REPORT

OF THE

CHELTENHAM COLLEGE

NATURAL HISTORY

SOCIETY,

FOR THE YEAR 1870.

"HOMO, NATURÆ MINISTER ET INTERPRES, DE NATURÆ ORDINE TANTUM SCIT ET POTEST QUANTUM OBSERVAVERIT, NEC AMPLIUS SCIT AUT POTEST."—*Bacon.*

CHELTENHAM:
PUBLISHED BY JOHN DARTER, BOOKSELLER AND STATIONER,
NORTHWICK TERRACE.
1871.

REPORT.

INTENDED originally for a private club to promote scientific inquiry, and almost immediately developing into an institution of our school, the Natural History Society has, during this the first year of its existence, met with decided success. It is satisfactory to note that its prospects have from the very first been steadily improving, notwithstanding the discouragements which frequently attend a young society.

The Scientific Meetings have been fewer than might have been desired. This was occasioned by the delays incidental to the formation of a new society, and by the unavoidable resignation at Midsummer of our former energetic secretary. Nevertheless, they have been well attended; the numbers present being encouraging, and the papers interesting and instructive, though at times wanting in originality. Originality, therefore, has been chiefly regarded in selecting papers for publication: in two cases, however, this rule has not been followed.

In other school societies masters are often inclined to take an over prominent part. This difficulty, however, has not been experienced by us. On the contrary, we cannot but think that our interests would be promoted, should the masters favour us with more communications.

The field-days, combining as they do amusement with work, are highly beneficial, and have largely contributed to the working of the various sections.

These can here only be shortly mentioned; all details being inserted later on the authority of the several committees.

Botany.—Decidedly well worked. Best point of the Society.
Entomology.—Also well worked. Sadly deficient in Coleoptera.
Zoology.—Practically reduced to Ornithology. So far, so good.
Geology.—Little attempted, less done.

To encourage the working of this last section, which is at present altogether unsatisfactory, the Council have resolved to offer a prize, value £1 10s., for the best original collection of local fossils.

Our funds are in a fairly flourishing condition, as will be seen from the account annexed; but due attention must be paid to the fact that out of this sum the expenses of printing this report have to be defrayed.

In conclusion, then, on reviewing the meetings, the papers, the field-days, and the funds, we think that though there is much room for improvement,* the Society has good reason to congratulate itself on the work of the past year; and if its members continue their exertions with equal diligence, we see no reason why it should not in future meet with equal success.

R. OBBARD,
W. F. WELLS,
T. GAGE GARDINER, } *Editors.*

We may be allowed to transcribe a letter from Mr. Cumming to the College Magazine, as shewing the objects with which the Society was formed.

TO THE EDITORS OF THE CHELTENHAM COLLEGE MAGAZINE.

GENTLEMEN,—I venture to trouble you with a few lines on a subject which I think may be of sufficient interest to find a place in your next number. Since I have been at the College I have found expressed on several occasions a desire for more concerted action and union between those members of the College who are interested in the pursuit of Natural History. This has resulted in an attempt at forming a Natural History Society. For this purpose a meeting of some masters and boys most interested in the proposal was held on Friday evening, the 18th of February, when a committee of boys was elected provisionally, to consider the means by which the objects of such a society might best be effected.

I think the objects to be kept in view are these:—

1st. The holding of periodical meetings for the purpose of reading papers, recording notes on observations, exhibiting specimens of interest, and discussing freely any questions suggested by such notes or specimens.

2nd. During the summer months joining together for excursions to places of interest in the neighbourhood.

3rd. The circulation among the members of several journals bearing on Natural History.

The questions of forming Public School Collections of specimens, or a Natural History Library distinct from the College Library, must be for after consideration. The subscription must, of course, be kept low; and probably the number of subscribers at first would not justify us in hoping very rapidly to acquire these desirable, though expensive luxuries.

I am glad to say that the scheme has the hearty sympathy of the Principal, and I may perhaps be allowed to say that the pursuits we aim at are just those in which masters and boys can most join together with that feeling of unity and fellowship which are too apt to be lost in their purely official relation.

I cannot but think, that in a school like ours, there must be many who would sympathise with this movement. I have only to add that I shall be very pleased if any sympathisers will communicate with me.

I am, yours, &c.,
L. CUMMING.

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* This is especially the case with regard to corresponding members. We should be most happy to receive communications from old Cheltonians, for surely among their numbers there must be some who take an interest in science, and would wish to encourage it in their old school.

The Cheltenham College Natural History Society.

RULES.

1.—That this Society be called the Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That this Society be composed exclusively of past and present members of Cheltenham College.

3.—That ordinary meetings of this Society be held at least every Friday, at 5 p.m., or at such other times as the Council may appoint, where papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

4.—That scientific periodicals, to be from time to time determined, shall be taken in.

5.—That albums be provided in which to enter minutes of captures and observations in the various departments of Natural History; members being appointed as album keepers, whose duties shall be to verify specimens and enter notes. That a map of the district be kept by which to determine the locality in which any capture is made.

6.—That during the summer months field days be appointed (at least once a fortnight) for the purpose of making excursions to places of interest in the neighbourhood.

7.—That excepting the 17 first members (to be accounted original members) election shall take place only after proposal and seconding by members of the Society; the candidate, with his proposer and seconder, to be posted on the notice boards three days before a meeting, when he shall be declared elected, unless sufficient reason for his exclusion be shewn to the President.

8.—That members' subscriptions shall consist of an entrance fee of 2s. 6d., and a further half-yearly subscription of 1s. 6d., payable in advance.

9.—That any member missing four consecutive meetings, without giving satisfactory reason in writing, or any member whose subscription shall be a whole half-year in arrears, shall be liable to expulsion from the Society.

10.—That for holding a meeting a quorum of fifteen members shall be considered necessary, unless the President decide otherwise.

11.—That the officers of the Society be a President, a Vice-President, a Secretary and Treasurer; who, together with the keepers of the albums and four other members, shall constitute the Council of the Society; and that Members of Council be elected at the first meeting of each half-year.

12.—That the duties of the President shall be to preside at meetings, and act as general referee in all questions of order.

13.—That in the absence of the President or the Vice-President, a member of the Council shall preside.

14.—That the duties of the Secretary and Treasurer shall be to enter the the minutes of meetings in a book to be kept for that purpose, to collect subscriptions, to give account of the same, and to transact the general business of the Society.

15.—That the Treasurer's accounts, after the approval and signature of two auditors, to be appointed at the preceeding meeting, be laid on the table at the last meeting in each half-year.

16.—That the Society have power, by a vote of the majority of member present at a special or a weekly meeting, to erase from the list of the Society any member whose conduct should be considered adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of any ex-member to be permitted during the next half-year.

17.—That members of the Society, on leaving the College, shall become corresponding members.

18.—That no alteration be made in these rules without calling a special meeting, of which notice must be given to each member by the Secretary.

LIST OF THE SOCIETY, CHRISTMAS, 1870.

OFFICERS :—

President: Rev. T. W. Jex Blake
Vice-President: Rev. T. A. Southwood

MEMBERS OF COUNCIL :—

L. Cumming, Esq.
T. Bloxam, Esq., F.G.S., F.C.S., Ph.D.
T. G. Gardiner
W. F. Wells *(Secretary first term)*

ALBUM KEEPERS :—

R. Shubrick *(Botanical)*
W. F. Wells *(Entomological)*
F. E. Gantillon *(Zoological)*
L. Cumming, Esq. *(Geological)*

SECRETARY AND TREASURER :—

R. Obbard

CORRESPONDING MEMBERS :—

Rev. Dr. Barry
Rev. J. Wood
Rev. G. W. Smyth
F. R. Price, Esq. *(O.C.)*
T. W. Scott, Esq.
A. Myers, Esq. *(O.C.)*
E. P. Johnson, Esq. *(O. C.)*
J. G. Sparke, Esq. *(O. C.)*
C. A. Friend, Esq. *(O.C.)*
J. M. Candy, Esq. *(O.C.)*

MEMBERS :—

Rev. C. Bigg
Rev. W. Boyce
Rev. W. Lewis
Rev. J. C. Turnbull
Rev. T. M. Whittard
Capt. Carter
H. M. Draper, Esq.
C. Elcum, Esq.
T. C. Fry, Esq.
J. Orchard, Esq., F.G.S.
P. H. Smith, Esq.
G. Nutt, Esq.
W. Hind
R. Shawe
G. Campbell
A. Phillips
H. Skipton
J. Cade
W. Ker
E. Dickson
S. Buller
J. Day
J. Maconchy
A. Friend
A. Pringle
H. R. Philipps
H. Reynolds
A. Allen
C. Nesham
W. Dumergue
E. K. Robinson
J. M. Lambert
W. Hopkinson
R. Chamney
A. Taylor
G. Collins
W. Fallon
B. Littlewood
C. Young
G. Gawne
W. Smallcombe
A. Layard
K. Brown Constable
T. Julian
P. Agnew

SOCIETY IN ACCOUNT WITH THE TREASURER.

RECEIPTS.

	£	s.	d.
By Subscriptions, Midsummer term	11	15	0
" " Christmas "	5	9	6
" " to Report (received Dec. 23)	4	9	6
Total	21	14	0

EXPENSES.

	£	s.	d.
To Printing Rules, &c.	1	8	6
" Scientific Periodicals	1	11	8
" Map, Albums, &c.	1	2	6
" Box for Documents	0	5	0
" Field Day—Chedworth	0	18	0
" " Sudeley	1	0	0
" " Cranham	0	10	0
" Incidental Expenses	0	6	6
" Stamps	0	2	2
" Balance in Treasurer's hands	14	9	8
Total	21	14	0

Audited and found correct:

T. GAGE GARDINER.
G. CAMPBELL.

Minutes of Meetings and Field Days.

A preliminary meeting, for the purpose of organizing a Natural History Society in the College, was held on February 18th, in Mr. Cumming's rooms, when a Provisional Committee was appointed to draw up rules, and to make other necessary arrangements.

Meeting held February 24th.

The Principal in the chair. Rules, which had been previously framed by the Committee, were then submitted for approval, and were passed with a few alterations.

Meeting held March 1st.

The Officers of the Society for the term were elected.

First Meeting for Scientific Purposes, March 9th.

Exhibitions:—A case containing the Moths and Cocoons of *B. Yama Maï*, *B. Pernyi*, *B. Cecropia*, *B. Cynthia*, and *B. Mori*. A paper was read by W. F. Wells on his experiences in breeding *B. Yama Maï*, &c. The following is an extract:—

"I sent for the eggs early in April, and in order to prevent the young worms being hatched before there was sufficient foliage on the oaks to feed them, I kept them in a cool place, where the temperature was seldom much above 58° Fahrenheit. Now, curiously enough, though the eggs are laid in August, and the larvæ formed about a month after, they do not emerge till the following spring. Consequently the shell of the egg becomes dry and requires to be constantly moistened, or else it would be so hard that the larvæ could not break through it. When the oaks had sufficient foliage to support the larvæ, I brought the eggs on a plate into a warm room, and covered them with a piece of wire gauze, pouring water on them and straining it off about twice a day. Thus the plate was always kept moist, and the young were able to drink as soon as they emerged from the egg. I often watched them as they emerged, and they appeared to me to swell visibly while drinking. I then placed them upon large cut boughs of oak, placed in jars of water, which I kept pure by putting in charcoal.

"At first they all went on well, eating very heartily, and my expectations rose high when the worms had passed their fourth moult. But, alas, these hopes were doomed to disappointment! During two fearfully hot days in June, notwithstanding all my efforts, (the room being in a wing and much exposed to the sun,) I could not keep the thermometer much below 100° Faht. This, added to the fact that their food was rather stale, caused the worms to die off rapidly, and soon I had not one left. Thus, then, I failed in my first attempt. On further consideration, I have attributed my failure to the following causes:—

1.—That I covered the oak boughs with muslin bags, and thus prevented that free circulation of air to which the worms are accustomed on their native hills in Japan.
2.—The two hot days.
3.—The slight staleness of their food.

4.—The too great moisture in the air owing to the evaporation of the water sprinkled on the floor and walls.

5.—The fact that one day the worms were fully exposed to a hot sun without my knowledge."

Mr. CUMMING, in proposing a vote of thanks, made a few remarks on the probabilities of success in rearing Japanese Silkworms.

