There is much that we can do in connection with trees by the *simple use of our eyes*. There is a sort of *macroscopic* or *telescopic* (if we may so use the term) view of trees that is most necessary and useful, as well as that obtained by near and closer inspection. This is the view we obtain at a distance, and which we can enjoy even in a train going at express speed.

It is *at a distance* that we can see best—

(a) The contour, habit of growth, or general outline of the tree,

whether *pyramidal*, as in the spruce, larch;

spreading and *rounded*, as in the oak,
ash, elm;

pillar-like, as in the poplar;

symmetrical or *one-sided*, as in trees that
grow on wind-swept uplands.

(b) The colour of their drapery—the contrast between the larch, spruce, Scotch fir, &c., as regards the colour of their foliage.

But let us for a moment examine our tree *at close quarters* and see what we can learn of its parts in detail by close and careful inspection.

(a) **Trunk.**—In the first place let us look at the trunk.

1. Its circularity will strike us—the form of greatest strength, and the one that offers the least surface to the force of the wind.
2. We can see whether it is straight or crooked, whether it tapers gently from base to apex, as in the larch and spruce, or tapers considerably, as in the *Wellingtonia* of our parks.
3. We can see whether the trunk is carried up right to the top of the tree, as in the larch, &c., or divides half-way into branches, as in the oak, elm, &c.
4. Any indications of disease and decay, excrescences, &c.
5. We can ascertain the circumference at the base, and from that the diameter.

(b) **Bark.**—When we have done with the stem we can examine the bark.

1. We can note whether it is *rugged* or *smooth*, brown, gray, or silver-white; showing a tendency to peel or come off in scales, as in the larch, birch, and plane trees.
2. We can compare the bark on the stem with that on the branches in these respects.
3. We can see whether it has any lichens, moss, or fungi growing thereon.

(c) **Branches.**—Let us now turn our attention to the branches.

1. We can determine whether they are inclined to the stem at an acute or obtuse angle. We can see at a glance that, generally speaking, the lower branches are longer, stouter, and more spreading; that the upper are smaller and more erect.
2. We can see whether the twigs are drooping in magnificent tresses, or have an upward trend or a downward curve.
3. We can note whether the twigs are one-sided, with the spray turning upward as in the beech, or whether the twigs are found on *both sides* of the main branch, as in the *elm*, &c.; whether they are alternately developed or oppositely placed.

(d) **Twig.**—Should the visit be paid in winter or early spring, we should obtain a portion of the branch or twig for closer inspection.

1. We should note whether the twig is crooked, rough-barked, indicating slow growth; or straight, smooth-barked, indicating quick growth.
2. We should make a *transverse* section of our twig, and note the relative position of bark, wood, and pith. We should look out for any indications of the annual rings and medullary rays.
3. We should examine the buds, make transverse and longitudinal sections, and note their relative positions, shape, colour, overlapping scales, rudimentary leaves and flowers.

4. We should point out the relation of bud arrangement to branching, and of the branching to the ultimate form of the tree.
5. The leaf-scars should be examined. Note their relative position, shape, &c.
6. Note the bud scale-rings, and from these determine the age of the twig.
7. There may also be the scars of last year *flower-clusters* in the forking of the twigs in such trees as the maple, &c.

(e) **Leaves.**—When we have finished with the twig we can go on to the leaves. This, of course, will be some time later on.

1. The time of their appearance should be noted.
Early—Birch, maple, &c.
Medium—Beech, lime.
Late—Oak, ash, elm, poplar.
2. Let us compare the colour of the leaves as they issue out of the bud with that which they assume later on. We find that various shades of *ruddy-brown* (maple, poplar, ash, &c.) and *light-green* (beech, lime, spruce) become changed under the influence of sunlight into a uniform emerald or dark-green.
3. We should examine their surfaces and note their texture, and see whether they are—
 rough or smooth,
 glossy or dull,
 symmetrical or one-sided,
 divided or entire,
 with teeth round the margin or without them.

4. We can compare the *under* surface of the leaf with the *upper* surface, and see
 which has the deeper hue, most hairs,
 and the most prominent veins.
5. Then we should examine the veins, and see whether there is a distinct midrib, as in the beech, oak, &c., and we should note the relation of the secondary veins to the main rib. Do they branch out like the barbs of a feather and make straight for the margin (beech), or do they curve towards the apex (poplar)?

(f) **Flowers.**—The flowers often present many points of interest. Many people are ignorant of the fact that trees like the oak, ash, elm, &c., bear any flowers at all. We should look out for such features as the following:—

1. Stamens and pistil in { same flower?—*maple*.
 separate flower?—*hazel*.
2. Staminate and pistil- } same tree?—*oak*.
 late flowers on } separate trees?—*poplar*.
3. Then with regard to the *time of appearance*:—
 - i. Staminate formed and appearing in winter—
 hazel, birch, &c.
 - ii. Pistillate, appearing { flowers and leaves in
 in spring } same bud—*birch*.
 } flowers and leaves not
 } in same bud—*hazel*.
 - iii. Staminate and pis- }
 tillate, appearing in } *oak, beech, &c.*
 spring }

4. The *disposition* as well as *position* of flowers should be noted.
- Pendulous—*Maple*.
 Erect—*Horse-chestnut*.
 Staminate pendulous, but pistillate } *birch*.
 erect at first
- Flowers found on wood of previous year's or on this year's growth?

5. Then, with regard to *fertilization*, is it brought about through the agency of—

Insects?—Chestnut, maple, willow.

Wind?—Poplar, hazel, fir trees, &c.

And in the case of *wind-fertilized* trees,

Note—

(a) absence of showy petals, scent, honey.

(b) flowers drooping, oftentimes in catkins easily swayed by the wind.

(c) flowers appearing *before the leaves*.

(d) abundance of dry, powdery pollen, easily carried about by the wind.

And so on indefinitely; and having examined a sufficient number of trees of the same species, we can ascertain whether these *characteristics* are a *permanent* feature common to all trees of the same kind, or merely accidental traits of a particular tree. Thus we make

our observations,
 our verifications,
 our deductions,
 our generalizations.

V. CORRELATION

Educationists attach considerable importance to the proper correlation of studies, and "trees" enable us to carry this principle into practice.

The work can easily be connected with the recitation, composition, drawing, modelling, &c.

i. The study of trees can be made an excellent means of cultivating the children's *power of expression* by teaching them the exact meaning of words. Thus, during the ramble the children note certain peculiarities in respect of the trees that they meet with. The correct term to express this feature is given and learnt on the spot, *e.g.*:

"gnarled oak",
"pendulous catkin",
"rugged elm," &c.

ii. **Leaves.**—The scholars are taken out with the object of collecting leaves.

(a) A short *object-lesson* would be given on a leaf, each child being supplied with a specimen, and attention drawn to—

Parts of the leaf,
Form,
Texture,
Veins, &c.

Drawing, Modelling, and Composition lessons would follow on the leaf.

iii. **Fruits.**—In the same manner fruits of various kinds.—Acorns, nuts, samaras, hips and haws, &c.,—are collected and dealt with.

(a) *Object-lesson.*—

Attention should be drawn to—

1. Form.
2. Colour.
3. Object of the wings of the samaras, and colour of cherries, &c.
4. Need for dispersal of seeds and fruit.
5. Methods employed to bring this about—
wind,
birds,
squirrels, &c.

(b) *Drawing,*
Colouring,
Modelling,
Composition, } to follow the object-lesson.

iv. **Buds.**—Twigs with buds on lend themselves admirably to correlation of work. For instance, let us take a twig of the *beech*-tree.

(a) *Object-lesson.*

Note 1. Alternate arrangement of buds.

2. Zigzag form of twig.

3. Shape of buds—some long, tapering, and pointed (leaf-buds only); others thicker and shorter, containing leaves and flowers.

4. Colour, overlapping scales, &c.

(b) *Brush-drawing.*—Such twigs lend themselves admirably to brush-drawing.

There is thus no end of material in connection with trees for the most interesting study, and the enthusiastic teacher will find plenty of matter for lessons in connection therewith all the year round.

VI. THE ÆSTHETIC

In connection with this question of Nature-study, we cannot dissociate from the subject the poetical side, the appeal it makes to one's imagination, and the manner in which it trains not only our mental and moral faculties but also the æsthetic. We do not want every child to become a poet or an artist, but we would have every one acquire some amount of the artistic and poetic vision. Trees are calculated to cultivate this taste for the beautiful in a marked degree. Is it not with feelings of fondness and pride that we contemplate those magnificent trees that beautify our landscape?

As the poet truly sings—

“One impulse from a vernal wood
May teach you more of man,
Of moral evil and of good,
Than all the sages can”.

Whether we regard such a tree as the horse-chestnut with its tier upon tier of richly-painted flowers; or the sturdy oak in the pride and lustihood of its growth; or the “lady of the forest” with its beautiful form, its silver-white stem, its ruddy-brown and purple branches crowned with a mass of drooping tresses that show when viewed *en masse* every shade of green from olive to the brightest emerald; whatever tree we behold we are presented with a spectacle that delights

the heart of the artist, poet, and botanist—with a sight that charms all lovers of the graceful and truly beautiful.

Yes, during the spring and early summer the invisible artist has been busy at work painting a scene of indescribable beauty. Here he shows preference for the emerald, there for a shade of brown, and yonder he has dipped his brush in the yellows and has blended them harmoniously with the greens. The olive, too, is represented in yonder unassuming ash leaves, and the sombre hue of the Scotch fir is not without its effect. There is contrast, there is variety, everywhere there is freshness most restful and pleasing to the eye.

In the distance behold yon aged oak-tree, that has braved the storms of centuries, keeping sentinel o'er an undergrowth of birch and alder and hazel—mere striplings whose soft sap-wood will not bear strain or rough handling.

Later on, the season of the sere and yellow leaf is no less interesting. "Slight frosts take off the greenness of the leaves with a delicate touch; warm, sunny autumn days throw light and shadow on the ever-changing scene."

Study the beech and the birch and the oak at this time, and notice the "indescribable mingling of gold and orange and crimson and saffron, now sobering into drab and maroon, now flaming up into scarlet".

And when the winter comes, and the leaves fall off one by one, we can still admire, if we have the artist's instinct in us, the wonderful diversity of those naked twigs, as well as those dainty little pendulous cylinders of the birch and alder (as one writer poetically de-

scribes them); or we may behold that "crystal-frosted pine-tree glistening in the sunshine with innumerable diamonds on a frosty winter morning".

Yes, all the year round there is something in trees to satisfy this love for the beautiful and give thoughts that "do often lie too deep for tears".

Trees, then, form an excellent means of Nature-study, and a study of trees is calculated to develop not only our mental and moral faculties, but to promote a taste for the truly beautiful. Moreover, they are with us at all seasons of the year, and a study of trees compels us to leave our class-rooms, our towns and villages, and go where we can make our observations in the pure air, in the healthy breezes, untrammelled and unconfined, beneath the blue canopy of heaven.

THIRD CONFERENCE,

Tuesday, July 29

CHAIRMAN: THE LORD BALFOUR OF BURLEIGH, K.T.,
SECRETARY FOR SCOTLAND

LORD BALFOUR said:—I am here to-day as a substitute for Lord Reay, Chairman of the London School Board, who was to have occupied the chair. The objects for which this exhibition and the conferences are being held appeal strongly to me, for I am responsible for public education in Scotland, where we have been endeavouring during the past fifty-five years to get our teachers and pupils in the public schools, as well as others outside, to take an interest in the somewhat new departure of Nature-study. We have urged upon the managers of all schools to provide in their courses a training for their children in the habits of observation. We have laboured to make the subject a voluntary one, and at the same time we have tried to have it incorporated for pupils in all schools throughout Scotland. It has also been our desire to train and fit the teachers by two methods. In the first place, special classes for those who are engaged in the work of teaching have been provided, and during the last four or five years these classes have been attended by 7000 teachers, nearly half of the number upon the register. Secondly, our object has been to arrange the cur-

riculum of the training colleges so that those who enter the colleges may have an opportunity of being instructed in Nature-study. Our aim is to make school-life as interesting to the children as possible, to cultivate their faculties, and to enable them to take an intelligent interest in the world about them. I trust that I am not too sanguine in saying that this form of study is to be a recreation for pupils and teachers. Primarily the object we have in view is not the acquisition of facts, but to give the children an opportunity for accurate observation. Professor Bickmore, of New York, will explain to us his methods of instruction. We welcome him among us, and we do not regard him as a stranger. In fact any one coming from the United States may look upon this country as a second home. There is nothing which is more likely to promote a kindly and friendly feeling between the two countries than that we should understand and learn each other's aspirations. I have much pleasure in asking Mr. Choate, the American Ambassador, to introduce Professor Bickmore.

Mr. CHOATE said:—I desire to thank Lord Balfour for the very cordial manner in which he has referred to the United States and to myself. I shall not detain you long, my duty being merely to introduce to you Professor Bickmore, who will, I am sure, delight you, as he has delighted numberless audiences in America for many years past. For between thirty and forty years I have been acquainted with Professor Bickmore in connection with the American Museum of Natural History in New York, where he has done a great work for the promotion of natural history. He has also for many years worked in departments of

public instruction in the State of New York, and has devoted himself to the education of the teachers of that State in the matter of Nature-study. He is attending this conference as the accredited representative of the Department of Public Instruction and of the Museum, and whatever he may have to say upon the subjects engaging the attention of the conference will be worth listening to. It is clear from what has been going on at the previous meetings in connection with the exhibition that each country has much to learn from other countries in the matter of education, and especially in the particular branch of Nature-study. These conferences will manifestly redound to the benefit of the cause of education in all countries.

VISUAL INSTRUCTION

BY PROFESSOR BICKMORE, OF THE AMERICAN MUSEUM
OF NATURAL HISTORY

Dr. Bickmore, professor in charge of the Department of Public Instruction of the American Museum of Natural History, New York City, gave a brief account of the system of "Visual Instruction" carried on under the auspices of the State Superintendent of Public Instruction, from his institution, throughout the state of New York. Professor Bickmore exhibited a view of the great auditorium of the museum filled with eager auditors, and stated that this room was occupied four times by different audiences coming to hear the same subject, and that the aggregate atten-

dance upon his lectures last winter was 26,910. As he speaks, a stenographer records his words, which are printed, and duplicate sets of the illustrations with this text are supplied to eighty-five cities and villages in the state of New York, whence they are loaned to the surrounding towns. This instruction is also repeated in twelve other States of the Union. It has spread into Canada, with the remarkable growth shown by the fact that last year the attendance was 8400, and this year over 27,000. This admirable work in the Dominion is supervised by Professor Penhallow of M'Gill University.

As the club-room could not be satisfactorily darkened, the audience was invited to adjourn to the adjoining museum, where Professor Bickmore displayed a series of the views in actual use in the schools of New York City, commencing with a series of slides representing a teacher of a kindergarten school and her class going from the city of New York into the adjoining country. The audience were brought to a beautiful garden of flowers, where the life-history of a lotus-flower was displayed in all its natural and brilliant hues. Then Professor Bickmore exhibited a series of views to illustrate teaching in the grammar-schools, which forms the principal part of his work, in which the audience were invited to journey from the Atlantic to the Pacific coast. Passing up the beautiful Hudson River, they saw the grand Niagara, the Great Lakes, and the cities upon their borders; the inexhaustible mines of iron ore, and the attractive scenery of the Yellowstone Park, and the grand canyon of the Colorado; and the audience finished its journey at the Golden Gate, where

the bay of San Francisco empties into the Pacific Ocean. This route was over American territory.

On the following day Professor Bickmore took his audience with him along the Canadian Pacific Railway from Montreal, over the Selkirk Mountains to Vancouver. Next they visited the Hawaiian Islands, where they saw the marvellous volcanoes with the grandest craters in the world, and an eruption of the great mountain, Mauna Loa, in which the light of the fluid rock actually produced the negative from which the slide displayed was made.*

NATURE-STUDY IN RELATION TO RURAL PURSUITS

BY MR. G. H. MORRELL, M.P.

I have been invited to address you on one of the most comprehensive of all the items put down for the consideration of this conference—"Nature-study in relation to rural pursuits", suggestive of an attempt on my part to analyse one's country experiences, and set out the details in terms of Nature's laws; and that in five or ten minutes.

* In recognition of the facilities offered to his photographic assistants by the authorities of the British Museum, the National Gallery, the Museum of Natural History, and other institutions in England, Professor Bickmore has presented to the London County Council a duplicate series of the slides used by him in New York for one of his lectures on London. These may be borrowed by educators throughout the country, on condition that they employ them for the purpose of giving free instruction to the pupils and the public generally.

We have before us not merely a study of the things of Nature in the concrete form, tangible, whether alive or relics of the past, but also of the forces and powers of Nature which, though not tangible, yet can be perceived or felt, for these last demand our attention in all country pursuits quite as much as things tangible. We are to consider the whys and wherefores, not merely to satisfy curiosity, but as individuals desiring to take our place intelligently in the complex surroundings in which we live; nay, further, when we in some degree understand them, we have to consider how to capture some of these forces, and compel them to act in a particular direction for our own benefit—all this in ten minutes.

Country pursuits trend in so many directions—the passive contemplation; the pick-to-pieces anatomical form of investigation; then conversion; and appropriation; then unravelling and regrouping with full appreciation of Prof. Grove's old dictum, that "all the forces of Nature, heat, light, electricity, magnetism, chemical affinity, and motion, are all convertible into each other". Is it not obvious that Nature-study must hold a first place in forwarding an intelligent enjoyment of country life? But this has not been the case hitherto. Nature-study has been relegated to a late period of life.

To take up Nature-study early is considered a new move. I well recollect, in 1860, at Rugby, a pioneer start was made in this direction, and that at Oxford about the same time the admission to a degree was granted to an honours man in natural science without Greats, provided he had taken up an extended course in Moderations. It has taken some years to get

beyond this. The enormous extension of the science group of subjects has not rendered it more easy to get the work through in the limited time of a university course; and in the school period so much time is given to Greek, and especially Greek grammar, on the ground that that has been hitherto thought to be almost the only suitable subject on which to train the mind, that little time has been available for getting in a groundwork of natural science on which to proceed at the university. A good deal of modification of curriculum has taken place, it is true, but Greek is still at Oxford a *sine quâ non* for entrance into the university. I have no authority for saying that this conference hopes for the abolition of Greek; though I might urge it. Many do not; but I will go so far as to say that the form in which natural science and Nature-study is now put forward has been so improved that this conference may well accentuate this, and ask for less Greek and more Nature-study—or, as I should prefer, ask for a definite system of parallel courses leading up to different degrees at the university, when, of course, Greek would be on the road to one degree, Nature-study on the road to another. I might definitely ask the conference to press forward the contention that Nature-study may take up a position for the start on a science course of equal value and parallel to the position of Greek on the classical course. There must be first secured adequate training of the mind in any case. We contend that Nature-study does afford such training, and more.