He said that although on *a priori* grounds as to climate, &c., there seemed every prospect of success, to judge from the fact that many Japanese plants already flourished in our gardens, still insects, especially in the larva state, seemed most susceptible of any, even slight, change in physical conditions. In support of this he mentioned the Fen insects which, as soon as their proper haunts were destroyed, entirely disappeared, although in many instances their food plants still abounded. This was found to be the case with the Large Copper on Whittlesea Mere, and was fast proving true with regard to *P. Machaon*, our largest native butterfly. He also instanced the remarkable failure of an attempt to naturalize the Gipsy Moth on one of its old Fen haunts. In conclusion he said, "We must not therefore conclude that even the closest parallelism of climate is sufficient to justify the sanguine hopes of success which Mr. Wells seemed to entertain."

23 members were present.

MEETING HELD MARCH 23rd.

Exhibitions :—Microscopic objects, by G. TOVEY. A Bird's Nest and a piece of Bacon petrified at Harrogate, by W. F. WELLS. After private business, a lecture on "The Classification of Plants" was delivered by Mr. CUMMING.

32 members were present.

MEETING HELD APRIL 13th.

Exhibitions :—*P. Arion*, *L. Dispar*, *V. Antiopa*, and other rare English butterflies, by Mr. CUMMING. Sowerby's Botany, by W. F. WELLS. Oolitic Fossils, by MR. ORCHARD. After private business, F. GANTILLON read a paper on "The Migration of Birds," and Mr. CUMMING concluded his lecture on "The Classification of Plants."

20 members were present.

FIELD DAY ON CLEEVE, APRIL 14th,

Of which no account has been preserved.

FIELD DAY, APRIL 30th.

A drag took seventeen members to Chedworth. After visiting the fine Roman Remains for which that place is famous, and ransacking the woods for plants, the party returned home.

Meeting held May 4th.

Exhibitions were Box containing *G. Rhamni*, *Cleopatra*, *A. Cardamines*, (English and Foreign varieties); some tailed Blues, several species of *Papilio*, *Apatura Ilio*, and the *Phyllium* of the Seychelle Islands, by A. Pringle; *Fritillaria Meleagris*, by Rev. J. C. Turnbull, from Shire-Amney, in Wiltshire; a monstrosity of Daisy, in which the involucre was inverted and the florets grew downwards, the stalk passing through the centre like the handle of an umbrella.

A. Pringle said a few words on "Butterflies at Home and Abroad." The following were among the remarks he made:—

"The same classes of butterflies are found widely distributed over the earth, wherever a particular species does not occur, its place being supplied by some other closely allied to it. Thus the large Copper, exhibited at a former meeting, is peculiar to this country; while the Purple-edged Copper which has seldom, if ever, been seen on this side of the channel, supplies its place on the Continent. The chief difference between English and Foreign Lepidoptera consists in the greater variety and brilliancy of colouring, and larger size of the latter. As a rule the place of our butterflies is supplied by others of gayer tints, but sometimes the same insect is marked differently in this country and abroad. The common Sulphur is an instance of this; for in a foreign variety, *Cleopatra*, the small orange spots are extended over the whole surface of the upper wing. The Orange-tip undergoes a somewhat similar change: that part of the wings, which is white in British varieties, becoming yellow. Whatever may be the difference, however, in size or colouring, the distinguishing marks of a family will be found always the same. Their prevailing habits are also similar, though sometimes more strongly developed abroad. Our Swallow-tail has a very strong flight: tropical Swallow-tails have been found many hundred miles from land. The continental representatives of local English butterflies are also local; one of the Purple Emperors, *(A. Ilio,)* found at Aix, shews this tendency to such an extent that it is said by some to pass every stage of its existence in a single wood, never having been caught elsewhere."

He also gave a short account of the *Phyllium*, or Leaf Insect, which he exhibited, drawing attention to the fact that the specimen before the meeting had undergone some strange metamorphosis, by which it had become united to the leaf. In explanation, he suggested that this attachment might be the work of some fungus.

17 members were present.

Meeting, May 11th,

For private business, when it was determined that the number of periodicals taken in should be reduced.

Field Day, May 21st.

20 members went in a drag to Sudeley Castle, over which they were shown, by the kind permission of Mrs. Dent. After luncheon the party dispersed for scientific purposes, and then returned home.

MEETING, HELD MAY 25th.

Exhibitions were a Collection of British *Orchidaceæ*, by Mr. CUMMING; Australian Butterflies, by A. PRINGLE; Collection of Eggs, by F. E. GANTILLON.

A paper was read by R. OBBARD, "On the Structure, Characteristics, and Means of Fertilization in Orchids."

Auditors were elected at this meeting, which was attended by 19 members.

FIELD-DAY, JUNE 4th.

Sixteen members drove to Ladlecombe Bottom, near Cranham, where, in the course of a very pleasant day, many of our rarest plants were discovered.

MEETING, HELD JUNE 8th.

Exhibitions:—Plants and Diagrams, by H. S. SKIPTON; Cane Fruit and Pods of Cotton Tree, *(Bombax.)* by R. OBBARD.

H. S. SKIPTON entered into a discussion on the "Flowers of Virgil's Eclogues," showing deep research and considerable power of argument, but scarcely suited to the requirements of a scientific meeting.

The treasurer's accounts were laid on the table for inspection.

At the conclusion of this meeting, (the last in the term,) Mr. CUMMING congratulated the Society on its success during the half year, and exhorted the members to note their observations in the vacation, and to collect specimens for the College Museum.

32 members were present.

MEETING, HELD OCTOBER 5th.

Officers of the Society elected for the half-year.

MEETING, HELD OCTOBER 25th,

When the rules were revised, and the Album Keepers added to the Council.

MEETING, HELD OCTOBER 28th.

Exhibitions included Specimens of Tin and Copper, in various forms, from the Cornish Mines; Sections of a Mine at Tintagel, by Mr. CUMMING; a Davy Lamp, kindly lent by the Museum; and a few choice Sections of Wood.

MR. CUMMING read a paper "On the Mines of Cornwall":—

"While spending a large part of the last Christmas and past Midsummer vacations in the county of Cornwall, I availed myself of such chances as came in my way of examining the mining operations for which this extreme south-west corner of our island has long been famous. I am not this evening going to enter into a treatise on mining; but am going to give a few facts drawn either from my own observation, or from conversations with the practical miners on the spot, many of whom are men of great intelligence. Perhaps of all practical operations mining is that which has least been reduced to a science, and indeed I must confess myself mostly ignorant of the probable conclusions drawn by students of that branch of Mineralogy; still, unless I am mistaken, the very elementary question, How did the ore get into those veins where it is found? has been much vexed and little answered.

"I must, however, begin by premising one word about the geological structure of the County itself. It will be sufficient to say that it is an instance of a simple linear upheaval—the central ridge or back-bone running very nearly N.E. and S.W., from which the land slopes off pretty evenly both ways. This central ridge or back-bone consists of granite in many parts, otherwise of gneiss and mica slate, flanked up by clay slate which extends in most parts to the sea, except where an eruption of trap, such as serpentine or hornblende has burst its way through the overlying strata. The elevation reached is never great, in no place I think exceeding 1700 feet.

"It is in the clay slate, usually not far from its juncture with the granite that the metalliferous mines occur; the metals worked being chiefly tin and copper, though not unfrequently lead with a small alloy of silver is produced.

"The metal lies in veins or *lodes*, which are noticed as differing in structure from the surrounding rock, several often running more or less parallel to each other, and usually inclined to the surface. Running obliquely across a number of these lodes is nearly always a cross course or *alvine course* (*vide* section,) composed often of quartz, and not usually productive of metal.

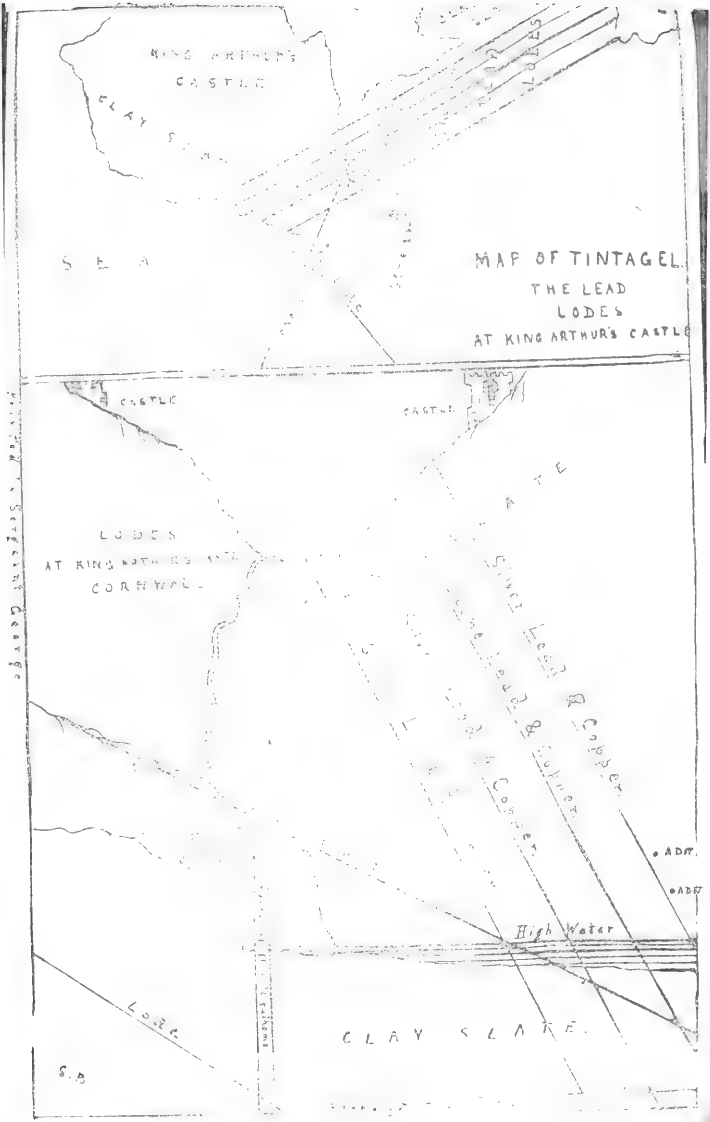
"These lodes are supposed to have been a long time geologically back the subterranean water-courses of the county, carrying away the water which filtered through the surface strata. Similar courses occur now in every part of the world, as ordinary watercourses running in a great variety of directions. It is moreover held essential to the production of metal that the lodes shall run more or less N.E. and S.W. (*vide* section.) This at least is a rule followed by practical miners, who all assured me that a lode was quite useless if running in any other direction. The practical miner also insists very strongly on the existence of the cross or alvine courses, crossing obliquely the more or less parallel veins.

"Where crossed by an alvine course, the lode is found to be shifted a few feet in one direction or another, and its metalliferous character is often entirely changed. Occasionally when the alvine course is metalliferous it contains metal quite different to that on either side of it.

"These cross courses seem to suggest the occurrence of subterranean disturbance along the line of the present alvine course, blocking the free flow of water through the channels, which were then filled up by matter filtering in; and that the metal must also have filtered in and crystallized in its present form. Tin, however, can scarcely have filtered through in the form of binoxide, as that is insoluble, both in water and all known acids.

"In the earliest times tin was not obtained from the lodes, but in the form known as *stream* tin. This form naturally occurs where a stream of running water happens to intersect a lode cropping up near the surface. The stone is disintegrated by the action of the water, the lighter and finer particles of sand are carried away far down the stream, the heavier crystals of binoxide of tin soon sinking to the bottom, where they are found mixed with sand in the stream's bed. The ore can then be obtained pure by repeated washings. This was probably the only form of working known in the days of the Romans, and many of the mines worked originally by them are now open. In some cases the workings are merely in the refuse left by former workers, which can now be worked to advantage owing to constantly economizing methods of separation of the ore.


KING


KING ARTHUR'S
CASTLE
S E A
MAP OF TINTAGEL.
THE LEAD
LODES
AT KING ARTHUR'S CASTLE
CASTLE
CASTLE
LODES
CORNWALL.
Lead & Copper.
High Water
ADIT
ADIT
CLAY SLATE.
Lode
S.B
Sergeant George

"It is by the known occurrence of this stream tin that the lodes are usually detected. The method of working would be to follow up a lode thus accidentally laid bare, and to work inwards until reaching an alvine course which always determines the line of the main passages.

"When tin stone has been raised from the lode it is first subjected to stamping, by which it is reduced to the consistency of fine sand. The separation of tin from sand depends on the fact alluded to just now, that when grit is mixed with water, as in a muddy river, the heavier particles are dropped first. From the stamps the sand is washed away by a current of water, proceeding along channels cut for it on a slight incline for some 30 or 40 yards. By repeating this process, at last nearly pure ore is found in the bed of the channel.

"Next the ore is subjected to a heat so great that arsenic, sulphur, and other substances often occurring as impurities in the tin volatize and disappear. The tin ore is then in a marketable form. To reduce it to metallic tin, it is heated in a restricted current of air, after being intimately mixed with finely divided carbon. The oxygen now leaves the tin and unites with the carbon to form carbonic acid, the tin being left in the metallic form."

The writer here described his descent into Botallack.

"I cannot now detain you with a special description of the copper mines. That metal is found exclusively in clay-slate, and often in company with tin, as in the Botallack mine to which I have just referred. I lay specimens on the table, and you will notice that many of them are of great beauty, being of the variety known as *peacock* copper.

"I wish, however, to say a few words about the mine from which I obtained the sections hanging on the wall. It is situated in a most beautiful spot on the sea-shore, close to Tintagel, (a name replete with very different associations,) and in fact undermining the ruins of the castle which legends assign to King Arthur. Here we have an instance of a mine yielding silver, lead, and some copper, the silver appearing as an alloy in the lead, and amounting in some samples to as much as 20 ozs. silver to the ton of lead.

"The method by which so small a quantity of silver can be profitably separated from the lead deserves notice, as it is one of those beautiful applications of the more recondite laws of nature to man's use. The law here made use of is that a substance in crystallizing tends to reject all foreign bodies. Thus lead in crystallizing tends to separate from its crystals the silver mixed with it. To apply this principle a row of earthen pots are immersed in hot cinders, some of the alloy being placed in the middle pot. The lead, on partially cooling, begins to crystallize; the crystals are skimmed off and placed in a pot to the right, the fluid from the bottom being placed in the pot to the left. The same process is repeated at each of the pots; and, in consequence, in the pots to the right the lead is becoming continually more and more pure, in those to the left more and more largely alloyed with silver, so that in the one the most to the left there will be lead with a large percentage of silver, amounting perhaps to one or two per cent. The lead can now be reduced to lithage or oxide of lead by heating in a current of air, the silver sinking to the bottom in the form of metallic beads.

"In conclusion, it may please the fancy to trace back the dawn of the commercial greatness of this country to these same Cornish tin mines. They seem to have been the only tin mines known to the ancients, and from them was probably obtained the tin for their bronze statues. Indeed Diodorus Siculus, writing in 9 B.C., speaks thus of the trade of the ancients with Britain: 'The inhabitants of Belerium are hospitable, and, on account of their intercourse 'with strangers, civilized in their habits. It is they who produce tin, which 'they melt in the form of knuckle-bones, and carry to an island in front of 'Britain, called Ictis. The island is left dry at low tides, and they then 'transport the tin in carts from the shore. Here the traders buy it of the

'natives, and carry it to Gaul, over which it travels on horseback, in about 'thirty days, to the mouths of the Rhone.'

"Now, there is much reason for believing the Ictis here mentioned to be St. Michael's Mount, and Belerium, Cornwall.* In the first place, it is not likely that there should have been so recently another spot on our shores which was an island twice a day at high water, and connected with the mainland at low water. In confirmation of this, there was dredged up in Falmouth harbour, about forty years ago, a block of tin, of such a shape that Diodorus might have compared it to a knuckle-bone, and of such weight that two slung over a horse's back would form a convenient load. In the very faces of many of the people, and in the strange foreign names lingering about, there is evidence enough of former intercourse with strangers. As for the men and women of Cornwall, their fame is told both in song and story. I will only repeat again the words of Diodorus, which remain as true now as 2000 years ago. Believe me—in that I have personally experienced it—that they are both hospitable and civilized in their manners."

S. BULLER explained, with experiments, the Structure and Principles of the Davy Lamp.

R. SHAWE read a paper on the *Aurora Borealis* of Monday and Tuesday, October 22nd and 23rd, from which we extract the following description of the phenomenon, as seen at Cheltenham :—

"It was I imagine about 8 p.m. that a long semi-circular bank of dense black cloud extended on the North horizon through the compass points of about N.E. and N.W., the arch of the cloud rising above the horizon to an altitude of near 20 degrees. From the back of this dark cloud were projected the most brilliant rays of luminous light of the deepest crimson and orange with fainter green rays, all pointing fanlike to the zenith. The colours exhibited by the rays were strongest at either extremity of the arch—to the N.W. and N.E. In the centre at the north, the rays merged into a band of almost darkness. The display lasted upwards of an hour. The intensity of the projected rays of colour, and their changes at either extremity of the arch, were most beautiful, and altogether most extraordinary from the height of the projected rays above the horizon, the intensity of colour, and the time during which it was visible."

In conclusion, the Rev. W. LEWIS said a few words on the supposed discovery of a crocodile in Wales, showing from private information that it was a hoax.

36 persons were present.

MEETING HELD NOVEMBER 4th.

Exhibitions :—A Stalactite from Cheddar, with horizontal and perpendicular section of Australian Stalactites; as well as Cheddar Plants and Photographs, by W. F. WELLS ; Skin of a Rattlesnake, by C. YOUNG.

W. F. WELLS described the Cliffs and Stalactite Caves at Cheddar from personal inspection during the vacation, illustrating his remarks by the exhibitions.

A. PHILLIPS said a few words on the "Ornithorhynchus."

C. YOUNG read a paper on "Reptiles."

After explaining the action and principles of Ruhmkorff's

* This theory is due to Sir Charles Lyell.

induction coil, Mr. Cumming expressed dissent from the theories on Aurora, advanced at the last meeting by R. Shawe. He considered Aurora as caused by the passing through rarified air of a spark analogous to that utilized in the secondary coil of the machine. This he illustrated by vacuum tubes.

Attended by 65 members of the College.

Meeting held November 11th.

The following were exhibited :—Plants and Diagrams, by H. S. Skipton ; Semi-petrified Eyes, taken from the heads of dead Indians in a Cemetery in Panama, by W. F. Wells.

The November Meteors were discussed by W. Hind. After refuting some false theories, he proceeded as follows :—

"The generally received theory of the present day, which satisfies all the phenomena which these bodies present, is that they are small masses of cosmical matter circulating about the sun, tiny little planets in fact, coming at times within the earth's atmosphere, and sometimes falling to the earth in the form of those mysterious half-metallic half stony little masses which we call aërolites. But if they be mere lumps of metal, why do they shine out with such brilliancy? Are they always in a burning state or do they only take fire when they come within our atmosphere? The latter is undoubtedly the case. The earth's atmosphere is the cause of their inflammation ; it would seem at first as if this combustion had a chemical origin, and that the meteors were composed of some highly inflammable matter, which is ignited by combination with our atmosphere. But such an idea seems now no longer necessary : we can amply account for it by the mechanical theory of heat, according to which that ignition is a consequence of the immense resistance which these bodies meet with on entering our atmosphere, and the enormous friction and heat produced thereby.

"It seems anomalous that so soft a body as the air should offer such immense resistance to the meteors, but we must remember that the resistance is also proportional to the speed with which they travel, and when we remember that the average velocity of the meteors is 30 miles in one second, a speed beyond human conception, the anomaly vanishes.

"Question begets question when we cross-examine inexhaustible Nature, and we ask the character and composition of these celestial fireworks. By analyzing their light by means of the spectroscope, we find that the burning matter is of a metallic or earthy nature, that in their composition they are closely connected with the common aërolites ; and, a striking fact, no substance foreign to our earth has been fonnd to exist in any aërolites or meteoric bodies. Such a fact points to a unity of composition in some at least of the members of our planetary system, and favours the supposition of a common origin to all that family of bodies of which the sun is the grand centre and chief.

"It is well known that there are certain nights in the year famous for their display of shooting stars ; the most famous being August 10, when, according to the Irish legend, St. Lawrence sheds his fiery tears ; and Nov. 11 and 14. A careful examination of the meteoric lists shews that although some shower has taken place every year, yet there are certain years when the display reaches an extraordinary magnitude and the meteors appear in stupendous numbers. The years recorded are 902, 934, 1002, 1202, 1366, 1533, 1602, 1793, 1832. Now, it will become evident, on examination of this account, that grand November displays take place 3 times a century, or about every 33 years ; and now we come to the question, why is it that these showers occur on certain days in the year, and in such magnitude every 33 years. It is assumed on very good grounds that there are a number of concentric rings of these meteoric bodies circulating about the sun, orbits in fact of which every part is thronged with meteoric particles. The orbits of these bodies are inclined at an angle of 17° to that of the earth, and in its annual course the earth cuts through these rings on certain days in the year. The majority of the rings have their particles distributed pretty evenly throughout their circuit: but the November ring, that is, the ring which we cut every November, is not of such equable density, the particles being thickly clustered in one part and but scantily dispersed in another. The size of this orbit is slightly less than that of the earth, and its time of revolution round the sun is 354 days. We see thus that the point at which we passed through the meteoric shower last year will be 11 days in front of that which we cut this year, and by dividing 354 by 11 we discover that in 33 years more we shall cut the meteoric orbit in the same point at which we do this year.

"Now what will happen when the circle sailing along in its path reaches the node, (that is the point at which its orbit intersects,) and encounters the mass of meteoric dust which travels in an opposite direction? Again, I must trespass on mathematics, but I hope all will understand me. Suppose we connect the circle and the sun by a straight line, at any moment the direction of the circle's movement will be at right angles to that line; therefore, as longitudes are reckoned from right to left, the motion of the circle will be directed to a point 90° of longitude behind the sun. The sun's longitude at noon on Nov. 14, 1866, was 232°, within a few seconds—90° from this gives us 142°.

"As therefore the meteors, as we meet them on our journey, should seem to come from the point of space to which the circle is travelling, we ought to see them coming from a point situated in longitude 142° or thereabouts. Now what was actually seen? One of the most salient points noticed—even by those who did not see the significance of it—was that all the meteors in the late display really did seem to come from one point in the sky. In fact there was a region in which the meteors appeared trainless, and shone out for a moment like stars, because they were directly approaching us. Near this spot they were so numerous and all so foreshortened, and for the most part so faint, that the sky at times put on a kind of phosphorescent appearance. As the eye travelled from this region the trains became longer, those being longest, as a rule, which appeared overhead, or trended westward. Now if the paths of all had been produced backwards, they would have all intersected in one region, and that region the one in which the most foreshortened trains were seen. So decidedly did this fact come out, that there were moments when the meteors belted the earth like the meridians on a globe,—the pole of the globe being a point in the constellation Leo. The apparent radiation from this point is an effect of perspective; hence we gather that the paths of the meteors are nearly parallel, travelling in straight lines from that point. Time will hardly allow me to give any details of the great shower. It will suffice to say, that in five hours 10,000 were counted,—a number small compared with that of 1233, when 34,000 were counted in one hour."

After apologizing for the unscientific nature of his subject, W. F. Wells read the following notes on his exhibition:—

"I will briefly relate the circumstances under which these eyes were found. They came to me from a cousin who was one of the civil engineers engaged in the construction of the railway which at present crosses the Isthmus of Panama. In this work it was necessary to cut through an Indian cemetery, of considerable extent, the soil of which was of a peculiarly dry nature, and most of the bodies brought to the surface were in a state of perfect preservation; in fact they were natural mummies. But after a day's exposure to the air all the flesh, which was perfectly dry, crumbled off the bones in a sort of light dust. You are all, I daresay, aware of the practice of burying gold and silver ornaments with the dead, so common among Indians. Some boys who were hunting for such valuables, found eyes like these in the heads of all the bodies which had been exhumed. Thinking from the colour that they had found gold, they collected as many as possible, and brought a pair to my cousin who purchased them, after assuring himself that there was no trickery. To the '*casual*' observer they are apparently human eyes: but this is in more senses than one, a '*ghastly*' delusion! For it was remarked by some savant that the hole at the back of the eye, into which the retina fits, was wanting. Here then was a difficulty, but inquiry into the traditions of the aborigines, who lived near the cemetery, revealed that the Indians had selected the spot for a burial-ground, because the bodies became embalmed by the natural properties of the soil.