We conceive that Nature in her varied moods is of high value for training the mind, and, in addition, affords opportunity which shall result in quickening

the perceptions, setting up a power for initiating inquiry, and grasping an idea, and must induce a power to think, and think accurately, which is the bed-rock of the whole. Further, we would train upon Nature as a subject that admits of no inaccuracies. But we have to be on our guard; for Nature-study in the hands of an incapable teacher, with plates of untrue comparison in natural history, or with blank maps before children who have not first mastered and set in a scale, or with relief maps having contours vertical 6 or 7 to 1 of horizontal, may convey inaccurate impressions. How often little regard is paid to first impressions! These inaccurate presentations may be due to the misfortune of a teacher, himself brought forward on wrong lines, who unwittingly may produce out of his pupils "a bookish blockhead, ignorantly read, with loads of learned lumber in his head"; or may be due to a not well-informed body of managers. We want, then, this conference to affirm first that Nature-study is a unit in education of equal value with other items in our curriculum, and, if this is granted, that it should be more pressed into service, not only on the ground that it is of value for training, but also that it is of value in the pursuits of daily life. From childhood to old age we are all in touch with Nature at some point: the choice of a profession or a pursuit indicates where the pull is strongest. In the early years of life we want education in the true sense of the word, leading and drawing out into prominence the innate latent powers. We are not all born with powers in the same direction. The only matter with a dunce is that we have striven to drive him along a road on which he has no interest, and have failed

to find out the direction in which his interest and his power lies. A wide and varied system for education should be our aim, and what more comprehensive than that based on Nature. One is afraid of misuse of this method as of that of the Kindergarten, of which in its higher aspects it forms a part. Kindergarten suffers much by misuse when it is taught instead of used as a method of education. How is this to be met? How much is due to failure in the training of our school staff to proper use of methods? The training colleges are really secondary schools in the main: the training in method of dealing with children is often left to a paltry few hours in the week. Method indeed seems to be the secondary instead of the primary object of the college. Let the college be for training in method of education for those who have had their secondary training elsewhere. My next point would be, that Nature-study, inasmuch as it promotes well-directed inquisitiveness into the things and powers that encompass us, and secures accurate investigation, observation, and comparison, must lead on to study of correlations, as of course. In country pursuits one can follow this to any extent. But no one makes so good progress as those who have been students of Nature as children. It is for this I urge its introduction in primary schools. Thereafter, whether your pursuits take you wide a-field or in the village, you cannot but note variations of form and colour, maybe mimicry, of teeth and beak, of fur and feather, of herbage and soil, of configuration and slopes conforming to substratum; variations, the resultant of foods and environment, or of position, altitude, and temperature or climate. You may pre-

dicare of certain plants or animals on particular soils that these will flourish or die down; or maybe your pursuits lead you to note local history, and you come to revel in details of geography, as often disclosing the moulds of history. Yes, given an early power and interest in observation, things that seem trivial to those not so trained are full of interest, and draw forth fresh powers of mind. The overturning of the soil, the shape of the share, and the trimming of the whipple-trees for horses unequally put together, set many a thought going on soil and plough and horse and harness: and we even come to see, with other eyes, the forces of Nature in our very sports and games. All this is provocative of interest. Why, then, should we not train the mind by methods that shall create interest and be in touch with realities, rather than, as is often the case, attempt to train on abstractions alone, difficult of apprehension and comprehension? On my second point I know I touch on dangerous ground, but would ask assent to this proposition, viz., it is preferable to train on matter that shall be of value in life's work, provided adequate training can be secured by its use; yet I would avoid too early specialization. We must prevent the school-master running riot with science in a primary school. What more distressing to the advocates of Nature-study than to see, say, a school-teacher, the would-be botanist, dissecting and classifying, and clouding in polysyllables, that which in primary schools should be introduced in a broad, general manner with a view to induce accurate observation: not too deep, yet not scrappy, but all true. We must put an end to misinterpretation, however popular; for instance,

no more of the false story of the love between the honeysuckle and the bee: yet we may note, as conveying quite a high moral, such things in general terms as the perceptive power of the climbing bindweed, holding its own way against a stranger, but yielding to a fellow-binder with whom he may meet; or watch with interest the digestive power of the sundew. Yet again, avoid the theory of alternate generation and the two hosts, yet note with the farmer "no fluke without a slug (snail), no gid without a dog"; avoid going into cross-fertilization question with the thrum and the pin-eyed primrose, yet note the variation. All broad and accurate investigation; in simple form, yet true as far as it goes, so that it may lead up to higher study later on: for everything in connection with Nature-study comes in handy in rural pursuits some time. Next, we want this conference to urge that those in charge of our schools shall be true educationists and guides; not men pitchforked into the profession just because they have passed an examination. These men don't help us to make Nature-study what we want. The government has undertaken to educate, that is, to find out what power an individual has, and develop that. How different is promise and performance—performance that seems to endeavour to turn out all on some dead level. Our duty to the people whom we compel to be under our regime is to watch the powers of their children coming into action, aid and direct and induce them to rely on their own effort, and not on "the support of another mind". Then may we hope to see the young in possession of that inestimable gift, the power to acquire knowledge. I believe the

remedy for our present difficulty in getting lads on from primary schools to the technical class is to be found in modification of our method of education, rather than in forming new schemes of matter to be instructed into minds unreceptive, and in terms unintelligible and often meaningless which cannot impart information; on a par with some of the words of the grammarians, the oft-quoted "interjection" enumerated among the parts of speech, and on which Horne Tooke's comment is—call it rather the refuge of the speechless. Time fails me to more than indicate how Nature-study points us to the outcome of the action of man; as, for instance, shown in results of drainage and clearances, not merely modifying the features of the landscape, but affecting village life and industry; telling us the past—the story of the forest and the works, as told in the half-timbered cottage or the iron tombstones of the Weald. And to-day it may be the action of man in applying the forces of nature; in bringing power to material by conveying electrical energy even from the "rhythmical pulsation on a tide" to work some inland factory: or, again, may be by appropriation of supply of gas hitherto unsuspected lurking beneath the surface revive again an industry that with the forest fell. Countless other details crowd upon the mind, all pointing to the value of Nature-study: a study that, pursued in its broad elementary form in our primary schools, induces a child to think, and in his humble way to argue out a subject for himself, and gives him an interest in his surroundings at all ages wherever he may be. My time is up. Let me then urge upon the conference to use their best endeavour

with the Board of Education, first, so to modify the scheme of the training colleges that more time be given to method, and that effort be made to turn out true educators, not merely teachers just in advance of their pupils, of some of whom it may be, and has been said, that the teachers "learn the lesson and the pupils hear them say it", and whose power of teaching gets no further; and, secondly, to insist that Nature-study, being a unit of first-class educational value for training the mind, and also of value as putting the young mind in possession of elementary information on matters underlying his rural pursuits, as well as all his surroundings, set forth in the book of Nature, his constant companion, deserves a prominent place in the curriculum of all schools. Believing, further, that in whatever direction his work in life may lie, be his rural pursuits what they may, the student of Nature will never regret an early training that has furnished him with better eyes than his fellows.

THE ATTITUDE OF THE TEACHER IN NATURE-STUDY WORK

BY MR. A. D. HALL, DIRECTOR OF THE ROTHAMSTED
EXPERIMENTAL STATION

The term Nature-study is both clumsy and indefinite; teachers, however, feel in a general way what is comprised under the name. It is my object to put forward certain suggestions as to the spirit in which the teacher should approach the work, because on that alone depends the value of the subject. A pre-

vious speaker has been praising Nature-study because it deals with facts; I want to insist more on the opportunity it affords the teacher of dealing with method and ideas.

The real object of this kind of teaching is to develop the minds of the children along certain lines which are untouched by book knowledge, and which again are being repressed rather than encouraged by the whole trend of modern highly-systematized life. We have to remember that during the last few generations we have been entering into a new world; we have devised a system of education for the many entirely on methods appropriate to the few. At the same time, the growth of civilization, especially of the town, has deprived the many of the natural education they previously derived from things. The sharp country child has a chance of developing certain faculties and powers of which the merely town-bred child has no conception. The latter gets everything prepared for him; he is constantly being told by parent or teacher; his routine, even his games, are very much prepared for him. He becomes in a sense blind, and loses the faculty of instinctive deduction from the things moving before his eyes.

Let us consider the criticisms which have been directed against our officers and men during the late war. We are told that in the novel, first-principle kind of fighting, such as we had to acquire, our men were at a disadvantage; all their training, drill, and discipline was of less value than the readiness and "knowingness", which the country-bred Boer had picked up from his surroundings.

Now I advocate "Nature-study" as a means of

returning to something of this "knowingness", as giving the child the power to see and reason instinctively, and then to act on what he has gathered from the things about him. But let us be clear that it is the development of the child's faculties which is to be the object of our teaching. We have been told from time to time that we are pushing it purely from the agricultural point of view—to secure more labour on the land. I have never been disposed to worry much about that kind of criticism; after the present exhibition I don't think we shall hear of it again. I think, however, speaking as a teacher to teachers, that we ought to recognize a substratum of truth in the attack which many farmers have made upon education generally. It is only a few weeks ago since Mr. Chaplin roundly declared that education simply unfits children for work in the country, and the more education you give them the worse they become. Of course we all indignantly repudiate such a heresy; but let us face the question calmly, and ask ourselves whether, we won't say education, which is a large and intangible conception, but our particular plan of teaching, has not been such as unfits the child not merely for a country life, but for any other demanding more than copying entries or turning a handle. Let us direct our education away from the formal conventional side of life; no longer blind our children by making them see only through books, but expand and render flexible their minds, so that they will be better labourers in whatever walk of life they follow.

We agree, then, that "Nature-study" must stand or fall by its educational value. Well, in the first flush

of our enthusiasm about new work, we are apt to run into extremes and lose sight of the educational side. As teachers it has been impressed upon you that you must have lessons about the country; you find them, and the children find them, very pleasant, very interesting, very pretty, but that is not enough. You have only to go round the present exhibition to see how much of the work that is being done lacks any guiding idea. Mere collecting of natural objects, mere sketching, mere copying of notes dictated by the teacher: these things are worth just as much, or rather as little, in connection with Nature as with, let us say, foreign stamps. Nor do we want what someone has cruelly called "sugar-coated pills of science"—pretty little lessons about this or that natural object or process,—the chief aim must be method, and the practical logic of cause and effect that comes from seeing how one thing develops naturally from another. I want the teacher, when he starts this new work, to realize the importance of thinking out beforehand a course that shall be truly systematic and consecutive, so that one part of the subject grows out of the other, and the whole binds itself together with the last lesson dependent upon the first. Just in the same way, you must not suppose that in this Nature-teaching it is sufficient to *read* about animals, plants, and flowers—to go back to books. Already text-books have begun to flow into the market. There are text-books which describe how swallows fly and sparrows chirp—and not always correctly,—and the child will read the description, and forget to look at the animal or bird and see that it does not do what the text-book tells him. Leave those text-books

alone, but put into the school library two or three of those classic books like White's *Selborne*, which was written by a man who saw things with his own eyes, and who can help other people to see them in their turn. Don't let us devour a series of half-facts about the country, and suppose that we can in any way approach Nature by a travesty of that description. Above all, I should like to insist upon the teacher, in all this Nature-study work, taking up a very small piece of work and doing it very thoroughly indeed. I do not care to see anyone trying to teach in one session, or in one year even, the whole development of a plant. You will find quite enough to occupy you if you take a seed or leaf and find out all you can about that. Don't be ambitious in the sense of covering too much ground, but do be ambitious to pass over no questions which the child may put to the teacher, and which the teacher may put to himself. Try and exhaust the subject, at any rate as far as it goes. In that way, by taking a small portion of the subject, and by not being afraid that there won't be much to put down in the schedule to show the inspector; by doing that courageously—and I think the inspectors will help—you get the opportunity and time really to do experiments. And Professor Armstrong has told us what an experiment means—it does not mean the demonstration of some well-known fact;—it means just trying to work out things for ourselves, asking questions and letting the thing itself answer them. Many of these experiments which deal with living creatures take time; they take, perhaps, weeks before the answer develops itself. As practical

teachers you may say that this makes it very difficult to scheme out our lessons, and may ask what should be done if the experiment were not ready. Well, these lessons ought to be part of the whole work of the school, *i.e.* they are not lessons in science or Nature knowledge merely, but lessons in knowledge, and composition; dictation, spelling, grammar, drawing, mathematics all ought to be swept into service, and you can fill in the vacant gaps of time in the lessons by making use of the other subjects and working them in at the same time. For instance, in asking questions from the child and getting his answers, you can do a great deal in what I think is very important, the study of words. People are very apt to hide behind a word. It is important never to let a child throw a big word at you and not to try to get it translated into everyday, common-sense English. You ought also to make it a lesson in drawing; everything ought to be recorded by means of some kind of drawing. You cannot more effectively help a boy, who is going to become a workman of any description later in life, than by making him understand drawing. He must be able to see what a plan means, learn something about an elevation, and he should be able to express himself with a few lines upon a piece of paper. If he can make that drawing he can issue orders, and if he can read a plan he can understand an order in a way that no written words will convey to him. Again, we want to make Nature-study an exercise in arithmetic. Measurements there must be as far as possible, and it is astonishing how many simple measurements can be drawn into this study of seeds, and plants, and so

forth, and all these lessons can lead up and be applied to arithmetic. The difficulty we find with boys is that they divide sharply the arithmetic they have learned at school from the arithmetic of life; and give them a problem about a field, or a haystack, they have no conception that what they learnt at school has anything to do with it.

One other point I have to insist upon, and that is the importance of training observation. We have got somehow or other to make people see things with their own eyes. Most men and women don't see things at all; they see the world dimly—men like trees walking,—and we do want to make them see things for themselves accurately. How can we begin? Begin with the very simplest thing of all, if it is to be a lesson in school. An object may be placed on the desk, and the children asked to describe it. You will get some most extraordinary results. Or some object out-of-doors may be chosen—say a chalk-pit. The children may be told to look at it as they pass to and from school, and then, as a lesson, they should write down what they have seen. By merely getting them into the habit of seeing things, and putting on paper what they have seen, you will have given them one of the most valuable faculties for their future life and training. So I would impress upon you the all-importance of making Nature teaching of any kind a lesson in seeing and observing.

I am often asked by teachers: "Can you suggest a subject?" "What shall we take up?" "Will you suggest a few books?" No, I won't. You must find out your subject for yourself. I want to see this

teaching the individual product of the teacher himself. I should like to see every school with a speciality. Perhaps one man may be fond of insects, another plants, another fruit-trees, and so on, but let each work out his own individuality, find a line for himself, and he will teach best if he interests his children in the thing he is keen about himself. What I would say to the teacher who asks for a subject is, just cast about, read one or two good books, and you will get an idea of something that interests you; think that out for yourself, use your eyes, do a few experiments during the remaining session, and you will be in a position to begin to take your children along those lines as a teaching-course next year. The work demands a certain sacrifice on the part of the teacher—it means giving up time and thought, and it means a certain amount of hard personal work. Have we any right to call upon teachers, burdened as they are with multifarious duties at school, to make this sacrifice of time and attention to a new subject? Well, I think you will agree with me that that is a point of view the teacher will repudiate. If he can convince himself that this kind of teaching is going to help his pupils as citizens in their lives afterwards, I think he will give it. There never has been a teacher worth his salt who did not feel at the bottom of his heart that a great deal of his work was a matter of self-sacrifice, and when he was doing his best he was giving something that was not in the bond and was personal to himself. If I can only convince some of you that there is value to the mind and to the soul of our children in this kind of work, I know that I shall not appeal to you in vain for the

sacrifice of yourselves in the thought, time, and attention that is necessary to make it go.

NATURE-STUDY IN ELEMENTARY SCHOOLS FROM THE TEACHER'S STAND-POINT.

BY MR. G. H. ROSE, HEAD-MASTER, CATERHAM BOARD SCHOOL, SURREY

"Nature-study in elementary schools from the teacher's stand-point" suggests three questions for consideration.

(1) Is Nature-study desirable in elementary schools?

(2) What aims should influence the teacher in his selection of a suitable course?

(3) May any advantages, generic to the teacher's main purpose, be expected to arise from such study?

First, then, "Is Nature-study desirable in elementary schools?"

Expanded, somewhat, this question becomes: "Is Nature-study simply the latest 'fad', to be adopted only under sufferance, or is it a natural and welcome development in the direction of truer educational methods?"

From the stand-point of the teacher, real Nature-study may be regarded, to put it briefly, as education by observation as opposed to information by memorized definition.

When, under the system of "payment by results", the chief aim of instruction in elementary schools

was to prepare for examination, definition was of the greatest service to the anxious teacher.

It did not matter that the child who could upon occasion produce lucid definitions to any extent would probably be unable to recognize any of the things he so glibly defined; for he was never called upon in school to deal with realities.

Those days witnessed the ascendancy of those magic science handbooks which were guaranteed to give the docile scholar—by means of a shrewd blend of mnemonic and definition—such a complete examination outfit as would enable him most certainly to earn the specific-subject grant.

Under such conditions the whole tendency of school-work was too long in the direction of artificiality.

Children were made to talk and write, often with seeming excellence, upon a variety of subjects which were, in reality, *only assemblages of words.*

The grotesque character of such results was better known to the teachers who produced them than to any others; and it was due, more, perhaps, to their denunciations of the system than to any other cause, that more enlightened work became possible.

Perhaps the first operative attempt to improve was in the teaching of geography, which has now pretty generally become real.

Clay models of physical features and pictures of actual places bring into the school-room something of reality.

But better than the clay model is the real hill, with the real spring issuing from it; and so well understood and generally accepted by all teachers is this truism, that *only the limitations of courage and convenience*

prevent the frequent transference of the geography lesson from the school-room to the hillside.

The child needs the concrete. He will try to simulate sea and land in his morning porridge-plate.

It is this anxious feeling for the real which has caused the occasional abnormal distention of that admirable institution the school museum; which, to satisfy some, should be nothing less than a compendium not only of natural history and science, but of all the arts and industries, embracing everything from leather-tanning to quartz-crushing and from a barnacle to a thunderbolt, to say nothing of such trifles as boomerangs and snow-shoes.

These things are not lightly to be decried. They at any rate show how ready the pendulum of correct pedagogic instinct is to swing right away from the crude old plan of learning from books alone.

The specimens in the museum cupboard are as much better than the essay-card as the geography picture-book is better than the geography catechism.