"Finding, however, that the eyes perished, they used to scoop out the eyes of their dead, and substitute those of a large cuttle-fish found in the Pacific Ocean. My imperfect knowledge of the subject will not allow me to theorize, and the nature of the soil in the cemetery is, I believe, unknown, I have therefore only stated what I believe to be a fact."

H. S. Skipton then discussed at some length the "Flowers of Virgil's Georgics," and, in conclusion, A. Pringle said a few words on the pests caused by the excessive increase of certain insects in particular years.

Attendance at this meeting 27.

Meeting held November 18th.

Exhibitions were Corals, by S. Buller; a Working Model, illustrating the hot-water apparatus for heating houses, by W. Ker; a box of rare Indian Shells, by C. Young.

W. Ker explained the principles of convection, tracing its action in the great natural phenomena of the Gulf Stream, and Trade Winds.

A paper was read by S. Buller on "Coral Islands:" which was followed by a description of the physiognomy of vegetation, shewing how particular classes of plants prevail in certain districts and give a distinctive character to the aspect of a country, by H. Reynolds. R. Obbard read a notice from *Nature* "On Singing Swans."

Lastly, Mr. Cumming exhibited a large garland-shaped vacuum tube.

Number present, 53.

Meeting held November 25th.

Exhibitions included Cornish Plants and Insects, together with numerous Photographs, by Mr. Cumming; Breast-bone of Owl and Wing of Widgeon, by F. E. Gantillon; microscopic slides of Diamond Beetle. Some notes were read by R. L. Shubrick on "Epiphytes and Parasites." Communications were made by F. E. Gantillon, through W. F. Wells, on the differences between the flight of Hawks and Owls. Mr. Cumming gave the following account of the Natural History of Cornwall, as observed by him during the vacation :—

"The Natural History, as usual, has its main limits and distinctions, marked by geological boundaries. Thus there are in the county three sorts of districts: the granite, the slate, and the serpentine; and, extending over these, three distinct classes of fauna and flora; while to the mere tourist's eye, they present three equally distinct and striking classes of scenery. The county being in no sense mountainous, hilly in parts, but chiefly flat, the great interest of the scenery rests on the cliffs. No one could help being struck by the different appearances presented by them, according to the rock of which they are built up. The serpentine having been thrust violently up in a state of fusion through the overlying strata, naturally seems to break up into masses very irregular in shape, and of very different density in its different parts. The consequence is that its parts behave differently when exposed to the action of wind and sea. The result is that, by a process of scooping out of the softer materials, caves are hollowed at the base of cliffs as much as 40 or 50 yards inwards. Two curious instances of this are noticeable in the Frying-pan at Cadgwith, and the Lion-den at the Lizard Point.

"In each of these, subterranean passages were hollowed till soft earth was reached; this was rapidly washed away, and an inland landslip of 20—25 yards in diameter, was the result. Thus a pit was made open at one point to the sea by a passage, up which the waves washed every high tide. To the same cause, of unequal density, we must attribute the outlying masses of rock, such as Lion, Gull, and Steeple Rocks, as well as the caves and pillars streaked with red and green, for which Kynance has acquired its fame.

"Leaving the Lizard, and passing as I did about the middle of last July to the Land's End, where granite prevails, the one thing which struck me most was the general regularity in form of the individual masses. All jagged edges and irregular corners had been ground down, so that the masses presented a regular irregularity of rounded forms. This I attributed to the great homogeneity of the granite, which almost naturally formed square or columnar blocks, exposing at every point a surface of the same hardness to the influence of the weather. Anything like an edge would soon become rounded down by wearing on both faces.

"Passing up the north coast, we come to yet another scenic effect, perhaps on the whole the grandest of the three, I mean in the slate district.

"Nowhere have I seen cliffs in grandeur comparable with those near Tintagel, where the rugged and flinty slate decends precipitously into the sea, from cliffs 200 or 300 feet high, so steep that one can often throw a stone from the edge into deep water, while every peak, standing out in profile, can be resolved, often in more than one way, into grotesque imitations of the human face, as a rule remarkable for massive brows and more or less snub noses.

"But to pass on, in reviewing the natural history the first remarkable fact is the peculiarity of the productions of the Lizard district. Here is the only spot in the country where serpentine crops up, and accordingly we find a fauna and flora almost peculiarly its own. We have a repetition of all our old genera, but when we look closer we find them represented by quite distinct species. Buttercups abound (perhaps more commonly than elsewhere,) but we find them to consist exclusively of *R. hirsutus.* Charlock to all appearance abounds, but on examination it proves to be *Sinapis nigra* and *Raphanus maritimus.* neither of them at all common plants elsewhere. The whole district consists, at first sight, of nothing but a barren moorland, covered in profusion with *Erica*, But there it is that *Erica vagans* thrives and abounds almost to the exclusion of every other plant; and most remarkable it is to trace the limits of the serpentine district by the occurrence of this plant, so exactly marked that on the road from Helston to the Lizard one can see the exact spot at which the ordinary vegetation ceases, and *E. vagans* begins : there too you find the boundary line of the serpentine district. In explanation I can only suggest that the plant needs a large amount of magnesia, of which substance serpentine is largely composed. The only other well known rock containing it is magnesian or mountain limestone. On this of course no heath can flourish, as even ordinary hard water, from containing lime, is fatal to all that family; hence also the entire absence of that order, excepting the *arbutus* in gardens, from this district. * Of other heaths *E. cinerea*, *E. tetralix* and *C. vulgaris* occur sparingly and in a stunted form."

Mr. Cumming then gave a list of rare plants, and varieties of common plants, peculiar to the Lizard, as well as of those which he considered peculiar to the south-west corner of England, deducing from their occurrence in Spain and Portugal that a neck of land stretched across the Bay of Biscay, from Cornwall to those countries. These plants are, however, to be found in any manual ; we therefore only insert one passage referring to them :—

"But the best is yet to come :—Just two days before my departure, near St. Knighton's Keve, halfway between Boscastle and Tintagel, I gathered wild specimens of *Adiantum Capilius Veneris* (Maidenhair) and *Trichomanes radicans* (Killarney Bristle Fern.) Never did miser gloat so over his treasure as I did when I scraped out from an obscure crevice in the rock, with my finger nail, a piece of *Trichomanes*, bearing a frond not half-an-inch high, and scarcely to be distinguished by the uninitiated from the lichens, amid which it was growing. I believe that to be the only spot in England where that fern has yet been found.

"And now I must conclude with a word or two about my experience in the Entomology of Cornwall. I had hoped to have shown you, before this, a bred specimen of the Striped Hawk Moth, *(Deilephila livornica,)* which indeed had been a treasure, had fate allowed. A full-fed larva I found at Loo Pool, feeding on dock, which soon retired under earth. About a week after, I had to leave the Lizard, and, in spite of every precaution in packing, the jolting on the journey proved fatal. Besides this, the Entomology of the Lizard has nothing peculiarly striking, though there are many species individually good. Of butterflies, the Silver-studded Blue, *(P. ægon,)* was very plentiful on the heather when we first went; beyond this there was nothing else worth mentioning. I must now content myself with giving a list of the chief moths I captured, adding notes where necessary :—*Trochilium ichneumoniforme*, flying in sunshine along grassy banks on sea coast ; *T. Philanthiforme*, similar to above : I had only heard of it previously from the Isle of Man ; *Lithosia Griseola* and *Complana*, both at Lizard ; *Epione Apicaria*, a good series, occurring at Lizard and at Boscastle ; *Acidalia emutata*, a few at Boscastle ; *Bryophila Glandifera*, one at Lizard ; *Agrotis lunigera*, one at Lizard ; *Hecatera serena*, one at Lizard ; *Plusia Orichalcea :* I had the pleasure of taking a specimen of this rare and beautiful insect, flying at a lamp in the hotel, Boscastle. I have not seen a capture recorded before for many years. Harding, of Deal, used to take it somewhere, but where, he never revealed ; and, suddenly, as rare things will, it vanished. *Ennychia cingulalis*, on dry banks, very common ; *Endotricha flammealis*, at Boscastle ; *Stenia punctalis*, not rare at Lizard ; *Leptogramma literana*, sparingly in oak wood at Boscastle ; *Teras Caudana*, common at Boscastle ; *Dictyopteryx Holmiana*, locally at Lizard and Boscastle ; *Pædisca profundana*, abundant at Boscastle : *Dicrorampha petiverana*, common at Lizard ; *Xanthosetia Zoegana*,

* This statement is slightly inaccurate. *Monotropa Hypopitys* has been observed by us in the beech grove on Cleeve, and there are authenticated specimens of *Calluna vulgaris* in the Museum. Eds.

X. Hamana, X. Badiana, &c., common at the Lizard; *Catoptria Citrana*, one specimen at Lizard; *Argyrolepia Francillana, Pterophorus Phæodactylus*, abundant on Rest-harrow, in the Frying-pan, Cadgwith; *P. Lithodactylus*, not rare, near Boscastle.

"One word, that by way of advice, and I have done. If any of you wish to spend a few weeks of summer, in the calm enjoyment of the pure delights which Nature yields, in a spot where, happily for you, respectability does not yet stalk undisguised, let me commend to you Boscastle. I can express no more pleasant anticipations for years to come, than meeting some of you there, when at the hostelry, yclept the Wellington, we will drink, first to the health of the College, and then to the health of the College Natural History Society!

39 persons were present.

Meeting held December 2nd.

Exhibitions:—*Lasiocampa Quercus, Sphinx Convolvuli, Orgyia antiqua*, by W. F. Wells.

Auditors of the secretary's accounts were elected.

W. F. Wells, after reading two papers from *Science Gossip*, on "Moth 'Sembling" and "The Attractive Power of Female Moths," spoke on his own experiences.

"In the end of June I obtained a larva of the Oak Eggar, and when the moth emerged from the chrysalis it proved to be a female; but, as I was travelling at the time, when the box was opened, the moth was found dead. Three weeks after this, while I was at Weston-super-Mare, I thought I would try my hand at Moth 'Sembling with this female. Oak Eggars were plentiful in the woods; and after placing the box on the ground, in the course of an hour, a friend and myself caught seventeen. Now, I have heard the theory propounded, that Moth 'Sembling will only be successful under two conditions,—(1) that the Moth should be a live virgin female; (2) that it should be just fresh from the chrysalis. I believe this is the generally received opinion. I however attracted male Oak Eggars with a female which had been *dead* more than *three weeks*. In the papers I have just read, several theories were started to account for the attractive power of female moths. In my case those of sight, and the peculiar odour emitted, will not hold good; for the males came flying over the tops of the trees and the female was *dead*. I shall not attempt to solve the problem;—perhaps some who hear this can enlighten me."

Mr. Orchard communicated a long paper on "Geology," with a view to stir up some members to pursue that branch of Science.*

S. Buller read the following paper on "Dew."

"The formation of Dew is one of the most absolutely necessary parts of the economy of Nature. Without it our lands would be parched up in the summer, and cease to give fruit; grass would cease to grow; cattle would die for want of food; and man would die for want of meat and vegetables. In fact, the whole order of Nature would be overthrown, and her laws broken.

"After a long, dry, sunny day, when the earth seems one mass of brick, during the droughts and heats of summer, what could we do? How could anything survive without the refreshing dew of the night? And here we see a beautiful example of the general theory, that Nature is supplied from Nature's

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* Mr. Orchard's paper was too general to be here inserted. Had it treated, as we should have wished, of the Cheltenham district, we should have had great pleasure in printing it. We hope he will favour us with the paper on this subject early next term..—Eds.

losses. The loss of the water in the day, which we see very often ascending like steam from the earth, becomes itself the refresher of the night, the very water being restored which the heat had taken away. In what manner this is accomplished I will endeavour to explain.

"After the sun has shone on the earth during the whole day, it is not difficult to believe that everything is rather warm; that is to say, that rock, meadow, and atmosphere alike are raised to some degree of temperature. Now the atmosphere contains water; indeed, we have just mentioned that the water which rises from the earth rises into the air in the form of steam or vapour. Evidently, also, the hotter the day the more water there is in the air, as the greater the heat of the sun the more water in the ground is converted into vapour, just as the hotter the fire the more steam we obtain from the kettle.

Suppose, then, that the air containing the vapour and the grass on the meadow are all left at the temperature of 60° Fahrenheit by the sun. When the sun sets, everything begins to part with its heat by radiation into empty space. It is easy to prove that a hot body will part with its heat to any surrounding bodies that are colder, until all are of the same temperature. In this way a fire gives out heat to a room. If then the meadows and the rocks on the surface of the earth are 60° Fahrenheit and empty space is—242°, it follows that the first two must radiate out heat. Now different substances have different capabilities for radiating out heat. The metals, as well as stone, &c., are exceedingly bad radiators, while grass and painted wood are exceedingly good radiators: water also is a very good radiator.

Hence it follows that the grass which was 60° Fahrenheit will cool much faster than the rock or stone which was 60° Fahrenheit. Hence in the night-time grass will get much colder than rock or stone. And water is a good radiator; therefore the water in the air (before mentioned) would get cold very quickly; but air is an exceedingly bad radiator, in effect no radiator at all; therefore the water contained in, and surrounded by the air, cannot radiate out heat, so as to grow cool, since the air all round it will keep it warm.

So then the grass, the rock, and the air which were 60° Fahrenheit, will become changed in temperature; the grass to 10° Fahrenheit; the rock to 40° Fahrenheit, and the air almost the same as before.

"Now vapour, including the vapour in the air, consists of particles of water separated, or in other words vaporized, by heat. If then the heat be taken away, the vapour remains vapour no longer, but becomes water. This is called condensation.

"Now the grass acts in this way on the vapour of the air. It collects the aqueous vapour in the form of little drops, by condensing that of the stratum of air just round it. This is Dew: this is the provision made by Nature, for refreshing the world in dry seasons.

"Now, regarding the formation of Dew, we shall find that several points are required for its plentiful deposition.

"I.—A hot day preceding, to fill the air with vapour from the earth, and thus give a plentiful supply of it, from which Dew may be formed. It will be noticed, also, that this is the time when Dew would be most wanted.

"II.—A still and cloudless night. For if the wind blow, the stratum of air around the blade of grass would be changing so often that there would be no time to condense its vapour. And if the cloud obscured the heavens, radiation could not take place towards empty space.

"Here also we must see that a still cloudless night gives least promise of rain; and so Dew is on these nights most needed. Gardeners who wish to prevent their plants growing too cold at night, and hence being killed, can protect them either by clouds of smoke or thin gauze, or anything else which prevents radiation of heat; and thus the advances of science help onward the humbler pursuit of gardening.

"It is easy to shew that Dew is not an exhalation from the earth, for if a little roof be placed over any part of the grass, that part remains nearly dry, whereas if Dew was an exhalation from the earth this would be the best means of securing a plentiful supply. That it is not a fine rain is proved by the fact that it is least copious on cloudy nights.

"Thus in the formation of Dew, of which we have the greatest amount when there is the greatest necessity for it, and in countries which are the most parched, we see an excellent example of that order which rules the world, the laws of which science does not invent but only can discover and admire."

Mr. CUMMING explained the principles of the Magneto-Electric Machine, and administered a heavy shock to the members present.

Number present 45.

STATISTICS.

Number of scientific meetings ...	12
Number of field-days	4
Greatest attendance during spring term	32
Least	17
Average	22·2
Greatest attendance, autumn term	65
Least	27
Average	44
Average attendance for whole year	33·1

The following Periodicals, &c., have been taken in :—

Nature
Science Gossip
Naturalists' Note Book*
Geological Magazine*
Journal of Botany*
The Entomologist*
Wild Flowers*
Cassell's Book of Birds*
Entomologist's Annual
John's Flowers of the Field

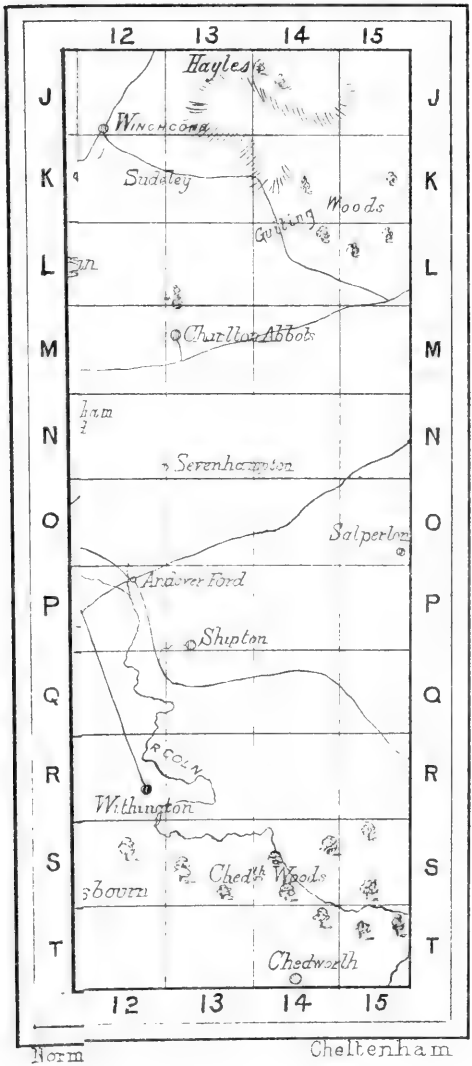
SECTIONS.

DISTRICTS.

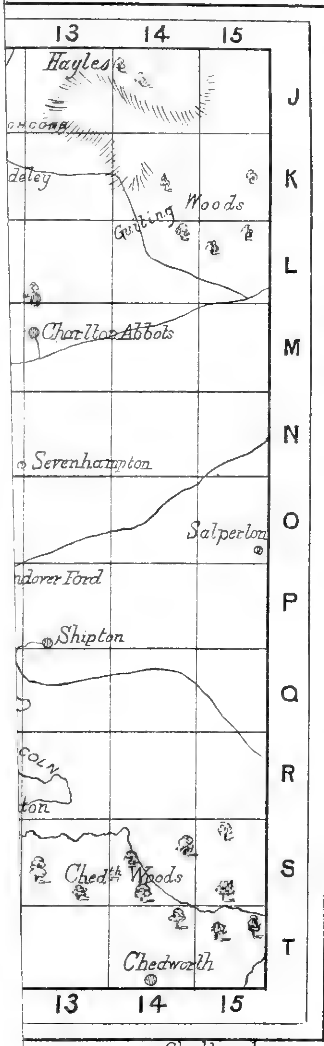
The map by which our districts are determined is "The Reduced Ordnance Map" No. 44, which contains 594 square miles. The map has been divided by us into square miles by parallel lines drawn from north to south, and east to west. Each of the squares is a district. Each of the spaces measured along the top (or bottom) of the map is given a number, while to each measured along the sides is attached a letter. Any district then is named by referring it to these letters and numbers. By this arrangement Cheltenham lies in N 7, the left hand top corner being A 1. For convenience of reference, a small print † of a portion of the map (scale : half inch to the mile) is inserted opposite, giving the principal roads, villages, and woods, together with the range of the Cotswolds. It may be remarked that all to the south and east of the hills marked in the map is hilly country, while that to the north and west is flat.

All marked * were discontinued at Midsummer.
† This was drawn by S. Buller.

MARS ADOPTED BY C.C.N.H.S.

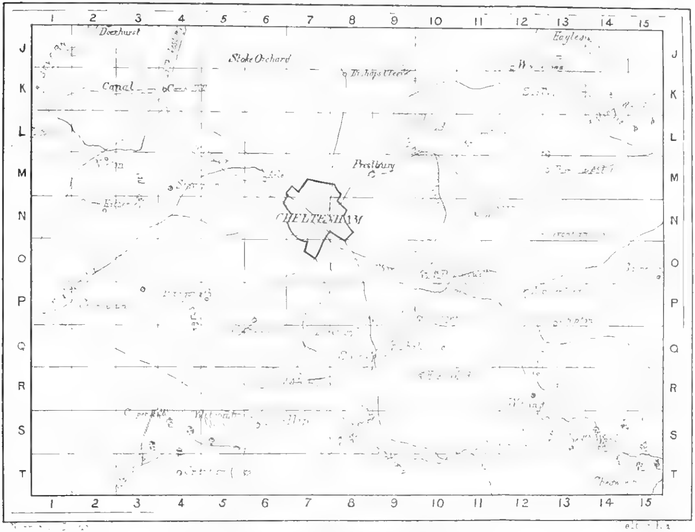


OOPTED BY C.C.N.H.S.



Cheltenham.

MAP OF THE NEIGHBOURHOOD OF CHELTENHAM SHEWING DIVISIONS ADOPTED BY C.C.N.H.S.



Scale of Miles

ORNITHOLOGICAL NOTICES.

The workers in this branch regret that they cannot offer a more complete record of the local Zoology. They hope, however, next year, to give a report showing more diligence in their section. The small number of this year's notices of migratory birds and entries of eggs taken is owing to remissness in recording rather than in observation.

MIGRATORY BIRDS.

Name	Date	District	Finder	Name	Date	District	Finder
Wryneck	April 5		J.G.D.	Cuckoo	Apr. 12	S. 6	R.L.S.
Swallow	April 7	O. 10	W.F.W.	Land Rail	May 5		F.E.G.
Nightingale	Apr. 10	N. 6	F.E.G.	Swift	May 10		F.E.G.

EGGS TAKEN.

Name	Date	Finder	Name	Date	Finder
Rook	Mar. 26	F.E.G.	Wood Wren	May 14	F.E.G.
Cole Tit	May 1	A.L.	Cirl Bunting	May 17	J.G.D.
Sparrow Hawk	May 10	F.E.G.	Red Backed Shrike	May 25	W.S.
Kestrel	May 10	F.E.G.	Great Titmouse	May 26	W.S.

GEOLOGICAL NOTICES.

There can be no better proof of the Society's deficiency in this department, than to transcribe the only entries in the Album—*Gryphæa incurva*, *Astrea Marshii*, and *Turritella terebra*. As the working of this section requires most encouragement, a prize will be given under the following conditions for the best collection of local fossils.

(1.) That every fossil be found in the neighbourhood by the collector himself.
(2.) That to every specimen be affixed its name and locality.

ENTOMOLOGICAL NOTICES.

It has been the object of the Entomological Committee, in drawing up these notices, to give a tolerably complete list of the Cheltenham *Lepidoptera*, appending to every insect of any rarity the number of the district in which it was captured, with the initials of the member by whom it was recorded. The *Tineina*, *Tortrices*, &c,. have been so poorly worked, owing to the comparative inexperience of our Entomologists, that the Committee have determined to exclude them from this year's catalogue. But, notwithstanding their omission, the list is such that the Society have great reason to congratulate themselves on the capital field open to their observation; for though it cannot be expected to record every year such captures as *V. Antiopa*, *X. conspicillaris*, and *C. Celerio*, yet the yearly occurrence of many rare insects is well authenticated. For not only has every season been marked by

the appearance, in large numbers, of *T. W-album*, *N. Lucina*, and *P. Geryon*, but at least 600 specimens of *P. Arion* have been taken by members of the College alone, since its accidental discovery in 1868 by W. F. Wells.

In the accompanying list Doubleday's arrangement has been followed.

DIURNI.

Genus	Species	District	Finder
Pieris	Brassicæ		
	Rapæ		
	Napi		
Anthocaris	Cardamines		
Gonepteryx	Rhamni		
Colias	Edusa	T 4	K. R.
Argynnis	Paphia		
	Adippe		
	Aglaja		
	Euphrosyne		
Melitea	Artemis	P 7	K. R.
Vanessa	C. album	S 4	W. W
	Urticæ		
	Polychloros	N8	W. W
	Antiopa	N7	K. R.
	Io		
	Atalanta		
	Cardui		
Arge	Galathea		
Satyrus	Egeria		
	Megæra		
Satyrus	Semele		
	Janira		
	Tithonus		
	Hyperanthus		
Chortobius	Pamphilus		
Thecla	Rubi		
	Quercus	P 7	K. R.
	W. album	S 4	J. D.
Polyommatus	Phlæas		
Lycæna	Agestis		
	Alexis		
	Corydon		
	Alsus	P 7	J. D.
	Argiolus		
	Arion	T 4	W. W
Nemeobius	Lucina	P 7	K. R.
Syricthus	Alveolus		
Thanaos	Tages		
Hesperia	Sylvanus		
	Linea		

NOCTURNI.