Still, they do not entirely obviate the weakness of the prevailing object-lesson system; which is, that it forces into the child's mind a succession of ill-digested and unassimilated matters, resulting too often only in erroneous ideas of processes and products.

Is it not the experience of every adult, that, however well an unknown object or locality may have been described to him, the first sight of it is usually a surprise?

How much more must this be the case with children, whose imaginative minds, unaided and unfettered by any precise valuation of descriptive words, create

ideals strangely differing from the realities so laboriously pictured for them.

The only absolutely reliable channel of knowledge is observation.

The orange-tree grown from the pip on the window ledge of the city board school—the water-snail passing its declining days in the 3-lb. jam jar—the home-made barometer read daily in the village school-room until it becomes a trusty friend—these and kindred things are such common indications of a breaking away from the old style, that it is surely correct to say that the whole tendency of recent methods in elementary schools has been to approach and to impinge upon Nature-study.

The complete change has not yet become sufficiently general, but the time is surely approaching when every school that for one reason or another is hesitating will bring itself into line by adopting some measure of Nature-study, not because it is the fashion, but because it is the obvious sequence to what we have all already done.

But the elementary teacher has so often been the victim of the educational "crank" that he must be pardoned if he is predisposed to doubt the lasting character of new educational expedients.

Transitory innovations, which add to his burden by filching time from what he knows are the essentials of his work, are always unwelcome.

Even innovations which are acknowledged to be new essentials can only receive their due and proportionate share of his attention by the nicest adjustment of conflicting desires.

So that those who are expecting so much from the

elementary teacher in this direction will be wise if they exercise some amount of patience.

The next point proposed for consideration is:—

“What aims should influence the teacher in the selection of a suitable course or scheme?”

These are the halcyon days of liberty of curriculum; a liberty which, let us hope, will be fostered and rendered more potential under the new local authorities whose genesis is being awaited with such mingled hopes and fears.

And amongst the many claimants for a share in the sadly cut-up school-time of our children, there is none, amongst optional subjects, which is being more thought about than this of Nature-study.

For many a one, alas! its fascinating suggestions are only an irritation.

Longing to undertake this duty, but crippled for want of help, such a one feels there is no possibility of doing as he would like to do.

May it not be probable that the ambitions and elaborate character of many of the published accounts of achievements in this newest field of educational work help to dishearten him?

The best he feels capable of doing falls so far short of what he knows has been accomplished, that he at once puts the whole thing on one side.

If he could see, as so many are now doing, that some little, modest, home-made plan of his own is infinitely better and more suitable for him than the all-embracing one of some more fortunately situated teacher, he would, if he only ventured to embark upon it, find it lead to happy results.

Too often, however, the alternative is between

doing nothing, or taking a reading-book course of lessons.

And here it is necessary to digress slightly in order to touch upon a somewhat difficult matter.

Is there not some fear that injudicious attempts to force this subject will be putting a temptation in the way of teachers to debase Nature-study to the level of reading-lessons?

Do not many of the excellent and usually well-informed so-called object-lesson and Nature-study readers act somewhat as a snare?

For the pity of it is, that often, the more reliable the book the more is the teacher using it tempted to trust to its full descriptions and its exquisite pictorial aids rather than bother to hunt up Nature's actual instances.

Is there not, to say the least, a temptation to learn and know the book matter rather than to know the living things themselves?

For the whole essence of Nature-study is that it shall be concrete; and unless the teacher possess the necessary inclination and, might we not add, inspiration in this direction, he will, if he do anything, probably attempt a book-conducted journey through a large variety of subjects bewilderingly wanting in anything like orderly sequence or purpose.

If anything is to be achieved, the teacher's personality must be the prevailing motive force over and above any books he may use.

So that his first aim in choosing or constructing a scheme will be to keep well within his own powers.

He may by inclination be something of a geologist, a botanist, or a physicist.

It matters little.

Let him take his own best-loved subject, and, with no dominating desire to obtain tangible results, let him re-travel with his scholars the road along which he himself has derived such pleasure.

It is not desirable that during the all too-short period of school-life the child should only have partaken in a hurried scramble here, there, and everywhere.

Better far for both teacher and scholar that one branch of Nature-study should have been taken sympathetically and soundly.

And let that one branch have been what it may, there will have been woven into it, and attached to it, gleanings, purposeful gleanings, gathered here and there where Nature's many pathways intersect; gleanings which will have created in many eager young minds longings for wider digressions along those other far-reaching tracks.

So that it will be prudent to set out with a smaller intent which may perchance widen as it proceeds, rather than to start encumbered with an all-embracing scheme which will probably prove only a wearisomeness to all concerned in it, and which will almost certainly have to be largely jettisoned before the end of the journey.

There are some enthusiasts who would make the subject dominate the whole of the curriculum—who would teach boys to recite Wordsworth's "Little Yellow Celandine" rather than Tennyson's "Revenge", who would make all mensuration dependent upon hay-ricks and corn-fields, and would have the boy sketch a rhubarb leaf and not a rifle.

Such theorists must not expect the teacher to fall in with any such suggestion.

The whole thing would soon assume the aspect of a fraud in a boy's mind.

The enjoyment, and possibly the benefit, to him of his ramble is in direct proportion to its freedom from consequent essay writing.

If he hates arithmetic, squeezing a sum for him out of an oak-tree will not make him love the arithmetic more. It will probably decrease his respect for the tree.

Correlation and co-ordination have their limits and their pitfalls, and most teachers will prefer to keep Nature-study for the unalloyed enjoyment of their scholars, and will not allow it to waste its beauty and its usefulness by dribbling away in bifurcations here, there, and everywhere.

But having decided what shall be the main channel of enquiry into Nature's secrets, the teacher will descend from his rostrum and start to rediscover the old things with his scholars' eyes and ears.

And the recurrent joy will never wane for him.

The cunningly-packed beech-mast bursting into wrinkled loveliness of vernal green, the crimson star-stigma on the hazel-twigg, the silver gleam that betrays the sand-hidden bivalve as it opens its twin canals in the shallow sun-warmed sea-water, the capture of the resting, gaudy dragon-fly, the fragile, fleeting snow crystal caught upon a school-boy's sleeve, the perfect equipose of unequal weights upon the balanced beam, the line of tender seedling shoots which marks the starting of the season's garden crops—be it what it may, that which brings profitable delight to the scholar will bring perennial pleasure to the teacher guide.

For the teacher will find himself exercising a gentle leadership and guidance none the less effective because almost imperceptible to the scholars.

Leading rather as one who is foremost amongst them as a learner himself, sharing in their disappointments as well as partaking in their awakening delights, he will be careful to do or say nothing that shall decrease the pride of his young companions in first-hand discoveries.

It is impossible to appreciate fully what this means, unless one has seen some such sight as a large class of boys in school during the course of a Nature-study lesson, all eagerly engaged in some simple investigation to them delightfully new; with their teacher, actually an expert in the work they are doing, but apparently as intently curious as themselves, flitting here and there amongst them with mingled encouragement and congratulation. In this connection it is suggested that members of the ramble-party should always be provided with maps of the route arranged to be taken; for this enables each individual to be, as it were, as much an independent tourist as one of an organized party.

The success of any scheme must lie first in its simplicity, and next in the prudent guidance of the teacher.

It is only the great one amongst teachers who is able to carry to accomplishment a widely-varied scheme. We who are only of average powers shall, if we are prudent, work within narrower limits; not scanning too closely the difficulties which lie in the way, for he who sees only the difficulties will know nothing of the delights.

The final question for consideration is, "May any advantages generic to the teacher's main purpose be expected to result from Nature-study?"

Many enthusiastic advocates and promoters of Nature-study assure us that we shall miss the mark if we attempt anything like definite teaching in connection with Nature-study; that it is pernicious to expect any tangible results.

They go so far as to deprecate anything which can by any possibility be considered a specific course in any of the "ologies".

Simple, recorded observation of Nature, with the obscure unmeasurable transformation of mind which that observation will produce, is all that they approve.

But Gilbert tells us that even the enterprising burglar loves to hear the little brook a-gurgling, while for practical Nature-knowledge the hardened village poacher would often take a lot of beating. And teachers will probably feel that Nature-study alone will hardly correct any of that inherent moral obliquity which it is their sorrow to meet so frequently in their pupils.

Opposed to those who look for no results are the enthusiasts who look for great socio-political results from courses of Nature-study.

Untrammelled intercourse with and knowledge of Nature in all her varying moods and methods will, they assure us, fix the youthful peasantry to the land; and they call for the aid of the teacher.

"Give", they say, "unlimited and properly-pursued Nature-study to the rustic youth, and the towns with their artificial attractions will no longer allure him

from the sober prospect of following in the footsteps of his forefathers and finally resting where they rest."

The consideration as to whether such economic results will or will not follow may possibly influence the rural teacher to some extent in his regard or disregard for Nature-study. He will in any case certainly do his best so to direct the intercourse of his scholars with Nature that they may be able to make the most of all the opportunities that the future may afford them of becoming thriving rural citizens.

But for him, as for his fellow in the town, the chief consideration must always be whether this thing will enable him to turn out from his school potentially better men and women no matter where their lot may be cast—in the factory or on the farm, in workshop or in garden, in the dairy or in the warehouse, as the "handy man" or as Tommy; while at the same time he will rightly hope that some, at least, of the first-fruits of his training will be for his own gathering during the school-life of his scholars. Rightly, for even for the least ambitious worker in Nature's school-room there are many agreeable experiences that are lacking often for the worker in the old stereotyped style.

The scholar's widened interest in things around him, the alertness, the delicacy of handling which takes the place of former clumsiness, the fostered love of drawing beautiful things,—all these and other gains will be obvious enough.

And there will be other rewards that only the experienced teacher can properly and fully value.

If the study of Nature's processes and products engenders an attempt to follow her methods and to accept her promptings, if the best organizer and

operator is always the one who aids rather than resists healthy natural tendencies, and if only the constant watcher can rightly appreciate those tendencies, then surely he is to be held the most prudent teacher who soonest recognizes in the child's ceaseless endeavour to escape monotony some natural prompting which ought not to be unnecessarily thwarted.

And in trying to meet satisfactorily that craving for diversity of thought and action, the teacher finds nothing more suitable for the purposes of a delightful change-subject than true Nature-study.

The child can in no other way be supplied with so unfailling a sequence of the interesting and the unexpected.

There is no subject forming part of the curriculum of an elementary school which will interest all children.

There are some subjects which seem at times to fail to interest any children.

But of all subjects Nature-study will leave the fewest scholars untouched.

The awakening of dormant and unsuspected powers of appreciation is greater, perhaps, under its influence than under any other.

In many instances school-days would have left absolutely no treasured memories for maturer years if Nature-study had not been pursued; and only the teacher knows the teacher's feelings when he meets an ex-scholar who cannot reasonably be expected to look back upon school-days with pleasure.

It is in overcoming such difficulties as are continually met with during definitely-planned rambles that the spirit of comradeship between teacher and pupils will be at its brightest.

When the search for some desired object becomes keen and eager through long-continued failure, the free, unfettered intercourse is something to be known to be appreciated.

And while the more formal relationship between teacher and class may on such occasions well be dispensed with, there is perhaps no time when the teacher sees his own disciplinary influence put to a more severe and practical test; while under the loosened rein the real boy, not the artificial one who sits in class, discloses himself,—often to the wonderment of his teacher.

Surely there is a gain in this.

But one more instance.

Parents ought to follow with interest *all* the doings of their children, yet only a few really take any concern in what may be called the staple items of elementary school work.

But the majority are found to take unquestionable interest in such things as school gardens, maps of their neighbourhood, and school rambles with their after-math of private collections, experiments, and drawings.

We in the elementary schools cannot afford to neglect anything that tends to foster mutual sympathy between the home and the school.

These are purely first-fruits which may or may not presage the later, wider, and more potent economic results which some look for.

Where the opportunity exists for linking together observation and experiment, experiment and practice, there must indeed be sown the seed which will produce wider powers and possibilities for after-school life.

The provision of suitable conditions for the exercise of those powers and the realization of those possibilities must, fortunately for the teacher, be left in other hands than his.

But the elementary teacher, rural or urban, will not admit any obligation to send out of his school children capable of taking up without any further teaching or training the different occupations they may, according to the accident of locality rather than to natural adaptation, be called upon to follow.

If we encourage Nature-study in our schools, the good of our pupils will be our chief and direct object; all indirect gains must be subordinated to that.

FOURTH CONFERENCE, Thursday, July 31

CHAIRMAN: SIR GEORGE KEKEWICH, K.C.B.,
SECRETARY TO THE BOARD OF EDUCATION.

SIR GEORGE KEKEWICH said:—We are met to-day to hear and to discuss some papers which will be read by experts in the subject which we have under consideration. It is one which is just now specially interesting to the educational world, for it is, in a certain sense, a new development of our educational curriculum, though, in another, it is as old as humanity itself, which depends for its very existence upon the knowledge of natural processes. The study of Nature is of the essence of all true education, and it is somewhat remarkable, and not perhaps creditable to our common sense, that we should not have fully realized this until the twentieth century.

As it is, we owe this exhibition, which shows by ocular demonstration how the subject can be effectively taught—we owe this exhibition to the energy and enthusiasm of a few persons—and only a few—who have realized the importance of including Nature-study in the curriculum of our schools. We are greatly indebted to Mr. Medd, who has given a very large portion of his valuable time to the work, and who has been the life and soul of the undertaking, and to Sir John Cockburn, whose good work as regards education we all know so well.

We are to-day to hear papers on education in secondary schools.

Perhaps the scholar in a secondary school is somewhat better off as regards opportunities than the scholar in an elementary school, at any rate better off than the great mass of children in our urban elementary schools. Many of our great secondary schools are in rural districts; and even when they are not, the scholar in an urban secondary school can reach the country with less difficulty than the city scholar in these days of cheap locomotion. One may at any rate say this, that the study of Nature is just as essential for the scholar in a secondary school as for the scholar in an elementary school. In some ways it is even more essential, for it is absolutely necessary to a liberal education. And he can carry the study higher as a basis of scientific knowledge.

There is surely no kind of teaching which confers upon our children so many and such varied advantages.

It is unrivalled in promoting habits of observation, it rivets the attention of children upon what they observe, it *develops intelligence*. And the development of intelligence, after all, is the greatest and the most comprehensive of all the objects of education. For you cannot have knowledge, real knowledge, without intelligence. It is no use teaching a child a string of facts which he does not understand. This sounds like a truism, but I fear it is only comparatively recently that many of us have begun to realize it.

Nature-study is so large a subject, it confers so many benefits actual and incidental upon our schools and children, that time would fail me if I ventured to

attempt to deal with them as they ought to be dealt with, or without condensing the description of them in a very small compass.

Properly taught, Nature-study inculcates humanity to all things living—to the animal, the bird, the insect, the flower, and the plant; it teaches our children that the marvellous structure of all of these is not a thing to be lightly considered,—or to be rudely injured by the hand of man, at any rate without sufficient cause.

We may distinguish between those creatures that are beneficial or harmless, and those which are destructive or harmful. I always have my doubts whether there are any creatures that are not, in some sense or other, beneficial, or that do not in some sense fill an useful place in the great plan of the creation. But man has to look to self-preservation, and he must necessarily, from that point of view, regard those creatures as baneful which destroy or injure himself, or his dwellings, or his food, or interfere with his comfort.

Then, again, the study of Nature induces refinement and improves our civilization. It brings with it an appreciation of the delicacy of Nature's workmanship, of her beauty of form, and of her magnificent colouring. There is nothing in art which has not its prototype in Nature.

Nature, again, is the very root and basis of science; the student of science is a student of natural products, of their energy, their properties, their power, and their combination. The study of Nature brings to the child scientific habits of thought, of enquiry, of reasoning, deduction, generalization, and verification.

The wealth of Nature, the scope of study, is

practically unbounded. The student delights in her lavish exuberance; he sees her, and loves to see her, as she is; not garishly clothed by the carpet-bedder, or ordered and arranged by the landscape-gardener. I call to mind those words of Calverley's when in one of his inimitable productions he was satirizing Propriety:

“ I walked in the Forest, and above me stood the yew—
 Stood like a slumbering giant, shrouded in impenetrable shade.
 Then I walked in the Citizens' garden, and lo! the same tree
 clipped into shape:
 The giant's locks had been shorn by the Dalilah scissors of
 decorum.
 And I said, ‘How beautiful is Nature, but how much more
 beautiful is Art!’”

Let our child love, not the mathematical exactness of this Italian garden, but the wild profusion of “the groves of lign-aloes that the Lord has planted”.

The student finds fresh interest and fresh material in every variety of surroundings, in the garden, in the field, on the open moor, in the depths of the wood, on the bosom of the river, by the shore of the sea. To him there are lessons in the flower and the fruit, the herbage, the trees, in all the life of the land and of the water. He finds ever something new to wonder at in the mysterious life of trees and plants, a life which modern science has not, even yet, fully comprehended, and which perhaps is beyond our comprehension. To him Nature is an inexhaustible book, which he may read for all his life, while the pages are for ever multiplying as he reads. There is no weariness in this study, for the reader is constantly encountering new beauties and new poetry to delight his eyes and soul, and excite his imagination. The

study of Nature's mysterious processes, the discovery of her objects, the study of science based upon Nature, are probably more interesting and engrossing than any other kind of education.

In conclusion, I should like to say how greatly I sympathize with the difficulties of urban schools in obtaining Nature-study, at any rate in its perfection. There is no reason, however, that it should be wholly excluded from them, and I hope to see the day when school excursions into the country are more frequent and more easily undertaken than at present.

Nature-study, if it is to be thoroughly and satisfactorily given, should be mainly an outdoor occupation in the large, fresh air; and I think it may be pursued at all times of the year in fine weather. I wish the urban schools could get more facilities for such study, which, among its other benefits, would greatly conduce to the health and physical development of the children. We have been too much accustomed to think of education as a thing necessarily obtained in a school-room. It is surely better to get it in the fresh air and large room of the open fields or woods, if you can, and as far as you can.

But even in the rural districts, I believe that the facilities for, at any rate what I may call home lessons in Nature, are becoming more limited. Surely every cottager should have his garden, if possible surrounding his cottage. But I fear that there is a tendency, because of its cheapness and because of its profit to the builder, to build the cottages required, in rows along the village street, without gardens; and to, in fact, urbanize our villages. And I fear that there is no remedy for that.

But it is certain that such a plan, with perhaps an allotment (though I do not despise allotments, which are excellent in their way) half a mile away, does not attach an agricultural labourer to the soil in the way that a cottage with his own garden surrounding it does, especially if he has been taught in his youth to appreciate the enormous advantages of rural life, in the manner I have tried to indicate.