Genus	Species	District	Finder
Smerinthus	Ocellatus		
	Populi		
	Tiliæ		
Acherontia	Atropos	N7	W. W
Sphinx	Convolvuli	N7	W. W
	Ligustri		
Chærocampa	Celerio	N7	K. C.
	Elpenor	P 7	W. W
	Porcellus	O 6	K. R.
Macroglossa	Stellatarum		
	Fusiformis	P 7	K. R.
	Bombyliformis	P 7	K. R.
Sesia	Myopæformis		
	Tipuliformis		
Zeuzera	Œsculi	N7	W. W
Cossus	Ligniperda		
Hepialus	Hectus		
	Lupulinus		
	Sylvinus		
Hepialus	Velleda		
	Humuli		
Procris	Statices		
	Geryon	R6	R. O.
Zygæna	Trifolii		
	Loniceræ	S 4	K. R.
	Filipendulæ		
Nola	Cucullatella		
Nudaria	Mundana		
Lithosa	Complanula		
	Griseola		
Euchelia	Jacobae		
Chelonia	Plantaginis		
	Caja		
Arctia	Fuliginosa	P 7	K. R.
	Mendica		
	Lubricipeda		
	Menthastri		
Liparis	Chrysorrhœa		

Genus	Species	District	Finder
Liparis	Auriflua		
	Salicis		
Orgyia	Pudibunda		
	Antiqua		
Demas	Coryli		
Eriogaster	Lanestris		

Genus	Species	District	Finder
Bombyx	Neustria		
	Rubi		
	Quercus		
Odonestis	Potatoria		
Lasiocampa	Quercifolia		

GEOMETRAE.

Genus	Species	District	Finder
Uropteryx	Sambucata		
Rumia	Cratægata		
Angerona	Prunaria	S 4	K.R.
Metrocampa	Margaritata		
Eurymene	Dolabraria	O 10	J.D.
Selenia	Illunaria		
Odontopera	Bidentata		
Crocallis	Elinguaria		
Ennomos	Tiliaria	O6	K.R.
	Fuscantaria	N7	K.C.
	Erosaria		
	Angularia		
Himera	Pennaria		
Phigalia	Pilosaria		
Biston	Hirtaria	N7	K.R.
Amphidasis	Prodromaria		
	Betularia		
Hemerophila	Abruptaria	N7	K.C.
Boarmia	Repandata		
	Rhomboidaria		
	Perfumaria		
Gnophos	Obscurata	P 7	K.R.
Pseudoterpna	Cytisaria	P 7	J.D.
Geometra	Papilionaria	O 6	K.R.
Iodis	Vernaria		
	Lactearia		
Phorodesma	Bajularia	N 7	J.D.
Hemithea	Thymiaria		
Ephyra	Porata	O 5	K.R.
	Punctaria	P 4	K.R.
	Trilinearia		
	Omicronaria		
Asthena	Luteata		
	Candidata		
	Blomeraria	P 7	J.D.
Eupisteria	Heparata	T 4	K.R.
Acidalia	Scutulata		
	Bisetata		
	Trigeminata		
	Incanaria		
	Ornata		
	Immutata		
	Remutata		
	Imitaria		
	Aversata		
	Degeneraria	P 7	K.R.
	Emarginata		
Timandria	Amataria		

Genus	Species	District	Finder
Cabera	Pusaria		
	Exanthemaria		
Corycia	Temerata		
Macaria	Liturata	P 7	K.R.
Halia	Wavaria		
Strenia	Clathrata		
Panagra	Petraria	T 4	K.R.
Numeraria	Pulveraria		
Fidonaria	Atomaria		
	Piniaria	P 7	W.W
Minoa	Euphorbiata	S 4	K.R.
Abraxas	Grossulariata		
	Ulmata		
Ligdia	Adustata		
Lomaspilis	Marginata		
Hybernia	Rupicapraria	N7	K.R.
	Leucophæaria		
	Defoliaria	N7	J.D.
	Progemmaria		
Cheimatobia	Brumata		
Oporabia	Dilutata		
Larentia	Didymata		
	Olivata	P 7	K.R.
	Pectinitaria		
Emmelesia	Albulata		
	Decolorata	P 7	J.D.
Eupithecia	Venosata	P 7	K.R.
	Centaureata	N7	K.R.
	Subfulvata		
	Subumbrata	P 7	K.R.
	Isogrammata	P 5	K.R.
	Satyrata		
	Castigata	S 4	K.R.
	Lariciata		
	Subnotata		
	Campanulata	S 4	K.R.
	Vulgata		
	Exiguata		
	Coronata	T 4	K.R.
	Rectangulata		
Thera	Variata		
Ypsipetes	Impluviata	T 4	L.C.
	Elutata		
Melanthia	Rubiginata	O 5	K.R.
	Ocellata		
	Albicillata	P 7	R.O.
Melanippe	Procellata		
	Substristata		

Genus	Species	District	Finder
Melanippe	Montanata		
	Galiata	P 7	K. R.
	Fluctuata		
Anticlea	Rubidata	O 9	L. C.
	Badiata	O 9	L. C.
	Derivata		
Coremia	Propugnata	O. 10	L. C.
	Ferrugata		
	Unidentaria		
Camptogramma	Bilineata		
Phibalapteryx	Tersata	P 7	K. R.
	Vitalbata		
	Dubitata	N 7	J. D.
	Vetulata	O 7	K. R.
	Certata		
Cidaria	Miata	N 7	J. D.
Cidaria	Corylata		
	Russata		
	Immanata		
	Suffumata	P 7	K. R.
	Silaceata		
	Prunata		
	Testata	O 7	K. R.
	Fulvata		
	Pyraliata		
	Dotata		
Eubolia	Cervinaria		
	Mensuraria		
	Palumbaria		
	Bipunctaria		
Anaitis	Plagiata		
Tanagra	Chœrophyllata	P 7	W. W

DREPANULÆ.

Genus	Species	District	Finder
Platypteryx	Unguiculata		
Cilix	Spinula		

PSEUDO-BOMBYCES.

Genus	Species	District	Finder
Dicranura	Bifida	J. D.	N7
	Vinula		
Petasia	Cassinea		
Pygœra	Bucephala		
Ptilodontis	Palpina		
Notodonta	Camelina		
	Dictæa	N7	K. R.
Dilobia	Cæruleocephala		

NOCTUÆ.

Genus	Species	District	Finder
Thyatira	Derasa		
	Batis	P 10	L. C.
Cymatophora	Ocularis	N 7	K. C.
Bryophila	Perla		
Acronycta	Tridens	N 7	J. D.
	Psi		
	Leporina	N 7	K. R
	Megacephala		
	Ligustri		
	Rumicis		
Leucania	Conigera	P 7	K. R.
	Lithargyria		
	Comma	O 5	K. R.
	Impura		
	Pallens		
Gortyna	Flavago		
Hydræcia	Micacea		
Xylophasia	Rurea	P 7	K. R.
	Lithoxylea		
	Polyodon		
Xylomyges	Conspicillaris	O6	K. R.
Neuria	Saponariæ	T 4	K. C.
Heliophobus	Popularis		
Charæas	Graminis	N 7	K. R.
Cerigo	Cytherea		
Luperina	Testacea		
Mamestra	Furva		
	Brassicæ		
Apamea	Basilinea		
	Unanimis	N7	W. W
	Oculea		
Miana	Strigilis		
	Literosa		
	Arcuosa	O5	K. R.
Grammesia	Trilinea		
Caradrina	Morpheus	N7	K. R.
	Blanda		
	Cubicularis		
Agrotis	Suffusa		
	Saucia	P7	J. D.
	Segetum		
	Exclamationis		
	Corticea		
	Nigricans		
Triphæna	Janthina		
	Fimbria	N7	K. R.
	Interjecta	S 4	K. R.
	Subsequa	S 4	J. D.
	Orbona		
	Pronuba		
Noctua	C. nigrum		
	Triangulum		
	Brunnea	O10	J. D.
	Festiva		
	Dahlii	O 10	K. R.
	Xanthographa.		

Genus	Species	District	Finder
Tæniocampa	Gothica		
	Instabilis		
	Stabilis		
	Gracilis	N7	K. R.
	Cruda		
Orthosia	Lota		
	Macilenta	P7	J. D.
Anchocelis	Pistacina		
	Lunosa		
Cerastis	Spadicea		
Scopelosoma	Satellita		
Xanthia	Citrago	N7	K. R.
	Ferruginea		
Cosmia	Trapezina		
	Diffinis		
	Affinis	N7	K. R.
Dianthœcia	Carpophaga		
	Cucubali		
	Conspersa		
Hecatera	Serena		
Polia	Flavocincta		
Epunda	Lutulenta		
Miselia	Oxyacanthæ		
Agriopis	Aprilina		
Phlogophora	Meticulosa		
Aplecta	Advena	N7	K. R.
Hadena	Protea		

Genus	Species	District	Finder
Hadena	Dentina		
	Oleracea		
	Pisi	N7	K. R.
	Thalassina	P7	K. R.
	Genistæ		
Calocampa	Exoleta	O5	K. R.
Xylina	Rhizolitha	N7	K. C.
	Semibrunnea	N7	J. D.
Cucullia	Verbasci		
	Umbraticæ		
Heliodes	Arbuti		
Abrostola	Urticæ		
	Triplasia	N7	W. W
Plusia	Chrysitis		
	V. aureun	P7	K. C.
	Gamma		
Gonoptera	Libatrix		
Amphipyra	Pyramidea	P7	K. R.
	Tragopogonis		
Mania	Typica		
	Maura		
Toxocampa	Pastinum	P7	J. D.
Catocala	Nupta		
Euclidia	Mi		
	Glyphica		
Phytometra	Ænea		

DELTOIDES.

Hypena	Proboscidalis		
Herminia	Barbalis		
Herminia	Grisealis	O5	K. R.

PYRALIDES.

Pyralis	Farinalis	N7	K. C.
Aglossa	Pinguinalis	N7	K. C.
	Cuprealis	N7	K. R.
Pyrausta	Purpuralis	O7	K. R.
	Ostrinalis		
Herbula	Cespitalis		
Ennychia	Anguinalis		
Botys	Lupulinalis		
	Pandalis		
	Flavalis		
Botys	Hyalinalis	T4	K. R.
	Verticalis		
	Urticalis		
Ebulea	Sambucalis		
Pionea	Forficalis		
Scopula	Olivalis		
	Prunalis		
Stenopteryx	Hybridalis		
Scoparia	Ambigualis		

Date of Appearance of Early Insects.

April 2	G. Rhamni
" 3	P. Brassicæ
" 6	V. Urticæ
" 1	P. Rapæ
" 16	V. Comma
	P. Argiolus
	V. Io
April 19	V. Polychloros
	S. Ægeria
	A. Cardamines
April 28	T. Rubi
May 18	T. Tages
	T. Alveolus
	A. Euphrosyne
	P. Alexis
	P. Agestis
	P. Napi
	E. Mi
	E. Glyphica
May 28	M. Artemis
	N. Lucina

BOTANICAL NOTICES.

As accuracy is in the opinion of the Botanical Committee an essential requisite in all local Floras, they have allowed the insertion of no plants except such as have been found and recorded by members themselves; nor have they admitted even the commonest species until fully convinced of their existence in the district. As a further guarantee, in all cases where doubt can possibly arise, they have affixed the initials of the observers, not to create rivalry by shewing their respective merits, but simply that in case of error the responsibility may attach to some one individual member. Completeness the Committee have found it impossible to obtain, for besides the fact that some plants must have been passed over owing to the want of observers during the summer vacation, they found that Water Plants in general, and the orders *Juncaceæ*, *Cyperaceæ*, and *Gramineæ* had been so neglected as not to be worthy of insertion at all. Otherwise the Committee are well pleased with the result of the first year's work, and would only recommend the Society to devote their energies during the next season especially to those parts of the flowering plants that have been omitted in this year's catalogue.

Localities have, for brevity, been given according to the Society's map; for though it might appear that such descriptions are not sufficiently particular, yet after mature deliberation they have been adopted on the ground that the knowledge of exact localities is of little use to those who do not dwell in the district, and that it is much easier for inhabitants of Cheltenham to find rare plants mentioned in our list by direct application to any of the members who will always be glad to give all information in their power.

In addition to the general list, which is drawn up in a manner similar to that known as the London Catalogue, the Committee have thought it advisable to transcribe from the Album a list of all the early plants, in their order of flowering until the opening of the Hawthorn, so as to have some record by which to compare the progress of vegetation in future years.

NAT. ORD. RANUNCULACEÆ.

Genus	Species	District	Finder
Clematis	Vitalba		
Anemone	nemorosa		
Ranunculus	peltatus	O9	W.W
	heterophyllus	K4	R.O.
	circinatus	K4	L.C.
	Drouettii	P6	L.C.
	fluitans	Q13	R.O.
	tripartitus	N9	R.S.
	Ficaria		
	Flammula		
Ranunculus	auricomus		
	acris		
	repens		
	sceleratus		
	parviflorus	P5	L.C.
	arvensis		
Caltha	palustris		
Helleborus	viridis	Q12	R.S.
Aquilegia	*vulgaris*	S15	C.N.

NAT. ORD. 1,* BERBERIDACEÆ.

Berberis	vulgaris	Q6	H.R.

NAT. ORD. 2, NYMPHÆACEÆ.

Genus	Species	District	Finder
Nuphar	lutea		

NAT. ORD. 3, PAPAVERACEÆ.

Genus	Species	District	Finder
Papaver	Argemone		
	dubium		
Papaver	Rhæas		
Chelidonium	majus		

NAT. ORD. 3*, FUMARIACEÆ.

Genus	Species	District	Finder
Fumaria	officinalis		

NAT. ORD. 4, CRUCIFERÆ.

Genus	Species	District	Finder
Thlaspi	arvense		
Capsella	Bursa-pastoris		
Lepidium	campestre		
	Smithii	N7	R.S.
Draba	verna		
Cardamine	pratensis		
	sylvatica	L5	R.S.
	hirsuta		
	impatiens	L5	R.S.
Arabis	hirsuta		
Barbarea	vulgaris		
Nasturtium	officinale		
	sylvestre		
Sisymbrium	officinale		
Erysimum	cheiranthoides	P7	L.C.
	Alliaria		
Hesperis	matronalis	K15	W.W
Brassica	Campestris		
	Napus		
Sinapis	arvensis		
	alba		
	nigra	P4	L.C.
	muralis	N7	R.O.
	b. Babingtonii	N7	R.O.
Raphanus	Raphanistrum		

NAT. ORD. 5, RESEDACEÆ.

Genus	Species	District	Finder
Reseda	Luteola		
Reseda	lutea		

NAT. ORD. 6, CISTACEÆ.

Genus	Species	District	Finder
Helianthemum	vulgare		

NAT. ORD. 7, VIOLACEÆ.

Genus	Species	District	Finder
Viola	odorata		
	hirta		
	canina		
Viola	sylvatica		
	tricolor		
	arvensis		

NAT. ORD. 9, POLYGALACEÆ.

Genus	Species	District	Finder
Polygala	vulgaris		

NAT. ORD. 12, CARYOPHYLLACEÆ.

Genus	Species	District	Finder
Silene	inflata		
Lychnis	Flos-cuculi		
	diurna		
	vespertina		
	Githago		
Sagina	apetala		
	procumbens		
Spergula	arvensis	N7	H.R.
Arenaria	serpyllifolia		
	tenuifolia	N7	W.W
Arenaria	trinervis		
Stellaria	media		
	Holostea		
	graminea		
	uliginosa		
Cerastium	aquaticum	M8	R.O.
	glomeratum		
	triviale		
	arvense	R6	H.R.

NAT. ORD. 13, LINACEÆ.

Genus	Species	District	Finder
Linum	catharticum		

NAT. ORD. 14, MALVACEÆ.

Genus	Species	District	Finder
Malva	moschata		
	sylvestris		
Malva	rotundifolia		

NAT. ORD. 16, HYPERICACEÆ.

Genus	Species	District	Finder
Hypericum	perforatum		
	quadrangulum		
	dubium		
	humifusum	OS	R.S.
Hypericum	pulchrum		
	hirsutum		
	Calycinum	S 8	W.W

NAT. ORD. 17, ACERACEÆ.

Genus	Species	District	Finder
Acer	Campestre		
Acer	Pseudo-platanus		

NAT. ORD. 18, GERANIACEÆ.

Genus	Species	District	Finder
Geranium	pratense		
	pyrenaicum	P 7	L.C.
	molle		
Geranium	dissectum		
	columbinum		
	Robertianum		

NAT. ORD. 19, OXALIDACEÆ.

Genus	Species	District	Finder
Oxalis	acetosella		

NAT. ORD. 21, CELASTRACEÆ.

Genus	Species	District	Finder
Euonymus	Europæus		

NAT. ORD. 22, RHAMNACEÆ.

Genus	Species	District	Finder
Rhamnus	Frangula	H7	H.R.

NAT. ORD. 23, LEGUMINIFERÆ.

Genus	Species	District	Finder
Sarothamnus	scoparius	M9	W.W
Ulex	europæus		
Genista	tinctoria		
Ononis	arvensis		
Anthyllis	vulneraria		
Medicago	*sativa*	N6	H.R.
	lupulina		
Melilotus	officinalis		
Trifolium	repens		
	b. incarnatum	G9	R.O.
	pratense		
	fragiferum	N6	H.R.
	procumbens		
	minus		
Lotus	corniculatus		
Lotus	major		
Astragalus	hypoglottis	P10	H.R.
Hippocrepis	comosa	P10	H.R.
Onobrychis	sativa		
Vicia	sylvatica		
	cracca		
	sativa		
	sepium		
	hirsuta		
	tetrasperma	N8	R.O.
Lathyrus	Aphaca	N8	R.O.
	pratensis		
	sylvestris	K12	W.W
Orobus	tuberosus	P 10	A.A.

NAT. ORD. 24, ROSACEÆ.

Genus	Species	District	Finder
Prunus	communis		
	Avium	O 9	C.N.
Spiræa	Ulmaria		
Geum	urbanum		
Potentilla	anserina		
	reptans		
	Tormentilla		
Potentilla	Fragariastrum		
Rubus	Idæus	L11	R.O
	cæsius		
	fruticosus		
Rosa	spinosissima	C 8	R.S.
	tomentosa	Q 7	L.C.
	canina		

Genus	Species	District Finder
Rosa	arvensis	
Agrimonia	Eupatoria	
Poterium	Sanguisorba	
Alchemilla	vulgaris	
	arvensis	
Cratægus	oxyacantha	
Pyrus	communis	
	malus	
	Aria	M. 11 R.O.

NAT. ORD. 25, ONAGRACEÆ.

Epilobium	angustifolium	
	hirsutum	
	parviflorum	
Epilobium	montanum	
	tetragonum	
Circæa	lutetiana	

NAT. ORD. 26, HALORAGIACEÆ.

Callitriche	verna	

NAT. ORD. 27, LYTHRACEÆ.

Lythrum	Salicaria	

NAT. ORD. 29, CUCURBITACEÆ.

Bryonia	dioica	

NAT. ORD. 33, GROSSULARIACEÆ.

Ribes	*rubrum*	
Ribes	*Grossularia*	

NAT. ORD. 34, CRASSULACEÆ.

Sedum	acre	
Sedum	*reflexum*	Q7...H. R.

NAT. ORD. 35, SAXIFRAGACEÆ.

Saxifraga	tridactylites	L. 10 W.D.
Chrysosplenium	oppositifolium	
Chrysosplenium	alternatifolium	

NAT. ORD. 36, ARALIACEÆ.

Adoxa	moschatellina	
Hedera	Helix	

NAT. ORD. 37, CORNACEÆ.

Cornus	sanguinea	

NAT. ORD. 38, UMBELLIFERÆ.

Sanicula	Europœa	
Conium	maculatum	
Apium	graveolens	O8...L.C.
Helioscladium	nodiflorum	
Sison	amomum	
Ægopodium	Podagraria	M. 9 R.O.
Bupleurum	rotundifolium	N. 10 R.O.
Bunium	flexuosum	
Pimpinella	saxifraga	
Œnanthe	fistulosa	
	crocata	
Æthusa	cynapium	
Silaus	pratensis	
Angelica	sylvestris	
Pastinaca	*sativa*	N7...W.W
Heracleum	Sphondylium	
Daucus	carota	
Caucalis	daucoides	M. 11 R.O.
Torilis	Anthriscus	
	nodosa	
Scandix	Pecten-veneris	
Anthriscus	vulgaris	
	sylvestris	
Chærophyllum	temulum	

NAT. ORD. 39, LORANTHACEÆ.

Viscum	album	

NAT. ORD. 40, CAPRIFOLIACEÆ.

Genus	Species	District Finder
Sambucus	nigra	
Viburnum	opulus	
Viburnum	Lantana	Q. 12 R.S.
Lonicera	Periclymenum	

NAT. ORD. 41, RUBIACEÆ.

Genus	Species	District Finder
Galium	verum	
	cruciatum	
	palustre	
	saxatile	
	Mollugo	
Galium	aparine	
Sherardia	arvensis	
Asperula	odorata	
	cynanchica	

NAT. ORD. 42, VALERIANACEÆ.

Genus	Species	District Finder
Valeriana	dioica	
	officinalis	
Valerianella	olitoria	
	dentata	

NAT. ORD. 43. DIPSACEÆ.

Genus	Species	District Finder
Dipsacus	sylvestris	
	pilosus	S 6...L.C
Scabiosa	succisa	
Scabiosa	columbaria	P9...R.O.
Knautia	arvensis	

NAT. ORD. 44, COMPOSITÆ.

Genus	Species	District Finder
Tragopogon	pratensis	
	porrifolius	T 5...R.O.
Helimintha	echoides	
Leontodon	hispidus	
	autumnalis	
Hypochæris	radicata	
Lactuca	muralis	
Sonchus	arvensis	
	asper	
	oleraceus	
Crepis	virens	
Hieracium	Pilosella	
	sylvaticum	
Taraxacum	officinale	
Lapsana	communis	
Cichorium	Intybus	N7...W.W
Arctium	Lappa	
Carduus	nutans	
	lanceolatus	
	palustris	
	arvensis	
Carlina	vulgaris	
Centaurea	nigra	
Centaurea	scabiosa	
Eupatorium	cannabinum	
Artemisia	absinthium	O8...R.O.
	vulgaris	N8...R.O.
Filago	Germanica	
Petasites	vulgaris	O 10.F.G.
Tussilago	Farfara	
Erigeron	acris	L 10.W.W
Solidago	virgaurea	P 7...H. R.
Senecio	vulgaris	
	Jacobæa	
Inula	dysenterica	
Bellis	perennis	
Chrysanthemum	segetum	
	Leucanthemum	
	Parthenium	S 5...R.S.
	Tanacetum	
	Chamomilla	
Anthemis	arvensis	P10 .L.C.
	cotula	P7 . .L.C.
Achillea	Ptarmica	S 5...W.W
	millefolium	

NAT. ORD. 45, CAMPANULACEÆ.

Genus	Species	District Finder
Campanula	rotundifolia	
	Trachelium	
Campanula	glomerata	
	hybrida	S 10.R.O.

NAT. ORD. 46, ERICACEÆ.

Genus	Species	District Finder
Monotropa	Hypopitys	M10 R.O.

NAT. ORD. 47, ILICACEÆ.

Genus	Species	District Finder
Ilex	Aquifolium	

NAT. ORD. 48, JASMINACEÆ.

Genus	Species	District	Finder	Genus	Species	District	Finder
Ligustrum	vulgare			Fraxinus	excelsior		

NAT. ORD. 49, APOCYNACEÆ.

Vinca	minor			Vinca	*major*		

NAT. ORD. 50, GENTIANACEÆ.

Gentiana	amarella			Chlora	perfoliata		
Erythræa	centaurium						

NAT. ORD. 51, CONVOLVULACEÆ.

Convolvulus	arvensis			Convolvulus	sepium		

NAT. ORD. 52, SOLANACEÆ.

Hyoscyamus	niger	T 5	L. C.	Solanum	Dulcamara		
Solanum	nigrum			Atropa	Belladonna		

NAT. ORD. 53, SCROPHULARIACEÆ.