I have trespassed on your time long enough. But after what the President of the Board of Education said at the opening of this exhibition, I felt that I was free to assure you how strongly I sympathized with this movement. I have been a humble unscientific student of Nature all my life, during nearly all of which I have had my home in the country. And I love the country.

NATURE-STUDY IN COLLEGES AND HIGHER SCHOOLS

BY PROFESSOR L. C. MIALL, F.R.S.

The characteristic features of Nature-study in colleges and higher schools are determined by the age of the students, who are usually adult, and also by the fact that microscopes and other appliances can be supplied and used in class. Many of the students are undergoing training as teachers. I have found, however, that a course of Nature-study may be well suited to students who do not propose to teach. Nothing, for example, forms a better introduction

to the botany and entomology of an agricultural course than a short discipline in Nature-study.

It is not uncommon to give model lessons to classes of teachers, *i.e.* lessons which can afterwards be repeated in school. I do not like this method. We ought not to encourage the servile repetition of old lessons; our teaching should be closely adapted to the wants and capacities of the class actually before us, and we get into a false position by attempting to teach grown-up people as if they were children.

I find it best not to anticipate personal observation by explanations of any kind. In my own courses the laboratory work always comes first, and the classroom merely gives an opportunity of correcting and driving home the work of the laboratory. We have found that laboratory work, without lectures or separate class-work of any kind, is one good form of instruction for adult students.

Every subject may be treated as an inquiry, and there is no method of teaching so enlivening and practical as that which is based upon questions answered by observation and experiment. The teacher must, of course, be himself an inquirer, which does not necessarily mean that he prepares researches for publication. Some people tell me that the method of teaching by inquiry is too hard and too slow. I do not find it so in practice. The first steps cost much time and pains, but after a few weeks or months the progress of the class is so rapid as to compensate handsomely for the slowness of the preparation. Real knowledge has to be paid for, but it is worth all that it costs.

I believe that no course of Nature-study is valuable that has not some degree of originality. The teacher who finds out nothing for himself has not yet hit upon a good method. I would apply this test not only to the teacher, but to the text-book. Some books on Nature-study, though pleasantly written and beautifully illustrated, contain no fresh matter whatever, which means that the writer has not discovered a productive way of interrogating Nature.

The chief interest of Nature-study is life, and living objects, especially living plants, are found to be more stimulating than any others. We can observe them under all conditions, and experiment on them without cruelty or appreciable cost; we can vary their food, vary the stimulus of light, investigate the conditions necessary for fertilization, and so on. The plant does the thing which is really hard: it grows. The many substitutes for the direct study of living nature, such as learning by heart, collecting, naming, drawing up lists, filling up schedules, are at best accessories, and may be positively harmful. Live natural history is what we want above all.

The hindrances to Nature-study are many. The number and variety of public examinations, the crowded time-tables of most schools, the lack of time for due preparation, and (in elementary and-secondary schools) the large number of pupils who are taught in one class, all these are serious obstacles to good work. In many ways the organization of education is very defective, and the teacher is seriously impeded by difficulties which do not belong to the subjects taught, and which admit of a remedy.

According to the method pursued in training we

may expect to turn out resourceful or resourceless teachers. Some teachers can do no better than to get up all their lessons out of books, and to illustrate them, if at all, by bought appliances. There are teachers who depend entirely upon lantern-slides, models, and other things which should be unimportant accessories. Such teachers are likely to be mechanical in all their methods, dictating notes to their classes, and making it a chief point to get the technical names spelt right. Where native aptitude is aided by good training, we may hope now and then to turn out a real teacher of Nature, who brings a fresh eye and a fresh curiosity to every lesson. He has the air of expecting that very day to learn some new thing. He becomes by experience full of knowledge, full of resource, but even more eager to learn than when the whole of Nature lay before him as an unstudied book.

NATURE-STUDY IN GIRLS' SECONDARY SCHOOLS

BY MISS MARY GURNEY, MEMBER OF THE COUNCIL OF
THE GIRLS' PUBLIC DAY-SCHOOL COMPANY

"We plant a solid foot into the Time."—*Tennyson*, "*The Princess*".

I believe that the great changes of the last thirty years in the education of girls have laid the foundation for the interest now shown in Nature-study. The higher education of girls is placed upon a new footing; girls have been taught to think and to make use of their senses, to handle and to observe. With

regard to the work of the Girls' Public Day-School Company, the advice of Professor Huxley was sought in early days, when a letter from him as to the lines of education to be pursued was printed for the use of mistresses. The same principles have guided the work of the great pioneer schools, Cheltenham and the North London Collegiate, and of numerous endowed and other schools of the home-country and of our colonies, as is evidenced by the exhibits here.

In speaking of actual school work, I wish to point out that all branches are now affected by a contact with realities. The cubes of the kindergarten take the place of long rows of figures; scales are used early for measurements, and weights are understood; geography begins with maps of the room or of the school-garden; and drawing, with brush-work, from flowers or animals. Thus, when books are reached, these do not convey mere words to the mind, but carry on the thoughts and impressions derived from real objects.

The greatest of all the reforms has been in the branch most closely connected with Nature-study;— in the teaching of science. In place of the perusal of such books as Mrs. Mareet's *Chemistry* and *Natural Philosophy*, girls are now taught on the heuristic method; they have their laboratories, which they prize; they are trained in experimental work, and in the making of their own instruments; whilst in their botanical and geological work they handle plants and stones, and are taught to persevere in research by the aid of microscopes.

Some of the results may be seen in exhibits here, as, for example, a series of dried flowers from Shef-

field, and of paintings of flowers, in connection with Professor Balfour's schedule, from Brighton, and seaweeds and fossils from Dover (schools of the Girls' Public Day-School Company); also paintings, slides, and specimens of the mycetoza and mosses from St. Margaret's, Bushey; flowers dried in sand from Cheltenham College; plants growing in solutions from James Allen's school; &c.

Leaving regular school work, I come now to voluntary Nature-study. It may be thought that as love of Nature has been strong in all ages of the world, especially shown in the worship of Nature deities and in Greek and Latin poetry, training is not needed. But Nature seems to be best appreciated in later life, and what an advantage it is then if habits of observation have been early gained!

Sir J. Paget, in his address in 1888 to university students on scientific study, dwelt especially on the need of education in the power of observation, and also on the importance of accuracy. He noticed, too, another point (already discussed here), that Nature-study is as suited for the town as for the country. He said: "Even in natural history you may study the habits of the London wild birds, or you may study wild flowers on any piece of ground left undisturbed for two or three years". This last point is illustrated in this exhibition by flowers from the Blackheath High School found on the heath. We have, again, the authority of Lord Avebury, in his *English Landscape*, for the necessity of observation to throw new light on familiar scenes.

I will now notice some practical attempts at Nature-study. Amongst the exhibits we have: *The*

Perfection of Life in Plants, by Miss Hibbert-Ware of the Clergy Orphan School, Bushey, containing a consecutive plant history, with illustrations on every page; also the *Life Histories of Plants and Animals* from the Streatham Church School, &c. I will further mention the schemes of two schools.

At Clapham High School Nature-study (including object and other lessons given in class hours) is in the hands of the science mistress, with a mistress trained at Swanley College.

The children learn all the branches of practical gardening, with bee-keeping, and they select plants, or such living creatures as gold-fish, for care in their class-rooms.

They have a meteorological hut in the garden, and keep weather charts from readings taken there daily: 1, maximum and minimum temperature; 2, wet and dry bulb; 3, hygrometer; 4, barometer; 5, rainfall; 6, wind.

They watch the growth of plants in the garden, and draw the various stages of budding, in the same branch of an apple-tree, dated April 3rd, 11th, 17th, 22nd, and 29th. They keep Nature-diaries, and record their observations, as the eclipse of the moon at various hours, and the first sight of a bird or flower.

Nature-sheets are hung in their class-rooms, and they write down and sign there any daily remarks, such as "All rose-trees (except Allen-Richardson's) are budding", "A fossilized insect has been dug up in Streatham", "Blackbirds and thrushes are beginning to sing".

At Streatham Hill High School there is a Nature-

club of 125 members, including children from all forms down to the transition. It is divided into sections occupied with—

1. Collections of wild flowers.
2. Observations on animal life.
3. Collections of sea-side objects.
4. Drawings, models, paintings, and photographs from nature of natural-history subjects.
5. Cultivation of plants for flower-show.
6. School gardens.

Each member may form part of two only of these sections, and must keep a Nature-diary, and a rough note-book for use on expeditions. Two expeditions are made each term to the country or to museums, and one social meeting is held for discussion and comparison of results.

Field-clubs are started in other schools. One head-mistress has written to me, that though the field-club has been started but a short time the keenest interest has been felt, and more enthusiasm has been shown in connection with it than with anything else.

NATURE-STUDY (PLANT-LIFE) IN TECHNICAL SCHOOLS

BY MR. G. F. SCOTT ELLIOT, M.A., B.Sc., F.L.S., F.R.G.S.,
F.R.H.S., &C., WEST OF SCOTLAND TECHNICAL COLLEGE,
GLASGOW.

The Nature-study classes in the Glasgow Technical College have now been carried on for three years, and

the results of my experience may be of some interest to other workers in the same field. From the first class (in 1899), it has been clear to my mind that such instruction must be guided by several important objectives.

(1) Such courses are primarily intended to produce a habit of observation, of drawing conclusions; and of exercising common sense.

(2) A certain amount of practical skill in dealing with flowers or specimens, and an elementary acquaintance with the microscope, are necessary for our teachers, who, especially in country schools, have to use such flowers as they can get, not such as they would prefer, and who are entirely precluded from obtaining any outside assistance.

(3) A certain amount of solid information is absolutely necessary for them. The students must know sufficient to be able to use ordinary sources of information, and they must learn where they can obtain knowledge which they do not possess. Even their influence with the children and their parents depends very much on their being well informed. Of course no teacher should hesitate to confess his ignorance, but he would do well to remember that every such confession diminishes his influence.

(4) Real interest in the subject must be maintained; no progress can be made with perfunctory or uninterested students. One important ideal of such teaching is to inspire a real love of country life and to reveal the fascinations of Nature-study. But it is also necessary for such classes to be real work; they must not degenerate into games played by the master and students. Many suggestions on this subject appear

to lose sight of the chief aim of all education, viz., to train students in the habit of doing those things which they do not wish to do.

There is no real difficulty, in my own experience, in preserving a real interest, even when the students are working at high pressure during the whole of their time.

Those who come to us are either Training-College students (the Established Church of Scotland) or teachers sent by the Lanarkshire County Council. All are over twenty-one, and both classes contain a large preponderance of women. On the whole we have had 470 students under instruction. The time allowed to us has always been very much less than we should have liked. Generally we expect fifteen lectures of three-quarters of an hour each, fifteen laboratory attendances of at least two hours to three hours, and five excursions in the country. In fifteen lectures, it is quite possible to give a sufficiently good foundation for any future work which the students wish to do by themselves, and it is certainly possible to give them an enormous amount of practical suggestions and hints which could not be obtained from any book, or, indeed, in any other way. There is no reason whatever for such lectures to be dry, formal, or wanting in original research. In fact, on this subject a teacher must altogether fail if he follows text-books or the ordinary university courses. It seems to have been suggested that all lectures are necessarily dry, stereotyped, and dull. Those who have had the privilege of listening to the late Professor Tait, or to Professor James Geikie, must emphatically protest against such a view. There is, of course, no doubt that they require a tedious preparation, much uninteresting and

difficult research, and they also involve great expense, which often necessarily comes from the teachers' pockets. Illustrations by diagrams and lantern-slides undoubtedly assist in making the lecture vivid, and especially preserve interest.

The laboratory time is divided between the study of flowers, fruits, or other specimens, and microscopic work. In the study of flowers we try to get every point from the students by questioning. Our aim is to obtain an explanation of every detail of the structure of the flower by referring to its importance in the life of the plant. We consider a thorough training in this part of our work essential. Not one in twenty of these details are described in any accessible book, and by occasionally asking the class to do unseen flowers by themselves, we can readily distinguish as to who are becoming efficient. Drawing is not encouraged, because whereas in one hour only one or at the most two flowers can be drawn and described, at least four, or even six, flowers may be thoroughly studied and details noted in the same period. Thus we can, if fortunate in time, manage to describe fifty to sixty flowers thoroughly in a session, which gives enough experience for future work.

As regards microscopic work, all but a very few students managed to mount and examine some twenty microscopic slides. The sections were also all cut by the students' own hands. Of course skill in microscopic work is of a very evanescent character, but it is easily reacquired. It is also almost impossible for any student to learn microscopic manipulation without assistance. I have a very strong belief in the necessity of using the microscope in teachers' classes.

I do not see how it is possible to obtain any distinct idea of plant-life if a teacher has never seen stomata, root-hairs, or pollen grains. His knowledge, if he has not actually seen the things which he describes, must be dull and superficial. Then, also, for future study, a microscope training is desirable. It is the deadly dulness of a country winter that tends to make teachers prefer a town life, and unconsciously bias their pupils in the same direction. With a microscope a continuous study of plant-life is possible all the year round, and this is a very great advantage, as it prevents the disuse of the subject during seven months of the year.

It is, however, especially with regard to future developments and advanced classes that a preliminary microscope training becomes important. I do not despair of eventually seeing a capable and humble-minded scientist in every large school in every agricultural district in Scotland. The importance of such possibilities should alone make us very careful to preserve solid and thorough instruction in our classes. The excursions are considered to be exceedingly important, and also a very difficult part of our work. The continual occurrence in them of all sorts of unforeseen plants and phenomena is invaluable to both teacher and pupil, and gives a wholesome idea of the magnitude of Nature-study.

In the laboratory and on excursions from ten to fourteen students are placed under a demonstrator, and I relieve these demonstrators, though not in a regular succession. It is quite possible to have thorough supervision and maintain a good class-spirit in this manner.

Three difficulties are always serious. It is very hard to get good demonstrators, and even harder to keep them when discovered. The pay is not sufficient for me to be able conscientiously to advise a student to go in permanently for Nature-study teaching.

Now these demonstrators must be well-trained, able to influence students; and especially they must be gifted with that enthusiasm for Nature without which no equipment is of the least use. Such people are rare, and cannot be advised to delay their medical or other work for Nature-study. If we were convinced of the permanence of such classes, no doubt it would be possible to offer inducements quite equal to those which are open to, say, a lady medical student. But, at present, with all the real eagerness in the country for technical efficiency, it is quite impossible to obtain any post (however humble) by mere efficiency in some technical, botanical, or agricultural subject.

Another serious difficulty lies in the distaste of the average student for using his reasoning power; he is unaccustomed to do this, and regards it as a suspicious novelty. On the other hand, he is delighted to learn up words, and especially those Latin and Greek terms which he supposes to constitute "science".

Many text-books are responsible for this pernicious habit, which will, for instance, make students say that "on injudicious contact with the common nettle, a prickly sensation takes place". Care must also be taken lest students learn up hints and suggestions by heart and without intelligence. Such sentences as "the fruit of the oak is carried by ants", "the waxy appearance of this plant keeps off injurious insects", show this tendency.

A third difficulty is of a very delicate character. We use the heuristic method in the laboratory, but in the time at our disposal it would be fatal to do without lectures and a well-arranged and concise system. I would never criticise Professor Miall's views when carried out by himself, but it is my duty to protest against heuristic methods being adopted *à tort et à travers* against the judgment of the teacher. Personally, I see no reason whatever for disregarding all the work done for us by our spiritual fathers in the study of Nature. Moreover, we in Glasgow do not work in a paradise, where time and money are non-existent. We cannot afford a month, or a week, or even a day, in which nothing is done. Our students are not ideal students; we are not ideal teachers: it is difficult to see how any even elementary knowledge of a well-arranged and concise nature can be obtained without imparting information. There is no doubt that the prospect is a very tempting one. No expensive lantern-slides or diagrams, no lectures to prepare, rewrite, and bring up to date over and over again. There would be no need to get up those sides of the subject which we do not personally care for, because on such methods the student's minds must be inevitably led to the favourite ideas of the teacher.

But to me it seems probable that such methods, if adopted everywhere, would lead to the entire disappearance of Nature-study as a teaching subject: we could not show business men that such classes may definitely assist agriculture.

It is, however, in no way my intention to criticise systems adopted by others. The study of a single

plant might profitably occupy a whole lifetime, and involve not only botany but almost every science. Every earnest worker must, if original, have his own methods and his own enthusiasms. In these classes, which are intended to encourage originality and self-reliance, surely the teacher should be allowed the greatest possible freedom and the fullest responsibility. I would therefore plead that no unproven theory should be forced upon us against our better judgment.

SCHOOL GARDENS

BY MR. T. G. ROOPER, H.M. INSPECTOR, BOARD OF
EDUCATION

School gardens have been established in some countries for nearly a hundred years—they are no new fancy. When managers of a school undertake to start a garden for the boys to cultivate, they should keep clearly in view the exact purpose and scope of their undertaking. There is much past and present experience to guide them.

If the question be asked, "Why start a school garden?" authorities in different countries will furnish different replies. In Sweden, for instance, the reply will be, that gardens for school use have been provided for the purpose of promoting agriculture. Prussia will explain that the school gardens in that country were established to promote the cultivation of fruit-trees. In France and Belgium the school gardens are arranged for growing flowers and vegetables as well as fruit.

But the model which is far the most valuable is that which is supplied by Austria. The Austrian school garden exists to improve the general education and instruction of the scholars. For this is the real test of the value of any subject which is taught in primary schools.

In the long run any attempt to make primary education an industrial training will prove a failure. This is true not merely because as a matter of fact such attempts have been tried again and again, and again and again have been abandoned, but because the principle is unscientific. The purpose of the school garden should be to strengthen and improve the usual instruction and training which are given in primary schools. Therefore the garden is not a mere appendix to a school, such that the rest of the work will remain the same, whether the boys use it or not. The garden must be incorporated in the organization of the school. It is not enough that the time-table should contain provision for a few hours' garden work in each week. Besides this, every subject which is entered on the time-table should be modified by the garden work, and the instruction in almost all of them should be improved by being made more real and vivid, and more stimulating, through manual labour.

The final result of the combination of bookwork and handwork is to make the scholars grow up into thinking and observant men, who will prove generally serviceable in the affairs of practical life.

The boys, while they are working in their gardens, are taught to keep their eyes open to all that passes, and to be alive to every change in earth and air, in

the soil, and in all life that depends on it for sustenance. These changes they will not merely observe and then forget. They will find them considered of importance by their teacher, and learn to discuss them, and understand something more of them, by conversational lessons. Their observations will be used to make their book-studies clearer. When theoretical teaching accompanies and illustrates practical work, it is far more easily understood and remembered by the scholar. One great advantage of a garden for nature-studies is that the field of observation is simple and definite, two limitations to elementary studies which it is of the highest importance to bear in mind. While preparing the soil and the seed-bed, the scholars study the broad distinctions between sand, clay, gravel, and mould. While sowing the seed they study the germination of seed, while tending the plants they study the parts of a blossom and the formation of fruit and seed. They also study the insects and birds which help or hinder the gardener, and the moulds, fungi, and various weeds which blight or choke his crops. They also learn to record wind, warmth, cold, drought, frost, snow, hail, and learn the use of the barometer, thermometer, and other weather-recording instruments. Here again the explanation of the make of these instruments accompanies the daily use of them. To awaken a spirit of wonder and curiosity is a step towards creating a desire for knowledge. Most boys learn with greater zest when they see clearly the practical application of theoretical knowledge which is so laboriously attained.

Besides positive knowledge, the work in the garden

cultivates a love of industry, order, and tidiness; it builds up a feeling for beauty of form and colour in flowers and trees and fruits, and touches the heart of man as well as his brain. It is a natural gymnastic, and bridges over the space that separates physical and intellectual growth. It also supplies a link between learning and life, and although it trains neither the agriculturalist nor the horticulturalist in any immediate way, it predisposes youths to interest themselves in these industries; and if it be their lot in after-life to earn their bread in pursuit of them, it does nothing to give a distaste for such occupations, and yet it by no means unfits young people for any other.

In order to indicate more clearly and precisely the possibility of incorporating the work in the school garden with the rest of the subjects on the time-table, it will be well to deal briefly with each of them and point out the connection between the outdoor and indoor occupation.

Bearing in mind the occasion on which this paper is read, and the character of the exhibition which has been prepared with so much care, it will be well to begin with Nature-study and its connection with school gardens.

One of the principal aims of Nature-study is to give children a glimpse of animate nature—that is, of life—by means of definite and carefully-guided observation of plants and animals as they actually live in their ordinary surroundings.

The separate heads under which this study is approached find their central meeting-place and bond of union in the garden and its contents, and they are as

follows:—The site and aspect of the garden; the soil and its improvement by spade-work, draining, and manuring; the build of a plant; what a plant is made of; how plants are nourished, and their organs of nourishment; sap and its movements; conditions of healthy growth; germination, growth, flowering, fruiting, and seeding of plants; annuals, biennials, and perennials; evergreen and deciduous trees and shrubs; the dependence of plants upon insects.

All these matters of simple experience in the garden can be simply treated and explained in the school-room.

Much useful work may be done in the way of simple experiment by contrasting the effect of choosing for seed larger or the smaller samples. For instance, small potatoes, large potatoes, and the largest of all may be selected for setting in the ground and the results witnessed and recorded. The value of examples of defective cultivation should not be overlooked.

The effect of early and late springs on vegetation, the date of first sprouting and first flowering of certain plants, may be observed and recorded. If the records are kept for a number of years the comparison between the weather chart and the date of first flowering chart becomes interesting and suggestive. The changes that can be noted in it by carefully watching the soil, whether in winter, spring, or autumn, will be connected with the seasonal changes in plant and animal life. Children will observe and want to know why the surface of the petals of the rose and of the leaves of a cabbage do not become wet with rain any more than a duck's feathers; why there is such fragrance from the flowers when the air is moist; why

there is no dew under the shade of trees; why flowers shut up before rain. They will want to know why water rises from a saucer up into the mould in a flower-pot which is placed in it; what happens when water is poured on a dry, dusty soil; what happens when plants are watered in dry weather; why roots grow downwards, stems grow upwards, and branches spread horizontally.

The applications of arithmetic are numerous, together with simple notions of mechanics, geometry, and mensuration. There is first of all the garden account, that is, the outlay on seed and manure, balanced with the income from sale of produce. There is the calculation of the number of plants required to fill a given space. There is the calculation of the cost of cropping the plots, and the cost of manuring them. There is the comparative cost of the manure on two plots differently treated, which should be balanced with the actual weight of produce obtained in each case and the results of the sale of the respective produce. These calculations are equally good for mental training as true discount, and more useful to country children. There is the calculation of the percentage of sound seeds in a sample based upon an easy test for germinating seeds. There is the calculation of the loss to growers by the destruction of insect-eating birds.

The use of the spade as a form of the lever will be useful in explaining the three orders of levers—useful information which everyone is supposed to know, though the knowledge is not very common.

Geometry and geometrical drawing will be useful in laying out beds of various shapes, constructing

geometrical designs for flower-beds, and the like; constructing plans to scale and using the plan to set out the beds. The slope of the garden can be calculated, and in some cases levelling can be studied with advantage.

Ordinary drawing will be of value in two ways. Perhaps the most important will consist in making diagrams to illustrate important facts of plant and insect life. But it will also be of use in making drawings from nature of beautiful flowers and leaves.

Even a subject like geography will not be disconnected with the school garden, for it adds an interest to the geography lesson to ascertain what plants grown in the garden are natives of America, or Japan, or Africa, and the economic and commercial aspect of geography receives illustration. The influence of climate can be made clear and the explanation interesting.

The school library should contain a variety of useful books on gardening and allied subjects. Many school readers and school magazines will contain valuable articles on recent improvements in horticulture.

As subjects for composition, the studies that have been described will be equally useful and interesting.

Finally, home lessons may be given through the garden. Home lessons which involve painful and exacting thought are unsuitable for most children in elementary schools. On the other hand, healthy occupations which keep children off the streets and away from bad companions are desirable. For home occupations children can sow seeds, plant cuttings, tend seedlings, and carry out many easy experiments which are explained in school.

At the outset the proposal was to show that a school garden should be no mere separate accident of school routine, but an integral part of all the instruction which is given there. It is an addition without which each subject is less rich and varied in its contents and less valued in application.

Gardening is not so much an addition to the subjects which are taught in school, but a better, an improved way of teaching them.

In conclusion, the whole value of this kind of instruction is summed up in these words of the profoundest and most observant of English poets:—

“Let books and nature be their early joy,
And knowledge rightly honoured with that name,
Knowledge not purchased with the loss of power”.

The great educational problem of the times is how to secure the acquisition of knowledge without sacrificing power to act. In the solution of this problem one important factor will be found to be the right use of a school garden.

GEOLOGY AS A BRANCH OF NATURE- STUDY

BY PROF. GRENVILLE A. J. COLE, F.G.S., M.R.I.A.,
ROYAL COLLEGE OF SCIENCE, DUBLIN

Seeing that we live on the earth, that our fundamental chemical elements are derived from it, and that the natural forces which we harness to do our bidding are similarly dependent on terrestrial pro-

cesses, the study of the earth itself is surprisingly neglected.

We may set the old-fashioned geography-books aside as being purely descriptive and unquestioning, and may turn in geology to our immediate surroundings and seek their explanation.

London is badly placed for geological Nature-study, since the features observable, when the long suburbs have been traversed, are on a milder scale than in many parts of our islands; yet the Geologists' Association and other field-societies have long ago shown the large amount of observation that is possible in the London Basin. The study of the history of London without a knowledge of the country round it is a relic of the old classical days, which are still very slowly waning—the days when imitation-ruins and crystal founts with marble edgings were regarded as superior to any natural landscape. If we recognize that the Cotteswold Hills have done more for London than Queen Elizabeth or the old Metropolitan Board of Works, we shall want to enquire into the origins of the Cotteswold Hills themselves. We shall, in fact, turn to the earth and begin the study of geology.

With the basis of elementary chemistry and physics now available in self-respecting schools, the subject presents far less difficulty than was formerly the case. To some extent, geology has already been taught as a part of physiography; but it has got so mixed up there with other subjects that the natural aspect of the study has become much obscured. I take it that the apparatus required for teaching geology consists of a general geological map of the country in which the school is situated, the local geological map on the

scale of 1 inch to 1 mile, a common—a very common—microscope, with a few glass-slips and cover-glasses, a hammer, and a collecting-bag. The microscope is wanted to show grains of sand, minute fossils in clays, and so forth; and the structure of a few rocks can be illustrated by half a dozen sections. The use of polarized light and refined mineral conceptions are quite unnecessary from our elementary point of view. There are a good many people who are prepared to discuss "Carlsbad twins" and "granophytic structures" who never yet walked across a mountain, or saw "the waters wear the stones, the overflowings thereof wash away the dust of the earth".

As usual, the teacher must know a good deal more than he puts into his instruction. He must be able to make sketch-sections from the indications of his geological maps, so as to show how the rocks rest on one another, and how they control the features of the landscape. He must also have some conception of the aspect and geological structure of regions outside that in which he works. But his great aim will be to lead his pupils to observe, and to feel, as it were, the growth and movement, the vitality or decay, of the surface of the earth on which they live.

We must not expect or even desire them to be at once entranced by the æsthetic and the beautiful; but we must rather show them Nature doing something, show them her machinery and what is going on. Let us take the brook and its pebbles on one of our afternoon walks. Why is a pebble round? What is the stream doing? The pot-holes in its floor show how it drills away the solid rock. Where does the

waste-material go to? The delta in the lake may show us; and we are led on to talk of stratification, and the sifting out of mud from sand in regions of deposition. The whole valley is seen to be related to the stream in its floor. The more violent action, due to greater rainfall, near its head may produce steeper features in that region, and may carve out pinnacles and crags.

Then, if we allow some of the river-water to settle, then decant and filter, and finally evaporate, we note the matter carried invisibly in solution.

If we are in a limestone country, the characteristic forms produced on the surface-rocks by solution may be seen. What becomes of this material? This leads to all the interesting questions of shell-banks and foraminifera and calcareous sea-weeds, such as may be collected on almost any shore. The great bedded marine limestones may thus be explained.

But how are they now high and dry above-ground? Point to uptilted strata, and show how in all times the solid crust has heaved and stirred, here rising, here becoming depressed beneath the sea. Thus the fossils in loose sand on our east coast are obviously of comparatively recent origin.

Modern "raised beaches" may be pointed out; or modern evidence of submergence, as seen in the fjords and long sea inlets of our western shores.

These earth-movements, if long continued, give us mountain-ranges, in the cores of which granite wells up. We thus come to discuss the molten origin of granite, and the evidence furnished by its crystalline character and structure.

And so on—everywhere connecting the obvious

features of a rock-specimen that can be held in the hand with its larger features as a portion of some modern landscape. Photographs and lantern-slides are now obtainable to illustrate regions outside that which lies immediately near the school. And surely such pictures, when their meaning is made clear, and their connection with our world of action is revealed, stimulate the imagination and control the reason as fully as the tales of ancient kings and heroes.

Take, for example, a scratched block of northern chalk from the boulder-clay of Finchley, and look back on all that it means, on all the processes that moulded it in a period not so very far removed from our own human times. We see again the highlands to the north rising snow-capped, a second Norway, above a shallow and fluctuating sea. We view the great ice-streams coalescing, and trace them back as local glaciers into the barren recesses of the hills. We see the crevasses in the glaciers, and the huge erratic blocks carried on their backs. The gravel of our northern slopes is no longer a desolate affair, to be occasionally turned up in drainage-operations, and again concealed by the speculative builder; but it holds for us its own stories, and reconstructs for us the sunlit snows over which the mammoth marched on London. The very soil, *solum patriæ*, contributes its romantic chapters to the history of a romantic land.

And is it not easy to interest our pupils in fossils, and to show how different levels of the rocks contain differently-organized remains? Here we touch on the great chains of life, reaching away to Cambrian times. The extinct monsters of the past have a charm for

all beholders; indeed, is our education quite complete unless we have some knowledge of our kinsmen? A philosophic touch may be given if we show how the dominant race has been successively trilobitic, fishy, amphibian, reptilian, and mammalian; and it is always agreeable to find our own selves standing on the top of the entrancing series.

Is it not captivating?—a study that appeals to the open country under the open air; that takes equal count of the long days of sunlight and the bitter battery of the rain; that makes the slow stream, when it floods the cellars of the burghers in the city, call to us none the less with the voice of far-off hills; and that makes us, when we view the ranges of chimney-tops from our bedroom windows, aware that out in the great world beyond there are visions older than empires, where the long range of the snow peaks stands against a non-political and cloudless sky?

FIFTH CONFERENCE, Friday, August 1

CHAIRMAN: THE RIGHT HON. SIR W. HART-DYKE,
BART., M.P.

SIR W. HART-DYKE said:—It gives me sincere pleasure to take part in your proceedings to-day, and preside over your last conference, representing as it does the final stage in a great and exceptionally successful effort for the sake of education. Some years have elapsed since the formation of our Agricultural Education Committee, and considering all the success we have achieved, I am even now astonished to find the number of persons in all stations of life who have still a fixed idea that the sole object of educationists is book-learning, and that our only dream of success is to cram the unfortunate children in our rural schools with all the ologies, and with information and training which can only have the result of making them totally unfit for country life and occupations. The great interest which this exhibition has excited, its pronounced success, and the various conferences which have been held, have had a twofold result, each of which will make a grave impress upon education in the future in our rural schools. First, we have secured once and for all the sympathy, support, and adhesion of the Board of Education, so emphatically declared by the Lord

President of the Council in his excellent address at our opening ceremony. This is in itself a great incentive to us for further efforts and exertions on behalf of a movement which we believe capable of most beneficent results, and these conferences have brought together the best of our educational enthusiasts, whether representatives of county councils, teachers, and others, to confer together and give the benefit of their experience in laying the foundation for future success. Secondly, we have by reason of these many discussions given a clear insight as to our motives, our aspirations, and policy for the consideration of our fellow-countrymen. We have through the medium of this exhibition urged upon them in the most practical manner that our system of teaching in rural schools has been faulty in the past; that whilst we fully recognize the necessity of book-learning up to a certain standard, we must cease to deny to the rural youth of this country an insight into the delightful mysteries of Nature and all that surrounds country life.

One question is of vital importance to us, and that is, Who are to be our future masters for good and all—the Board of Agriculture or that of Education? Which body is to superintend and encourage our different organizations in each county in the future? At present when we go beyond the elementary schools we find only spasmodic efforts as regards agricultural education. The establishment of agricultural schools of a secondary type should surely be tried more extensively. Our agriculturists are beginning to wake up to the necessity of a more scientific training, if we are to compete with low prices and the fast-extend-

ing importation of foreign produce. When we have established our county authorities some demand will at once be made upon them as regards the higher education and the better training of agriculturists. Who are to guide, advise, and assist them in this enterprise? If it is to be the Board of Agriculture, they must have considerably more funds at their disposal than at present. Then there is not only the all-important question of teachers, but that of inspection. Who are to appoint and pay these inspectors, and who is to apportion the different districts in which they work—and to whom are they to report? Many of our counties also are the fortunate possessors of an agricultural college. I find that these institutions are getting more appreciated by our farmers every day, not only as centres for teaching and training, but as centres for research and giving information, after the closest scientific tests, to the farming community, and on these grounds they have again and again given proof of their value and necessity. The greater portion of the sum allowed to the Board of Agriculture is now given to these colleges; but after all this is far from dealing with such a great and national question in a comprehensive and practical manner. We are glad to think that the two departments I have mentioned are acting cordially together, but when the Education Bill has been in operation a few years a very different state of things may supervene as the demands and responsibilities of the Board of Agriculture increase and multiply.

And now whilst fully recognizing the importance of organization in each county for securing the higher training through, 1st, the all-important medium of

evening continuation-schools, and 2nd, through that of secondary and higher grade schools, leading up to the more finished work in a collegiate centre—also that no effort should be spared to secure an adequate supply of properly-trained teachers—let me emphasize one point: do not let us allow even a hint or suggestion to get abroad that we advocate any system of specializing in our elementary schools. Nothing would endanger or retard the movement we are all so anxious to promote so much as such an impression as that. We demand, considering the price which we shall have to pay, whether as tax-payers or rate-payers, that the education in our rural schools shall be thorough and complete. All we ask is, that the early and awakening intelligence of these little children should be directed, *pari passu* with the ordinary curriculum, to the life going on around them, to all those simple truths which can be garnered from a study of Nature and her multifarious surroundings. We urge that there is going on a grievous waste of brain power in a child when a constant habit of observation is not a part of its educational training, and that it is of vital importance that such a training should be a part of the earliest commencement of school life. I will not urge here the obvious advantages that may accrue ultimately to the agricultural interest; but this I do know, that on visits both to Germany and Switzerland I have taken particular notice of farming operations in both countries, and I have always been struck by the difference between the workers in the field in those countries and in our own. There you at once apprehend the training in method and observation which has been applied;

there the labour is all skilled and well-trained labour, and the tillers of the soil reap the full benefit.

I would that the great mass of agriculturists in this country would take these things to heart, and take the trouble, at all events, to inquire into and recognize what we are endeavouring to carry out. Too many of them, alas! have a notion that the more the labourers learn, the more difficult they will be to deal with; but our policy is to produce a class of labourer who will know the why and the wherefore, and apply both intelligence and method to the work before him.

We have everything to encourage us in the task before us. Two government departments are competing in furtherance of the object we have in view. In many counties the councils are taking up our cause with earnestness and success. County schools, local classes, scholarships, and exhibitions are being established in all directions with every prospect of good result.

This exhibition is, I believe, unique in its character in this country. It will bear fruit for many a long day, and we owe an everlasting debt of gratitude to Mr. Medd and his co-workers for the energy, skill, and perseverance which has secured such a pronounced success. The principle involved in our policy, Nature-study, must not be confined to rural schools, but should permeate our school training throughout. This benefit, at all events, I can predict as the outcome of our efforts: our rural schools will become more popular and therefore a better average attendance will be secured, thus earning higher grants for the credit of the locality in which they are placed. If we can add a more cheerful and a brighter side to

our school life without weakening or detracting from the necessary curriculum, it will be a solid gain.

THE TRAINING OF TEACHERS IN NATURE-STUDY

BY THE REV. CANON STEWARD, PRINCIPAL OF THE
TRAINING COLLEGE, SALISBURY

The subject with which I have been entrusted—a very large one—is one which, it would seem, goes to the very foundation, on the laying of which the success or failure of the present movement depends.

And when I look round on the really wonderful work in this exhibition, produced by teachers and scholars in every grade of school both in England and other countries, I cannot but wish that it had been placed in the hands of someone who has had longer actual practical experience in dealing with the teaching of Nature-study.

After the valuable addresses that we have heard at this conference, I am venturing to take it that there is a general acceptance of the following principles and methods:—

- (1) That the seasonal treatment is most natural and practical, as was urged by Professor Thomson of Aberdeen.
- (2) That the outdoor work may well be both
 - (a) *general and discursive*, as in a ramble over a large area, and
 - (b) *restricted and special*, as in a thorough study of some one

lane or pond or wood or hedgerow, as has been emphasized by Mr. Rooper, H.M.I., and is supported by Charles Kingsley, who wrote: "He is a thoroughly good naturalist who knows his parish thoroughly".

- (3) That it is well to proceed in this study from the wider area to the particular, and, as Lord Avebury urged, to defer specialization till the latest days of school life (*æt.* 17).
- (4) That the treatment of the subject is not to be so much didactic on the part of the teacher as heuristic on the part of the pupil, indeed, *concurrent study* by both.
- (5) That it is undesirable that the proclivities of both teacher and child—with the general flexibility and variability of the work—be cramped by excessive direction and systemization.
- (6) That while the pupil's own observation, investigation, and inferences are of paramount importance, *imitation* has its place, and, as Professor Lloyd Morgan said, "has often proved the stepping-stone to original research".
- (7) That in the general and outdoor study of Nature there *is* a place and a use (though it must be a *right place* and a *right use*) for the lecture-room, the laboratory, the text-book; the lantern-slide, the written record of observations, the diary, and the chart. It is here that the teacher's intelligence and judgment must hold the scales, and ~~wildly~~ fostering the love of scientific inquiry, check

- in himself and his pupils whatever is unoriginal, superficial, perfunctory, and unreal.
- (8) I should like to add a word on *correlation*, and to emphasize the maxim at the head of the card in the course issued by the authorities in Philadelphia. It is, "correlation for the sake of correlation should be avoided". I feel strongly that correlation can be, and is, much exaggerated. I confess to that feeling when the legs of the bee and spider are dragged in to teach simple addition, and forms of plant or animal are used as pegs on which to hang an elementary Euclid lesson, and even in the sometimes unnatural imitating movements in the Frœbelian games.

Now, how are we to help, in the direction of Nature-study, that vast army of teachers, running into hundreds of thousands, in elementary and secondary schools?

It is obvious that for all teachers, of every grade and kind, the same great psychological principles and truths apply. Realizing gradually that the "*maxima reverentia*" is due to the children, the world looks forward to the day when every teacher of the future will go through a course of training in theoretic and practical pedagogy. The trend of opinion seems now to be towards regarding Nature and natural objects as the most direct, natural, easy avenue to the child mind and child heart. We therefore hail the recently issued circular of the Board of Education, which makes simple natural science—Nature-study—an

obligatory part of the curriculum of the normal colleges. For my part, I welcome even more cordially the Board's recognition that for this subject a formal written examination is out of place. The pernicious system of payment by individual pass and class is abandoned. There are to be no more *marks* and pasteboard diplomas, which inevitably led to text-book cram, and seemed to aim at making teachers encyclopædias of second-hand unassimilated scientific information.

For the teachers of the future who pass through a course of normal training I see daylight. Nature-study will fitly form part of the training of *the teacher while in college*. It will not be left to be picked up along with certain other certificates and diplomas in after-life. Indeed, may we not devoutly hope that this subject will never be guillotined by these instruments of modern torture? The thoroughness and reality of the work done will be tested by inspection—inspection of the methods and teaching in the college, and of the studies and note-books and intelligence of the students.

For those teachers who have not in the past had opportunities for this study—and for those in the future who do not pass through the college course—we must look to the local educational authorities to provide classes of instruction. Possibly, as Mr. Hanbury suggested, the agricultural colleges may offer valuable help.

Here, in passing, I would refer to the great aid given by most cities represented in this exhibition, such as those of Leeds and Liverpool. In the ~~one~~ case the museums are not merely open for, but

rooms are set apart for children and their teachers; in the other case the objects are distributed on loan among the teachers, and the curators of the museum assist the movement by every means in their power. In some towns the Kyrle Society provides botanical specimens; in others, as in the London Board, the Board sends to each school, on requisition of the teachers, the specimens asked for. The Liverpool Board has inaugurated a very thorough system of excursions for Nature-study, to which I would draw the attention of every teacher. In Liverpool also there is a "Teachers' Nature-study Club", with some 150 members. The primary work of the club is done by excursions, with lectures preceding or following them. It is very gratifying to learn the keen interest taken by the teachers, as is evidenced by the fact that no less than 800 teachers have availed themselves of the help of the lectures.

I look forward to the day when we shall have closer co-operation of the various agencies, with more economy of effort, and when the sympathy of the different societies and individuals will be enlisted towards one common end. At present we see museums put to very narrow use, laboratories closed except to the *clientèle* of some particular teacher, field-clubs limited to the select few, and many a keen naturalist who, if asked, would undoubtedly give his knowledge both on country walks and in the lecture-room.

I am inclined to think that science specialization has begun too soon in the elementary or primary school. Nature-study will correct this. In childhood we must not narrow the sympathies, restrict

the field of observation, stunt the general intelligence, and anticipate that inevitable limiting of interests, and that concentration of effort and faculties which is forced upon us in after-life. The bent or bias of the individual will soon show itself, and can then be guided into the fittest channels. I would urge that specialized science is out of place in the primary school, and should come in the next stage, the higher-grade school, the organized-science school, the technical school, or in the evening classes, together with such industrial pursuits as dairy-work, agriculture, gardening, carpentry, and cookery of a less elementary kind.

There is, however, one product of primary education that employers of labour, masters and mistresses, the parents—yes, and the child himself when he grows to manhood—have a right to expect, and that is *general intelligence*; and it is to the newer educational developments, of which Nature-study is but one phase, that expectation turns.

I would take the boys to see the carpenter at work, to the blacksmith's shop, to the house that is being built, to the boat-builder's yard, to the mill and the quarry, to the limekiln and the tan-yard; and the whole country school to the menagerie on its way through the village.

Government blue-books are not exciting reading, but for teachers the reports of H.M. inspectors are instructive. They would do well to read Mr. Legard's general report for 1900 (vol. ii, p. 87). In Mr. Fitzmaurice's report for the North Central Division occurs this sentence on "Manual Occupations"—and it applies with greater force to Nature-study:—"Teachers will lecture and lecture, and conscientiously believe

that they are teaching or educating in the best possible way. It is a matter of words, not things; of listening, not of observation. No burden of investigation is cast upon the boys. They are not trained to inform themselves through their own sense impressions."

To come more directly to the *training of teachers in colleges*. As in the primary school, so here I would see specialization in science deferred for a third year. The aim of the college training must be directly devoted to the pedagogic aspect of the different subjects, and to a full and thorough knowledge of the subjects falling within the curriculum of the primary school. In saying this I must not be understood as wishing to narrow the training of the primary-school teacher. As long as the pupil-teacher is what he is, the two-year college course is already all too short for a thorough grounding in the necessary subjects and their educational treatment. To meet the needs of those who wish to specialize, I should like to see the new educational authorities empowered to open, for certain king's scholars, *central colleges for a third-year course*, to prepare them for the advanced work demanded of them in science schools, pupil-teacher centres, training-college lectureships, and schools of a higher or technical kind.

With regard to the college training of teachers in Nature-study, we are confronted with the difficulty of finding time for the *individual research* and investigation which is at the root of the whole study.

To do this we must resort to two methods: (1) We ~~endeavour~~ *endeavour* to bring within *easy reach of observation* the various forms of plant and animal life which are

fairly typical of the groups of studies, and to utilize as fully as possible the country excursions; (2) we correlate the study with drawing, brush-work, and clay-modelling. (If any of my audience desires more detailed information, there are copies of our scheme at Salisbury among our exhibits here.)

May I say a few words on this correlation with drawing and brush-work? We know that in early stages of childhood language expression is more readily preceded by *sense expression* following immediately on *sense perception*. The child observes, imitates, and reproduces the sound—the cry of the cat, the bark of the dog, the lowing of the cow, and the like. The eye, even more readily than the ear, observes, compares, discriminates. Here comes in the educative value of the modelling, the brush, or the pencil, which enable the child to express form and colour, its sense of proportion and relation.

Drawing has hitherto been much too conventional and mechanical. I dread to think of—*horresco referens*—those dreary infants' exercises, the niggling with little squares, the counting and the dotting—no intelligible mind picture before the child at the outset, no original effort to express it, but an unintelligent carrying out of the teacher's orders. Then comes the guessing what is represented. "A street lamp" (that ubiquitous street lamp!). No. "A letter-box." No. "A chimney-pot." That's better. (Silence.) "Well, I must tell you. A man's hat." Teacher triumphant.

What we want to have the teachers think about Art is, that it can, and does, set us to work on the pleasurable things, the inspiring things, the *beautiful* and true, whether in Nature or man's work, or in

human life and character. How can a child be led to this unless the objects presented to him appeal to his best sympathies, and attract him through that wonderful appreciative child-instinct which is the outcome of neither education nor experience? Inherent in the child is a love for, a sympathy with, the forms and colours, habits and life, in the world of Nature. Primary art education should be that which Nature supplies in its infinite phases. Herein are provided the most perfect objects for the human eye to contemplate, forms in themselves perfect, absolute beauty of proportion, harmony, and adaptation. It is Mr. Scott who points out that humanity is part of Nature, and so human faculties, senses, and emotions are in sympathy because they were formed for appreciation of it. Herein the essentials of expression are more easily secured, namely *truthfulness* in purpose as in fact, and *self-reliant individuality*, the product of the child's own senses and observations expressed in the child's own way.*

Ruskin writes of his own "steady habit of always looking for the *subject* principally, and for the art only as the means of expressing it", and he proceeds: "All literature, art, and science are vain and worse if they do not make you glad—enable you *χαίρειν ὀρθῶς*—give you rational and real enjoyment". The value of Nature-study, and of art in relation to it, is that it is pursued for no ulterior motive than its own self—not by any artificial stimulus of bribe or punishment, applause or popularity, for its commercial value, or our advancement in life. Herein, too, there is little

Teachers would do well to read *Nature-study and the Child*, by C. B. Scott. (Heath & Co.)

room for pride or that knowledge that puffeth up. Did not Lord Avebury tell us that the known is infinitesimal as compared with the unknown, and that it is almost impossible to ask a question that science can adequately answer?

To train the child to perceive, appreciate, and express even some of the beauty of Nature is to give him a life-long joy—a power *χαρπεῖν ὀρθῶς*—which in time may help to transform society, from the village loafer and town hooligan upwards. It is a power which leads some of us to appreciate the idealizations of old Greece, “the fair humanities of the old religion”. Through their eyes we can see the beautiful Daphne in the Mezereon of spring; in the Silene the neglectful attendant of Minerva’s owls; or the vain Narcissus in the graceful lily bending admiringly to see its own fair form in the stream.

It is a power which will help us to understand and love our Wordsworth and our Keats, and the undying word-pictures of Nature to be found in classic Milton and in Shakespeare.

In conclusion, may I beg of teachers not to despair because of their ignorance of botany and of biology and the like? Let them begin *as learners with their children*. I believe the secret of success lies in *concurrent study*. It is *Nature-study*—we have to know *Nature*, not natural history.

“The Highlander worships his purple hills; the Swiss clings to his flower-strewn Alp amid the snows; the humbler but not less loving cottager finds a large place in his or her heart for the gilliflower of the garden or the honeysuckle of the hedgerow.” It is not patriotism, it is something more subtle than that.

Without being Pantheists, we may be grateful for the old idealization that deified *Nature*—yes, and made her a *goddess*. It was man's expression of respect, reverence, homage, obedience, love. It was his testimony to the existence of a voluntary intelligent Almighty Agency. He recognized that he was in the presence of Life, Order, Harmony: perfection in the infinitesimal as in the infinitely great. And this conscious sense of the presence of the Infinite became to many a religion.

Therefore, I would urge that we learners have two teachers—(a) the accumulated discoveries of our own kith and kin, and (b) Nature herself; and that the best, the truest, the more immediate and ever-present teacher is Nature. Her lecture-room is all around us, her laboratory is in every phenomenon; the enthusiasm she inspires is overmastering; in fact, for some souls we know that she has been the genius of their lives.

Have *we* never felt that "Wisdom and Spirit of the Universe" close by us in our own experience? Can we not recall childhood's sensations at some new discovery—those blue eggs in that delicate nest, that sweep of the telescope through the heavens at night? It was a revelation. Intuitively we felt nearer a knowledge of the Infinite. Something whispered again to us as to the prophet of old: "The place where thou standest is holy ground". There was the nearness of Jehovah—Jah—I AM—Life and its Almighty Giver.

Thenceforward, perhaps, we grew to be more modest towards God, more gentle to His creatures, more wise in ourselves.

Our attitude to Nature must be that of pupils; our attitude to our children must be that of the old Greek Παιδαγωγός, the slave who led the child to school. "Come along with me and see." And, incidentally, how wise were those same Greeks with their οἶδα, "I know", for "I have learned"; for "I have *seen*" (εἶδω, *video*)! How more wise still was the greatest Teacher! "Verily, verily, I say unto you, Except ye be converted and *become as the little children*, ye cannot *enter*, ye cannot *see* the kingdom of Heaven." No, nor the kingdom of Nature.

Mutual effort, mutual discovery, mutual reverence must be our relations with our class. Did not Fröbel tell us to "become children with the child, learners with the learner"?

The larger knowledge, the wider research, the longer experience, the closer friendship with Nature necessarily make the older seeker after truth—at once a *poet* and a *prophet*. He is a poet because he reveals—a prophet because he tries to interpret—the meaning, the purpose, the beauty, truth, power, and divinity of his mistress. He speaks, as it were, for her. She is his inspiration. What has been revealed to him he reveals to the child—again like the Master Teacher, "Not many things at the first, because they are not able to bear them".

How much may we not learn thus *of* our children? Yes, much *from* them! How this treatment would appeal to the best traits and instincts of the child nature; how it would draw out, educate, the best in him! What sympathies would be enkindled between the master and the disciple! How truly *would* this fulfil the idea underlying the word 'study'—*studium*,

a delight! I venture to think that the teacher's aim must be to be the child's "guide, philosopher, and friend", the *child's* pedagogue, and *Nature's* poet and prophet, and *himself* ever a patient, humble, and devoted learner in the school of Nature's God.

THE INFLUENCE OF NATURE-STUDY ON THE SCHOOL AND ON THE HOME LIFE.

BY SIR JOSHUA FITCH

Visitors to the exhibition and to the conferences which have taken place in connection with it will have already had their attention drawn to many different aspects of the subject of Nature-study—its bearing on the national welfare in respect to industry, to æsthetic culture, to educational method, and to the conditions of healthy and intelligent life generally. But I am struck with the value of this movement for another reason. It promises to establish a new link between the school and the home. Parents, especially among the wage-earning classes, know very little, and do not greatly concern themselves to know, about what is being done in the school. The lessons taught in the class-room are thought to be bookish and recondite, and remote from the wants and the talk of the family circle. Now, of all the subjects taught in a good school there is none so likely to be the subject of conversation and sympathy at home as those which connect themselves with the study of natural history,

with the observation of the aspects of nature, with the weather, with the cottage garden, and with any pursuit which affects the decoration and the cheerfulness of the dwelling and the variety of outdoor life. By the expansion of the teacher's duties in these directions he awakens in parents a new interest in the work of the school, a fresh sense of the value of education as a discipline in character and a preparation for life. The father or mother, to whom the home lessons of a scholar in arithmetic or geography would be uninteresting because unintelligible, could not fail to be pleased with the efforts of a child to arrange and classify leaves or grasses, to illustrate his note-books with drawings of birds or flowers, or otherwise to concern himself about the world outside of the school-room,—a world in which the child and the parent have a common share, and may soon learn to feel a common interest. The American institution of "Arbor day", on which once a year a tree is planted in the school garden, and all the children are invited to contribute something to add to the prettiness and dignity of the school grounds and premises, well deserves study and imitation in many of our country schools.

Herein lies the great value of some of the manifold pursuits of boyhood and girlhood which are so abundantly and happily illustrated in this exhibition. They all make a direct appeal to the sympathies even of uninstructed parents, and they all help to make the home in which the child dwells a more interesting place for all who live with him. I look upon the present exhibition as a remarkable and hopeful symptom of the wider views of duty which are begin-

ning to prevail among many of our best teachers. What the Germans call *Naturkunde*, and what Professor Huxley called physiography, are receiving daily increased attention. From great historical schools like Eton and St. Paul's down to the humblest infant department and even to the pauper school, there are evidences of the zest with which scholars interest themselves in botany, in natural history, in bee culture, in the collecting of butterflies, ferns, or grasses, and in keeping a record, partly literary and descriptive and partly pictorial, of what has been seen and observed. Some of our most enterprising publishers, both English and American, have contributed excellent school-books, well illustrated and attractive, and yet careful and scientific in their statements of facts, by which teachers may be enabled to arouse a new appetite for a kind of knowledge hitherto absent from the ordinary school curriculum, and also to satisfy that appetite by means of systematic lessons.

It is a remarkable fact that one science, that of astronomy, occupies a less prominent position in modern school plans than it filled some years ago. When I was young I remember that visiting teachers were on the staff of upper schools for girls, and that these tutors gave lectures on the elementary truths of astronomy, and used to advertise their qualifications to teach what they described as the "use of the globes". The teaching was, to say the truth, not very scientific. The manifest absurdity of using a pair of solid globes both of the same size—the one to represent the earth, and the other the whole firmament of heaven—vitiating the teaching from the first, and caused the lessons to resolve themselves into twisting

globes round and round, finding out latitudes and longitudes, and learning the names and relative positions of a few constellations. The fatal fault of such instruction was that it did little or nothing to encourage habits of real observation, and was apt to degenerate into learning lists of names. I dare say you have heard Lord Avebury's story of his showing some of his neighbours and servants in the country the moon and a few of the wonders of the telescope on a starry night, when one of his hearers said: "I do not wonder, Sir John, that clever people should find out the sizes and distances of the stars, and how they move, but what I cannot make out is how you ever could learn their *names*". Names, however, both in astronomy and in other sciences, are constantly mistaken for things, and the learning of names is often a substitute for the knowledge of realities and of scientific facts.

But even the poor elements of astronomy which used to be taught by the professors of the "use of the globes" had their value. They did something, though not much, to enlarge the range of the learner's thoughts, and to make him sensible of the fact that there are more worlds than ours. It is pleasant to see here and there, though sparsely, in this exhibition, examples of models, drawings and diagrams, and simple apparatus made by scholars to illustrate the sizes and motions of the heavenly bodies; but, on the whole, we must admit that very few attempts are now made to include any knowledge of the heavens in our schemes of instruction. It is to be feared that the reason for this neglect is, that the elements of astronomy rarely form any part of a school programme prescribed either by

the Board of Education or by the University Local Examinations. The fact is, that astronomy is the most disinterested of sciences. There is no visible industrial purpose to be served by it, no money to be made by it, and no prizes to be won. In short, the teacher and the pupil alike are fain to conclude that it will not *pay* to spend any time on the study. Yet, if we consider the higher purpose of all true education, we cannot afford to forget that there is no study so well calculated to excite the imagination, to lift up the thoughts above the region of the prosaic and commonplace, to give a scholar a sense of the vastness and richness of the universe, and so to make him aware of the place which he himself holds in it. "When I consider Thy heavens, the work of Thy fingers, the moon and the stars which Thou hast ordained, what is man that Thou art mindful of him, and the Son of Man that Thou so regardest Him?"

It is not merely information about the heavenly bodies that enriches our intellectual life. It is the lifting up of the eyes and the heart, and the broadening of the mental and spiritual horizon, which make the study of even elementary astronomy so precious as an ingredient in popular education, and which justify the claim the advocates of Nature-study are making when they ask for this subject a more honoured place than it now holds in the curriculum of our schools.

I think, too, that more attention should be paid in our schools to the *weather*, that subject of universal interest in the outside world and in the home. Every school should have a thermometer and a barometer, a sun-dial and a rain-gauge, and the older chil-

dren should receive lessons upon these instruments, should learn how to consult them, and be encouraged to keep a record of the changes from day to day. I have seen few pleasanter sights in Geneva or in Zurich than that of groups of school-boys clustered round the pillar provided by the municipality, and set up in a conspicuous place, on which the barometric and thermometric reading, the anemometer, and the rain-gauge are displayed, with diagrams showing the daily fluctuations and the latest meteorological forecasts, besides a statement of the latitude and longitude of the town, its distance from other important cities, and an outline map showing the position and the names of the surrounding mountains. Boys and girls come with their note-books to put down the data thus furnished, and they have evidently been taught at school to make an intelligent use of the information which has been placed by the authorities at the public disposal. We might well follow in London the precedent thus set. If the County Council would erect in a conspicuous place in each of our parks a similar edifice, they might furnish at a small cost a valuable object-lesson, and thus co-operate with our best schools in encouraging the faculty and the habit of observation, and in giving to the whole public a new motive for the study of natural phenomena.

But though regular instruction might well be included in the school course, we must remember that all the best lessons of our life do not come to us in the shape of lessons. Teachers have, no doubt, some reasons to object to the importunate demands which are often made upon them to add a new *subject* to their overcrowded time-table. But they may well be

reminded that beyond the regular official scheme of work such as is planned to satisfy codes and inspectors, there is, or ought to be, a margin of time and influence open to every good teacher, and that in this neutral ground between school and home much may be done to promote thought and inquiry about the natural world.

I have often told the authorities of training colleges, and the same thing applies also to every elementary school, that the list of lectures and exercises should not be so planned as to absorb all the hours of the week. Some little time at least should be left unappropriated, and available for employments which are not regular lessons and which have nothing to do with preparing for examination. For example, suppose at least half an hour at the end of each week is reserved, and the teacher gathers together the upper classes of a school for some purpose not in the ordinary programme. Here is an opportunity for reading a story or a poem, for showing a picture and encouraging conversation about it, for giving a graphic extract from a newspaper, describing perhaps the Yellowstone Park, an Arctic expedition, or the lamentable earthquakes in the West Indies; for inviting some intelligent friend—clergyman or school manager—who has been travelling abroad, to come and tell his adventures and to bring with him photographs of scenery. In this way the children may come to know what a glacier, a desert, a prairie, or a waterfall is like. They may become conscious of the beauty and variety of the world in which they have come to live, and so may be led to desire a fuller knowledge of its wonders. Special occasions also arise, as at the

time of an eclipse, or when, if a telescope is available, the moon is at the full, or the satellites of Jupiter are visible, and when planets and constellations—the Great Bear and the North Star can be identified. It is by watching for such opportunities, and utilizing them as they occur, that a teacher may kindle an interest in natural phenomena quite as much as by formal school lessons, or by additions to his list of subjects.

Of course the staple and necessary subjects of all school instruction must not be neglected or encroached upon. Reading, writing, arithmetic, language, and history must always hold a first place. But beyond these there is room for a good deal of incidental Nature-study, if we will remember that here is the one region of our work in which inspiration, curiosity, and the observant habit of mind are of more true educational value than information in the form of facts or statistics. Man has been described as a creature with a great deal of curiosity but very bad eyes. It is for the teacher to encourage this curiosity, and then to satisfy it by showing the scholar, at all convenient opportunities, how to acquire that fine art, so often disregarded, the art of seeing. What Herbart calls mental "apperception" presupposes visual perception. *Nihil in intellectu quod non prius in sensu.* And the first business in Nature-study is to make the learner open his eyes, and know how to use them.

We may not, however, forget, in vindicating the claims of nature-knowledge as contrasted with knowledge of books, that after all there is much to be gained from our best literature and from the study of

good pictures. For the true poet and the true artist alike are students of Nature.

The teacher, in his private reading, will note passages from Chaucer and Spenser, from the Elizabethan dramatists down to our own time, which are full of references to natural scenery, and which may serve to illuminate his lessons and invest them with a new charm. The great Lord Verulam, whom posterity insists on calling Lord Bacon, though that was never his proper name, once (I suppose at some leisure moment when he was not engaged in writing the dramas commonly called Shakespeare's) wrote a charming essay on "Gardens", beginning with the words: "God Almighty first planted a garden. And "indeed it is the purest of human pleasures. It is the "greatest refreshment to the spirit of man, without "which buildings and palaces are but gross handi- "works." And he goes on to show what are the characteristic and suitable flowers and fruits for each month of the year, and what are the conditions under which a garden may be made most profitable and most delightful. Then there is Adam's morning hymn in *Paradise Lost*, and hundreds of striking descriptive passages in Izaak Walton, in White's *Natural History of Selborne*, in Kingsley, Scott, and our best novelists, as well as in later books, such as Darwin's *Voyage of the Beagle* or Mr. Cornish's *Studies on the Thames*. The teacher, in his own reading, will find it interesting to trace the very different ways in which the external face of Nature has appealed to successive writers—the love of smooth-shaven lawns and trim garden^s which is shown in the more artificial school of Pope and his French contemporaries, the more

homely and careful descriptions of scenery in Thomson and Cowper, and the keener insight and more exulting delight in the outward world which showed itself at the beginning of the last century in the poems of Wordsworth and Coleridge and Shelley. If time permitted it would be interesting, and not a little curious, to trace the parallelism between the sister arts of painting and of poetry in the successive ages. At the beginning of Christian art you have no landscape art for its own sake, but as backgrounds to the religious pictures of Perugino or Raffaele there are lovely little peeps of the *Umbrian Hills*. In Memling and other Flemish painters of the same age bits of charming landscape come in rather as decorative accessories to the figures of saints and martyrs than as prominent features in the artist's design. Then, later, Poussin, Salvator Rosa, and the Carracci were depicting the gloom or savagery of forest scenery, and Watteau, Lancret, and Fragonard the mere prettiness of the poet's pleasance, of parks and Dutch gardens. Then Cuyp, Paul Potter, and Claude were beginning to rejoice with greater freedom in unsophisticated and luminous landscape; and in our own country Morland and Wilson and Gainsborough were depicting rural scenes on canvas, while Cowper and Thomson were embodying the same tastes in their poetry. And yet later, Turner came to teach us what a loving eye might discern in cloud and sunshine, in rock and river. Mr. Ruskin, to whom we all owe so much for the teaching which has helped us to perceive the difference between the true and the false in art, thus describes what he conceives as Turner's message to his countrymen:—

"In his latest works there was the obscurity but also the truth of prophecy, the instinctive and burning language which would express less if it uttered more, which is indistinct only by its fulness and dark with its abundant meaning. He felt, and with long-trained vividness and keenness of sense, too bitterly the impotence of the hand and the vainness of the colour to catch one shadow or one image of the glory which God had revealed to him."

"I cannot gather the sunbeams out of the East, or I would make them tell you what I have seen; but read this, interpret this, and let us remember together. I cannot gather the gloom out of the night sky, or I would make that teach you what I have seen; but read this, interpret this, and let us feel together. And if you have not that within you which I can summon to my aid, if you have not the sun in your spirit, and the passion in your heart, which my words and touches may awaken though they be indistinct and swift, leave me; for I will give you no patient mockery, no laborious insult of that glorious Nature whose I am and whom I serve."

Is it not fitting that at the very time when Turner was working in this spirit, another student of Nature, secluded among the Westmorland hills, should be writing thus?—

"I have learned

To look on Nature, not as in the hour
Of thoughtless youth; but hearing often-times
The still, sad music of humanity,
Nor harsh nor grating, though of ample power
To chasten and subdue. And I have felt
A presence that disturbs me with the joy
Of elevated thoughts; a sense sublime
Of something far more deeply interfused,
Whose dwelling is the light of setting suns,
And the round ocean and the living air,
And the blue sky, and in the mind of man;
A motion and a spirit, that impels
All thinking things, all objects of all thought,
And rolls through all things. Therefore am I still

A lover of the meadows and the woods,
And mountains; and of all that we behold
From this green earth; of all the mighty world
Of eye, and ear,—both what they half create
And what perceive; well pleased to recognise
In Nature and the language of the sense,
The anchor of my purest thoughts, the nurse,
The guide, the guardian of my heart, and soul
Of all my moral being.”¹

Of course we cannot expect very young scholars to understand this, or to rise to this height of serene contemplation. Still less ought we to desire or expect to find them using unreal language and simulating emotion which they do not feel. But I think we can never wholly understand what the humbler exercises in Nature-study can do for the young, unless we also realize what the careful and affectionate observation of Nature can do for the mature man. Is there any of us who does not remember with thankfulness his first introduction to Wordsworth's poems—to the hush and the calm, the awakened sensibility for beauty, the purifying and ennobling atmosphere which those poems represent? And it is by keeping in view our own spiritual experience in later life that we shall be led to see by what early steps children may be helped to form mental habits such as may ultimately lift up their ideals, and make great things seem greater and mean and trivial things smaller all the rest of their lives. We know well that the moments we have spent in rapt admiration of a fair landscape, or of the “many twinkling smile of ocean”, have been some of the best moments of

¹ Lines written above Tintern Abbey.

our lives: we feel as the Apostles did, "It is good to be here". All too soon we descend into the world of duty; the vision passes—

"At length the man perceives it die away,
And fade into the light of common day".

Yet we are the richer for life, for having had such experiences. Memory brings back to me a day some years ago, when in late autumn there was a succession of sunset effects of quite extraordinary beauty. I was staying at a country house, and among other guests was Mr. Ruskin. Our host took us in the evening to a terrace, whence we were able to see a spectacle of wonderful richness—a blaze of vivid colour, great masses of gold and crimson and pale-blue, and over all the solemn shadows of the departing day. It was very touching to see how all the little company were awed and silenced in the presence of so much more beauty than the corporeal eye could see. Most moved of all was the great critic himself. All the dogmatism and the love of paradox which were wont to characterize Mr. Ruskin's conversation fell off from him like a disguise, and he stood for some minutes humbly as one entranced, and speechless with wonder and delight.

Such experiences are rare in all our lives. But when they occur they leave very precious memories behind them. Coleridge, in his almost-forgotten tragedy of *Remorse*, puts into the mouth of his hero, Alvar, what seems to some a rhapsody, but what many will recognize as sober truth:—

"With other ministrations, thou, O Nature!
Healest thy wandering and distempered child:

Thou pourest on him thy soft influences,
Thy sunny hues, fair forms, and breathing sweets,
Thy melodies of woods and winds and waters:
Till he relent and can no more endure
To be a jarring and a dissonant thing
Amidst this general dance and minstrelsy:
But bursting into tears, wins back his way,
His angry spirit healed and harmonized
By the benignant touch of love and beauty".

It is only in the light of larger and more permanent considerations that we can ever hope to see the small details of life and of education in their true perspective and proportion. And those of us who are seeking to know what exercises, lessons, and methods are best for encouraging Nature-study among the young, may find it helpful sometimes to project our thoughts forward, and to ask what ought to be the ultimate influence of such study in after-life, when the pupil becomes a citizen, a thinker, and a worker, and the master or mistress of an intelligent and happy home.

NATURE-STUDY AS AN ELEMENT OF CULTURE

BY MR. M. E. SADLER, DIRECTOR OF SPECIAL INQUIRIES
TO THE BOARD OF EDUCATION

Mr. M. E. Sadler (Director of Special Inquiries and Reports to the Board of Education), speaking on "Nature-study as an element of culture", maintained that some first-hand study of nature is an indispensable part of a liberal education, more especially

because it trains the mind to the accurate observation of things as they are; accustoms it to notice cause and effect, the force of inherited aptitude, the power of environment and the value of adaptiveness combined with tenacity; and makes it sensitive to beauty.

An intelligent study of nature, combining work out-of-doors with that done in the laboratory and classroom, quickened the intellectual interest of all pupils. Interest in Nature-study was readily imparted by teachers who are themselves interested in it. In the earlier stages of education, Nature-study should not be specialized. One main purpose should be to make children realize the inter-connection of different branches of knowledge. Nature-study should therefore be associated with practice in drawing and painting and other forms of artistic expression and of manual training. Nor should it be divorced from books. It deepened the understanding of the best literature; for example, a knowledge of some of the writings of Bacon and of Wordsworth should be an essential part of Nature-study for English-speaking boys and girls. Any systematic study of physical forces involved the study of mathematics. And the habit of studying the life-sciences prepared pupils to realize, in their study of history, how great had been the influence of climate, geographical position, fertility of soil, quick intelligence, and steadfastness of national character on the course of human development.

Thus Nature-study should be regarded not only as a subject by itself, but as an influence which would permeate the whole range of school studies and affect

the intellectual point of view of teachers and pupils. Its value largely depended on teachers being free to follow their own bent in teaching it. The result to be aimed at was openness and accuracy of mind, not the power to produce for an examiner on an appointed day copious but largely evanescent masses of knowledge. But if examinations were dispensed with, some other guarantee of the industry and efficiency of the teachers, and of the diligence of the pupils, would rightly be required. These guarantees would be best furnished (1) by securing for every intending teacher a liberal education and a thorough professional training; (2) by wise inspection of schools in their normal working order; (3) by encouraging educational experiments, and thus enlisting the active interest of all good teachers in the improvement of their methods of teaching and in the reform of our school curricula; (4) by the maintenance of a high standard of professional honour throughout the teaching profession, so that it should be regarded as a shameful act for any teacher to abuse the confidence imposed in him by the parents and the State; and (5) by taking every means in our power to quicken public interest in the work of the schools, and to show parents what schools can accomplish for the good of their children.

England needs the very best schools in the world. She cannot copy the educational systems of other nations, but she must study them in order to equal or surpass their excellence in her own way. Once let England realize what schools might do for her, and there would arise, here as elsewhere,² a great national enthusiasm for education. To provide in

the right way the quality and variety of education which England needs would be a very costly undertaking, but the best national investment. Our national habits of thought and life point to the conclusion that in the education of English children the study of Nature should have an important place.

SCHOOL RAMBLES AND THE TRAINING OF TEACHERS

BY MR. JOSEPH H. COWHAM, WESTMINSTER TRAINING COLLEGE, S.W.

I have been asked to state in brief outline the plan adopted at the Westminster Training College for preparing teachers to undertake the direction of school excursions. I shall content myself with a simple account of the school journey which I have planned and carried out for many years with the students of Westminster Training College. The aim of the journey may be briefly stated to be an attempt to connect the varying surface aspects of the London area with the different geological formations as these appear on the surface, and during the attempt to secure valuable exercises in observation, imagination, and reasoning.

Before starting on the journey, it is necessary for student teachers to have a thorough preparation by means of the class-room lecture. Nature frequently presents herself in so complex a form that unless a certain interest has been aroused in a definite group of phenomena, there is danger lest the observer in the

field become bewildered in masses of detail without gaining a thorough mastery of any.

My lecture passes quickly under review the various obvious denuding forces at work carving out the features recognized as river-bed, valley, hill range, &c. In fuller detail an attempt is then made to show the effects of earth movement in producing—

(1) Basin-shaped areas (synclinals). This is assumed as the structure of the London basin.

(2) Dome-shaped areas (anticlinals). The upper portion of the dome having disappeared, there are left the exposed edges of a large number of different formations, and these different formations coming successively into view during the school journey, give variety to the surface aspects, and thus make the selected area a very fruitful one for study.

(3) In order to make these curves appear more than mere speculation, a number of well sections are shown, establishing the fact that the rocks pierced by these vertical shafts appear in the same order at the surface at different stages of the journey.*

A comparison is now instituted between the map and plan of the area to be traversed. The plan is intended to show the different rock-formations crossed, beginning with the river deposits as far as New Cross, the London Clay from New Cross to Croydon, the sands and gravels of the Lower London Tertiaries at South Croydon, and the Chalk as far as Caterham. The attention of the students is then

* Diagrams illustrating the above paragraphs were printed on a separate sheet and distributed amongst the audience. They were reproduced from a work entitled *The School Journey*, by J. H. Cowham, and published by Simpkin, Marshall, & Co.

directed to the map, and the flat and hilly districts shown on the map are seen to change from one to the other, *i.e.* from flat to hilly, with the changes in rock-formation already noticed on the plan, *e.g.* the low-lying Deptford area with the river alluvium, the flat area to Croydon with the London Clay, the hills of Shirley and Addington with the sands and gravels of the Lower London Tertiaries, and the elevated and undulating area—North Downs at Purley—with the Chalk.

The comparison indicated above is continued southwards from Caterham to Tilburstow Hill—a distance of about four miles, during which not less than four well-defined and very different rock forms come to the surface, each form in turn giving a new aspect to the surface appearance, as, for instance, the long flat region of the Gault just beyond the Chalk, and the rapidly-rising area beyond the Gault due to the appearance of the sands and ironstone bands of the Folkestone and Hythe beds.

The preparation is completed by a brief reference to the behaviour of a few of these rocks under the action of frost, rain, and running water. For example, the tendency of the London Clay to flatten itself into an extended plain; the protection afforded by the accumulation of stones on the summits of gravel deposits, thus maintaining the elevated character of all such ridges; and the tendency of all Chalk areas to weather into long sweeping curves; and lastly, the presence of iron bands in sand deposits tending to preserve all such sandy ridges from being further lowered.

After preparation such as I have briefly described, the students with their maps, plans, and sections in

hand start on the journey. The first portion is by rail. An observation car of one large compartment is secured, if possible. With very little direction the following main facts in descriptive geography are observed and connected with their causes:—

1. The low alluvial deposit extending from London Bridge to New Cross is at once recognized. Here and there amidst the acres of dwelling-houses a patch or two of the old fertile garden ground of Hatcham may be seen.
2. At New Cross the elevation of the land changes. Instead of running over arches level with the house tops, the railway enters a wide cutting, and here abundant evidence is afforded of the slipping tendency of the London Clay. Trenches at intervals are recognized, built into the Clay to prevent it filling up the railway cutting. Beyond Forest Hill the flat Clay fields are readily identified.
3. Immediately after leaving Croydon the railway passes along a cutting through the gravel and sand hills of the Lower London Tertiaries. Beyond this cutting the student looks back upon the Shirley and Addington Hills—a beautiful feature in the landscape entirely due to the change from the London Clay to the Gravel of the Lower London Tertiaries. The train is now passing over the Chalk, and at Purley Station, where a change of train affords an opportunity to observe the surface aspects, the characteristics of

Chalk scenery are abundantly evident—long rolling curves, with not a single level yard of field in view. The Station Chalk Quarry shows patches of red sand and gravel. These are evidence of the extension at one time of the Croydon gravels as far as Purley. The hills about Caterham are capped by many feet of the same gravels. These gravel caps cause the beautifully varied aspects obtained at Caterham. The student at once recognizes the effect of a mixed rock-formation upon the surface aspects.

The walking expedition begins with an ascent of the Chalk ridge overlooking the town of Caterham. On the summit a halt is made, the view is enjoyed, and a few questions suffice to associate the beauty of landscape with the variety of rock forms. To realize the extension of these North Downs eastwards through Kent to North Foreland, and westward through Surrey and Hampshire to Salisbury Plain, is an easy task. The student then connects these downs with the Chalk hills at Hitchen, Dunstable, and Luton. A further imaginative effort enables him to reconstruct the dome of Chalk southwards over the Weald, and thus to connect the North Downs of Surrey with the South Downs of Sussex. Similarly a synclinal curve beneath the Wash connects the ridge north of London (which extends north-eastwards to Norfolk) with the Wolds of Lincolnshire and Yorkshire, whilst southwards the Chalk Downs of Sussex and Hampshire dip similarly beneath the Solent to reappear in the Chalk range crossing the Isle of Wight.

The student, in a few moments of imaginative effort, is thus led to place himself in living contact with a series of Chalk ridges extending from Yorkshire in the north to the Isle of Wight in the south. He has previously learnt these ridges in his lessons on the geography of the east and south-east of England as a series of detached hill ranges. They have been names hitherto associated with etched lines on an atlas, and little more than names. Now, resting on one of these hill slopes, he realizes that the others are part and parcel of the Chalk range beneath his feet. Not only are the Lincolnshire and Yorkshire Wolds, the Chiltern and East Anglian heights on the north, and the South Downs and Isle of Wight ridges on the south, one and the same with the Chalk Downs on which he stands, but Flamborough Head, Hunstanton Cliff, North and South Foreland, Beachy Head, Culver Cliff, and the Needles—all these become associated together as seaward terminations of different parts of the same Chalk mass.

It will need no effort on my part to enforce the value of thus associating, in the closest manner possible, viz. by the association of common origin, geographical features which have hitherto been frequently taught as detached and isolated facts.

It may be objected by some that the aim of the school journey is being somewhat obscured by this effort to connect distant features of the country with the North Downs. Surely, says the objector, you have come out to observe the facts of Nature around you, and not to construct by an imaginative exercise synclinal and anticlinal connections with his' ranges far out of view. My answer to such objections as these

is this: that the evils of geographical teaching in the past consisted largely in the accumulation of masses of unassociated, ill-digested, and unexplained facts. My object in the school journey is not to teach a great variety of geographical facts in a more or less agreeable fashion, but rather to fix attention upon a few well-known and easily-explained features, and to bring these features into intimate connection with the causes that have produced them, and then to connect what is thus thoroughly learned with like features, wherever these are to be found. In further illustration of this method, when the summits of the hills around Caterham are seen to be preserved from weathering by the caps of gravel upon them, attention is directed to other hills within easy reach of London. Hampstead is mentioned. Yes, Hampstead is the summit of a Clay mound capped with Bagshot sand. Shooters Hill; yes, here again Clay is at the base and a gravel protects the summit. Sydenham Hill; again a gravel outlier protects the top from weathering. Muswell Hill, again, consists of a boulder-clay resting upon the London Clay. The stony nature of the boulder mass weathers more slowly than the surrounding rock mass, and so a hilly structure is produced.

As the journey is especially planned for future teachers, who should know more than it may be necessary or wise to teach their scholars, an attempt is made, before leaving the Chalk range, to realize the condition of the wide area over which the Chalk extended at the time it was being deposited. The Chalk is shown^d to be an organic deposit. This is done by microscopic slides. Similar deposits are now forming

at great depths at the bottom of the Atlantic. When, therefore, this Chalk mass 1000 feet in thickness was being accumulated, the entire area was some 1000 to 2000 fathoms beneath the sea. The students are now asked to trace step by step the changes that have occurred since the deposit of the Chalk. They readily enumerate them as follows:—

1. An ocean condition when the British Isles and some areas of Western Europe were sunk many fathoms beneath the sea, and during which the calcareous tests forming the mass of the Chalk were deposited.
2. A gradual upward movement, until upon the Chalk brought near to the surface there were deposited the sands and Clay passed over in the railway journey from Charing Cross to Croydon.
3. The upward movement continued, but the force somewhat irregularly applied, so that a series of synclinal and anticlinal curves were formed.
4. The weathering down of the dome-like anticlinals resulting in the exposure of the surface of the series of rocks visited during the journey.

I shall not attempt to work out the features selected for special observation and reflection during the journey so fully as I have done this one on the Chalk. The attempt, to be successful, should be made during an actual excursion, and perhaps it will not be out of place if I state at this point that if in September of

this year a number of teachers will join me, I shall be happy to accompany them over the Caterham district.

Sufficient material for thought has been given at this stage of the journey, and a mental relief is afforded by walking over the undulating surface of the Downs. At a deep cutting along the road the Chalk is left behind and a new formation comes into view. The Greensand at this point is marked by a quarry burrowing beneath for 400 yards. The quarry may be followed for some distance. It affords striking evidence of the downward incline of the synclinal on this side of the London basin. If followed beneath London it would reach a lowest position and then gradually come upwards and emerge at the surface northwards of the Chalk beyond Dunstable, Luton, and Hitchin. As the greensand does not yield any marked feature on the landscape at Caterham it is rapidly passed under review, and a long and somewhat uninteresting trudge is commenced over the flat surface of the Gault Clay. The appearance of the London Clay area is recalled, and its striking features, viz. flat-weathering, plain-like surface aspect, well-cultivated and heavily-timbered fields, are repeated. As the next formation is a light-coloured, silvery-looking sand, the class is asked to make an attempt to locate the point of transition from the Gault Clay to the Folkestone Sand. This lends interest to the walk. The result is not always encouraging. Some trudge on and apparently fail entirely to see the slightest indication of the change. There are some who notice the slight alteration in the undulation of the roadway, and the still more marked and rapid dip in the surface of the adjoining fields;

and a few call attention to the spot where the houses at the entrance to the village of Godstone seem to indicate the change to a sandy subsoil. These latter indications, recognized by a few, are impressed upon the class. They now see that Nature demands attention to the smallest details if her secrets are to be revealed. A brick-yard, a cottage, a slight dip in the road, a change in vegetation—the rush indicative of clay, the bramble of sand—these are marks which a quick eye readily observes and an awakened intelligence as quickly interprets.

The village of Godstone presents its quarries of Folkestone Sand for inspection. The coloured bands of iron are striking features, and the compact ironstone on the top is readily seen. This is associated with the preservation of the mass beneath, and thus the slightly undulating nature of the surface is explained. This tendency of iron bands to protect the mass beneath from weathering is still more marked when the next formation is reached. This is the formation fully displayed on the summit of Tilburstow Hill. With the ascent of this hill the walking expedition ends, but at this spot are three well-marked and striking features demanding attention and thought.

1. A turn from the roadway, and a now almost obliterated but evident geological "fault" may be seen. This at once strikes the observer as evidence of some mighty internal force that has expended itself locally and yielded a local effect. Opportunity is now seized to draw the attention of the pupil to

other evidences of still mightier internal forces already observed but not specially mentioned: the tilting of the successive rock forms already passed—Chalk, Greensand, Gault, Folkestone and Hythe beds, the uplifting of the Chalk mass from the oceanic bed to 1000 feet above sea-level—these evidences of movement are recalled, and all are associated with one and the same cause, viz. that of the shrinking of the earth crust and consequent development of heat and the expenditure of internal force.

2. The view from Tilburstow Hill over the Weald and the distant view of the South Downs stimulate the imagination to bridge over the area with those successive masses of rock strata which have been slowly but surely removed by surface weathering. The successive rock forms passed over in the walk from Caterham may be found at the base of the South Down in Sussex. They face each other still; though thirty miles of Weald to-day separate them, they were originally connected; every year they become removed farther apart. These are the reflections which observation stimulates.
3. An attempt is now made to solve one of those difficulties which thirty years ago perplexed the writers of our physical geographies. The rivers Kennet, Mole, and Medway, rising in the Weald, appear to break through the North Downs on their way to join the Thames. We were told that they dashed

through these hills; and, seeing that the same was true of the rivers flowing southwards through the South Downs, the general truth was boldly announced that Chalk ranges do not form watersheds. The true history of these rivers becomes clear to the student when he considers the changes which in the comparatively recent past must have occurred in the Wealden area over which his observation is now fixed. He builds over again the dome of Chalk; this completed, he has but one Chalk range instead of two. The rivers flowing over this single ridge northwards to the Thames and southwards to the Channel would carve out their beds, and as by this process of river denudation the valleys through which they flowed would be deepened, a gradual upheaval of the Weald would enable them to continue their work and flow. Allow this double process of change, viz. the deepening of the river beds and upheaval of the Weald to continue, until, by weathering, the dome of Chalk has been completely removed, and the student grasps the explanation of the puzzle of these rivers appearing to break through the Chalk ranges.

There are other problems in descriptive and physical geography which claim attention in this journey, and which cannot be explained except by actual visit. I leave these, but repeat my offer to conduct those teachers who express their desire, over the field. An

afternoon spent in thoroughly mastering the twenty miles of journey between Charing Cross and Godstone places the teacher in a position of being able to explain the greater part of the physical conformation of the surface over the entire area of South-Eastern England. I conclude my paper by quoting the summary of advantages to be derived from this journey, which are printed at the end of my paper in the Special Reports on Educational Subjects:—

- (1) Accurate first-hand knowledge of a given limited and readily-accessible area is gained. This first-hand knowledge—full, accurate, and permanent—gives a possession of high value for purposes of gaining clear notions of districts which cannot be similarly visited.
- (2) The power to observe is quickened, and at the same time ability to concentrate effort upon a few well-defined objects in the midst of great profusion and variety of material is acquired.
- (3) A few truths, strikingly illustrated and capable of wide application, are established in every journey. The accumulation of many isolated facts is avoided.
- (4) The power to apply knowledge in possession to the acquisition of further knowledge provides both a means and a stimulus for the exercise of self-effort.
- (5) Besides being of direct service in the acquisition of reliable knowledge, the participation in a few "school journeys" enables the pupil to use his after-school rambles and excursions

rationally, and with pleasure to himself and others.

- (6) In some accounts it has been deemed advisable to limit participation in the "school journey" to those deserving of prize or distinction. No such limit is advised here. Frequently the dull and indifferent boy in school and book-work proves both active and interested in the outdoor effort. This activity aroused by the outdoor exercise reacts upon the scholar's effort in the school.
- (7) Lastly, the social and æsthetic advantages are not overlooked. A love of Nature is engendered. Teacher and scholar display mutual sympathy and regard. School work is intellectually benefited, and school life is morally elevated.

THE PRESENT WORK OF THE COUNTY COUNCILS

BY MR. H. MACAN, SECRETARY TO THE SURREY
EDUCATION COMMITTEE

The present work of the County Councils, as far as it relates to the training of teachers so as to qualify them to give instruction in Nature-study, has been, as regards certain phases (and perhaps the most important), very fully dealt with by Mr. Hobhouse on Thursday. He pointed out the value of the holiday courses now so common at our leading agricultural colleges and other institutions of tertiary or university

rank. It is quite true that for many years past all the principal County Councils have given facilities to selected teachers, in numbers of from ten to twenty per county per annum, to undergo these courses of training. While upon this point I would like to urge that what is desired by the teachers and for the teachers, in these short courses at any rate, is not advanced science courses, much less a renewal of their past acquaintance with systematic science study, but a definitely mapped-out and restricted series of lessons capable of being reproduced almost exactly with the simplest and cheapest apparatus available in the village school.

But this does not by any means represent the whole work done in the direction of familiarizing teachers with natural phenomena regarded scientifically, and giving them the materials wherewith to interest their scholars in the same. The Saturday classes which have gone on intermittingly for the last eight or ten years in the principal counties, whether dealing with the various branches of science, manual training, or drawing, have all worked towards the same end. As these are brought almost to the teachers' doors, and have been established in perhaps some hundred of the leading centres of population each year, their influence by this time must have been far-reaching. The foundation of school gardens in connection with the elementary and continuation schools, and the visits of the skilled experts of the County Councils in botany or horticulture, all serve as much for the instruction of the teachers as of the scholars. But a point which has been very much lost sight of is the value to teachers of the reorganization of the schools of science

and art which has been practically universally brought about by County Councils. These schools are very largely used, especially in the science subjects, chemistry, botany, physiography, &c., by the teachers of primary schools desirous of gaining additional qualifications for their work. In 1890 these schools were in all the more rural counties giving a worthless education mainly by means of books, an impossible way of teaching science. In my own experience three schools (farmed, of course) without laboratories and almost without apparatus served a population of half a million, and were naturally looked upon by teachers with contempt. Now fifteen schools fully equipped, many with two laboratories, are centres of work for the teachers, and serve for the education in physiography of all the pupil-teachers in the county.

In many counties also clubs and societies have been formed whereby field-work in geology, zoology, or botany, under the guidance of a County Council expert—for this is essential—fill up the Saturday afternoons during the summer, and the results of these rambles are imparted to the children in the day or continuation schools during the winter. The very provision of selected boxes of apparatus, schemes of study, or specimens for the evening-schools, and the visits of the county inspectors, also serve indirectly as a means of instruction to the teachers; considering that in forty out of the fifty rural counties the County Councils have for some six years past run practically all the evening-schools and introduced new methods almost everywhere, the influence of their work must be considerable. Where the inspector is also himself (as is mine) a skilled teacher, his conferences with the

schoolmasters produce as good fruit or better than a formal lecture. I could wish that the eminent gentlemen from above, whose omniscience from tonic sol fa to gardening, cooking, and basket-making fills me with amazement, could have more leisure and, if possible, more knowledge to deal in their inspections with the group of subjects which form the object of this exhibition; at any rate we would not then have a "senior chief" telling a teachers' conference in so many words that "Nature-study was all rot".

Of course in some counties, notably Staffordshire and Essex, systematic work throughout years and sessions by means of teachers' classes has been initiated, and where there are facilities for it no doubt this is of the highest value. So far the County Councils have not been able to get a finger into the training colleges, but there is a good time coming.

The Agricultural Education Committee have strongly recommended the government to encourage a third year's training at agricultural colleges to fit teachers for rural schools. With a view to making it possible for institutions of university rank to cater for these teachers without serious loss, the government have, in committee on the Education Bill, promised to increase the grant to day-teaching institutions, where a hostel is provided, by £15 per head, thus making it equal to that paid to residential colleges. It would then be possible for some ten or twenty teachers to live in a hostel attached to a college like Wye, and go through a course of agricultural training, the college receiving £50 from Whitehall for each student.

As a matter of fact very few teachers train for the third year now, chiefly because there are few places

of specialized training open to them, but also because there are not sufficiently remunerative positions open to the more special teachers. But this also, I feel sure, will be remedied in the near future. Besides, when the training-college system is reorganized it should be quite possible for part, at any rate, of the second year to be spent in some agricultural training college.

I venture to hope that we may even go further and see a new branch of training colleges (not inferior to, but different from the present), giving special attention throughout the teachers' careers to scientific study and nature-knowledge, opened in some eight or ten centres under the control of groups of councils. It is plain that if this is to be done well and thoroughly, some of the more elementary studies of a secondary kind now given in these colleges must drop out, and the necessary knowledge must therefore be acquired by the students in the proper place—a Secondary School—at an earlier period of their career.

I have not touched so far upon the disadvantages of the present system and the very partial effect of the work done. It must be remembered, in the first place, that the County Councils have hitherto had no mandate to train teachers in Nature-study or anything else. The letter, and, more important, the spirit of the Technical Instruction Act distinctly ruled out the training of teachers for other than secondary and technical purposes; hence knowledge to be used solely in the elementary school scarcely at present can be called a legitimate object for county funds. Nature-knowledge, *a fortiori*, as being chiefly useful

in the earlier stages of a child's career, has had to be touched with some difficulty.

Secondly, the County Councils had no *locus standi* which enabled them to get into close touch with the primary teacher. Not that the teachers were at all unwilling; on the contrary, no praise is too great for those who voluntarily gave up their little leisure week by week and year by year to qualify for the great work of the future. But no facilities to teachers, no aid to councils, came from the village school boards or from many of the village voluntary managers; wiser in their generation than the children of light, these bodies saw that, once the County Councils got a foothold in their schools and a place in the esteem of these teachers, their own doom could not be far off.

Thirdly, the same causes prevented the teachers seeing the fruits of their labours and securing that employment in the villages for which they had qualified themselves. No one who has not been through it, knows the heart-breaking work of the last ten years to overcome the dead weight of sullen opposition from those assorted groups of petty local obscurantists who have hitherto masqueraded as educational authorities. It is a popular superstition that education is demanded from below, that the great voice of the people in towns or villages cry out for the evening-classes, and the public authorities, thinking only of the rates, repress this yearning. As some one at a trades-union conference put it some few months ago, the persons who should direct education, and of course control the teachers, are those who, having had none themselves, have keen aspirations (not aspirates, be it noted) for it to be given to others. As regards the


introduction of Nature-study and similar teaching into the villages, this is all nonsense. The County Councils, often with the sole help of the teachers and a few enlightened squires and parsons, have had to supply what was not demanded, and practically to force these new departures and developments upon those who knew nothing of them and cared less. But the efforts of these trained teachers are steadily bearing fruit, and all that they require and desire is to work in a freer and more enlightened atmosphere, in closer touch with those authorities, colleges, and schools which provide their training, and then an impulse alike to village life and education will be given which cannot fail to make such life and its surroundings more tolerable to the rural population.

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