Verbascum	Thapsus			Euphrasia	officinalis		
	nigrum	R 12.	R.O.	Rhinanthus	Crista-galli		
Veronica	arvensis			Melampyrum	pratense		
	serpyllifolia			Pedicularis	sylvatica		
	Beccabunga			Scrophularia	nodosa		
	officinalis				aquatica		
	montana				Ehrhartii	S 6	L. C.
	Chamædrys			Linaria	Cymbalaria		
	hederifolia				spuria	P 7	H. R.
	agrestis				elatine	O 6	R. S.
	polita				vulgare		
	Buxbaumii	N 7	W. W		minor		
Bartsia	Odontites						

NAT. ORD. 54, OROBANCHACEÆ.

Orobanche	major	S 5	R. S.	Lathraea	Squamaria		

NAT. ORD. 54,* VERBENACEÆ.

Verbena	officinalis		

NAT. ORD. 55, LAMIACEÆ.

Salvia	Verbenaca	P 7	W. W	Lamium	Galeobdolon		
Lycopus	europæus				album		
Mentha	aquatica				amplexicaule		
	arvensis				purpureum		
	sativa			Galeopsis	Ladanum		
Thymus	Serpyllum				Tetrahit		
	Chamædrys			Stachys	Betonica		
Origanum	vulgare				sylvatica		
Calamintha	acinos				arvensis		
	Clinopodium			Nepeta	Glechoma		
Teucrium	Scorodonia			Marrubium	vulgare	P 7	W. W
Ajuga	reptans			Prunella	vulgaris		
Ballota	nigra			Scutellaria	galericulata		

NAT. ORD. 56, BORAGINACEÆ.

Genus	Species	District	Finder
Myosotis	palustris		
	sylvatica	K12	W. S.
	arvensis		
Lithospermum	officinale		
	arvense		
Symphytum	officinale		
Borago	officinalis	N7	H. R.
Lycopsis	arvensis		
Cynoglossum	officinale		
Echium	vulgare		

NAT. ORD. 58, PRIMULACEÆ.

Genus	Species	District	Finder
Primula	vulgaris		
	b. caulescens	S13	C.N.
	veris		
Lysimachia	nummularia		
	nemorum		
Anagallis	arvensis		

NAT. ORD. 60, PLANTAGINACEÆ.

Genus	Species	District	Finder
Plantago	major		
	media		
Plantago	lanceolata		

NAT. ORD. 62, CHENOPODIACEÆ.

Genus	Species	District	Finder
Chenopodium	album		
Chenopodium	Bonus Henricus	R8	W. W

NAT. ORD. 63, POLYGONACEÆ.

Genus	Species	District	Finder
Polygonum	persicaria		
	aviculare		
	convolvulus		
	Fagopyrum		
Rumex	crispus		
	acetosa		
	acetosella		

NAT. ORD. 65, THYMELÆACEÆ.

Genus	Species	District	Finder
Daphne	Laureola	Q11	H M D

NAT. ORD. 69, EUPHORBIACEÆ.

Genus	Species	District	Finder
Euphorbia	Helioscopia		
	exigua		
	peplus		
Euphorbia	amygdaloides		
Mercurialis	perennis		

NAT. ORD. 70, URTICACEÆ.

Genus	Species	District	Finder
Urtica	urens		
	dioica		
Parietaria	officinalis	G4	R o
Humulus	Lupulus		

NAT. ORD. 71, AMENTIFERÆ.

Genus	Species	District	Finder
Quercus	Robur		
Fagus	sylvatica		
Corylus	Avellana		

NAT. ORD. 72, CONIFERÆ.

Genus	Species	District	Finder
Juniperus	communis		

NAT. ORD. 73, ORCHIDACEÆ.

Genus	Species	District	Finder
Neottia	Nidus-avis		
Listera	ovata		
Epipactis	latifolia		
Cephalanthera	grandiflora	M10	W. W
Orchis	Morio		
	mascula		
	ustulata	Q9	H. R.
Orchis	pyramidalis		
	latifolia	N11	L.C.
	maculata		
	conopsea		
Habenaria	clorantha		
Ophrys	apifera	P7	H. R.
	muscifera	P10	R. S.

NAT. ORD. 74, IRIDACEÆ.

Genus	Species	District	Finder	Genus	Species	District	Finder
Iris..............	Pseudacorus ...						

NAT. ORD. 75, AMARYLLIDACEÆ.

Narcissus	biflorus	N6...	R. S.	Narcissus	b. plenis floribus	H3	W. W
	Pseudo-narcissus	C2...	L. C.				

NAT. ORD. 76, LILIACEÆ.

Tulipa	sylvestris	M6	W. W	Convallaria ...	majalis		
Allium	ursinum			Polygonatum ..	officinale		
Hyacinthus ...	non-scriptus ...						

NAT. ORD. 77, TRILLIACEÆ.

Paris ....quadrifolia ...

NAT. ORD. 77,* DIOSCOREACEÆ.

Tamus ....communis ......

NAT. ORD. 78, MELANTHIACEÆ.

Colchicum......autumnale......

NAT. ORD. 79, HYDROCHARIDACEÆ.

Hydrocharis ...	Morsusranæ ...	K4...	H. R.	Elodea	canadensis......		

NAT. ORD. 80, ALISMACEÆ.

Alisma	Plantago			Sagittaria	sagittifolia......		

NAT. ORD. 81, POTOMACEÆ.

Potamogeton ..	densus	Q8...	L. C.	Potamogeton	gramineus.....	K3...	L. C
	pectinatus......	K3...	L. C.		crispus		

NAT. ORD. 82,* ARACEÆ.

Arum .. ..maculatum ..

NAT. ORD. 82,* TYPHACEÆ.

Sparganium ...	ramosum			Typha	latifolia		

NAT. ORD. 84, JUNCACEÆ.

Juncus	effusus			Juncus	acutiflorus		
	glaucus						

NAT. ORD. 85, CYPERACEÆ.

Eriophorum ..	polystachion...	T5 ..	W. W	Carex...........	no entries except Pendula		

NAT. ORD. 86, GRAMINEÆ.

No entries except the commonest species.

NAT. ORD. 87, FILICES.

Genus	Species	District	Finder
Polypodium	vulgare		
	Robertianum	T 5	L. C.
Polystichum	aculeatum		
	b. lobatum		
Lastrea	Filix-Mas		
	dilitata		
Anthyrium	Filix-fœmina		
Asplenium	Ruta muraria	Q 11	R. S.
Scolopendrium	vulgare		
Blechnum	boreale	P 10	L.C.
Pteris	aquilina		
Botrychium	Lunaria	P 7	H. R.
Ophioglossum	vulgatum	N 9	R. Q.

NAT. ORD. 90, EQUISETACEÆ.

Genus	Species
Equisetum	arvense
	limosum
Equisetum	palustre
	maximum

Dates at which the Early Plants were first observed.

Mar. 10 Chrysosplenium oppositifolium
Ranunculus Ficaria
Corylus avellana
Mercurialis perennis
12 Daphne Laureola
19 Viscum album
Salix
Helleborus viridis
Galanthus nivalis
Draba verna
Primula vulgaris
24 Anemone nemorosa
Oxalis acetosella
Viola odorata
Caltha palustris
26 Luzula campestris
Viola canina
Potentilla fragariastrum
Larix (Larch)
27 Taraxacum Leontodon
April 2 Anthriscus sylvestris
Narcissus pseudo-narcissus
Nepeta Glechoma
Primula veris
Hyacinthus non-scriptus
6 Adoxa moschatellina
Viola hirta
Petasites vulgaris
7 Chrysosplenium alternatifolium
Cardamine pratensis
9 Lamium album
12 Prunus communis
Stellaria media
14 Fragaria vesca
Ranunculus auricomus
16 Luzula sylvatica
Viola sylvatica
Equisetum arvense
19 Euphorbia amygdaloides
Vinca minor
Arum maculatum
April 19 Ribes rubrum
Euphorbia peplus
Stellaria holostea
Alliaria officinalis
21 R. bulbosus
Tulipa sylvestris
Allium ursinum
Ribes grossularia
23 Lathræa squamaria
R. aquatilis
Paris quadrifolia
Ajuga reptans
Viola tricolor
Vicia sepium
Plantago media
Medicago lupulina
Galium cruciatum
26 Cardamine sylvatica
Sisymbrium officinale
Geranium Robertianum
Pyrus communis
Fraxinus excelsior
Vinca major
Myosotis arvensis
28 Veronica officinalis
Orchis mascula
Asperula odorata
30 Chelidonium majus
Alchemilla vulgaris
Cerastium arvense
Lamium anplexicaule
May 3 Lychnis diurna
Acer Campestre
Acer Pseudo-Platanus
Pyrus malus
R. repens
Pedicularis sylvatica
5 Convallaria majalis
Ilex aquifolium
Cratægus Oxyacantha

CHELTENHAM COLLEGE

Natural History Society.

REPORT

OF THE PROCEEDINGS OF THE SOCIETY FOR THE YEAR

1889.

Sumptibus Editorum Cheltoniensium.

CHELTENHAM.
JOHN DARTER, COLLEGE BOOK AND STATIONERY DEPOT, NORTHWICK TERRACE.
MDCCCXC.

CHELTENHAM:
THOMAS HAILING, OXFORD PRINTING WORKS,
1890.

CONTENTS.

INTRODUCTION.

The C. C. N. H. S. was revived on February 15th, 1889. A Committee was chosen to draw up Rules, and a Council was afterwards appointed. These are given below. Although much cannot be expected of such a Society in its infancy, yet this book contains ample proof that a good foundation has been laid, and that the Society promises to be a most useful adjunct to the intellectual life of the School, by giving scope for the development of those special scientific pursuits which are not recognized in the regular curriculum of a Public School. The number of members who joined the Society will be seen from the accounts to have been 16 Honorary Members, and 80 Ordinary Members. This augurs very well for the future. It is hoped that the publication of this Report will have a two-fold result, satisfy the existing Members that much has been already done and stimulate them to greater efforts, and further, induce many others to join. If these two results are achieved, the Report for 1890 will be still more full and interesting.

As is mentioned below in the Reports of the various Sections, Cheltenham is especially well-situated for the study of all branches of Natural History, and above all for Archaeology, which has been taken as a branch of Natural History, though of course not strictly being so. The whole surrounding district is full of the most interesting remains, and this section which does not require the same special knowledge as the other sections, ought to prove a most valuable one.

THE COUNCIL.

President ...	... ...	THE PRINCIPAL.
Vice-President	... ...	REV. J. MUGLISTON.
Treasurer ...	... ...	W. M. BAKER, ESQ.
President of Entomological Section ...		W. GRIFFIN, ESQ.
Secretary	„ (Lent & Summer)	C. WOODHOUSE.
„	„ (Michaelmas) ...	J. S. PARKER.
President of Ornithological Section ...		M. TANNER, ESQ.
Secretary	„ „ ...	E. A. WILSON.
President of Botanical Section	...	H. MATTHEWS, ESQ.
Secretary	„ „ ...	W. L. MELLERSH.
President of Geological Section	...	A. A. BOURNE, ESQ.
Secretary	„ „ ...	H. J. BURKILL.
President of Metallurgical Section ...		J. TAYLOR, ESQ.
Secretary	„ „ ...	H. G. BOIS.
President of Anthropological Section		A. S. DAVIS, ESQ.
Secretary	„ „ ...	H. A. THORNTON.
President of Archaeological Section ...		G. B. WITTS, ESQ.
Secretary	„ „ ...	A. S. OWEN.
Secretary ..	... ...	G. G. PRUEN, ESQ.

RULES.

1.—That this Society be called the Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That Ordinary Meetings of this Society be held on Fridays once in three weeks, at 5.30 p.m., or at such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

3.—That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4.—That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5.—That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-

6.—That any Member whose subscription shall be a whole term in arrears shall cease to be a Member of the Society.

7.—That Members be encouraged to join sections for the more accurate study of the different branches of Natural History : that the formation of these be arranged and the work settled at the first Meeting of each term : that each section be under a President, who is responsible for its Meetings and organisation, and that a Secretary be appointed by each section to keep minutes of its proceedings, of which a summary shall appear in the Report.

8.—That the Society issue a Report as often as the Council think fit.

9.—That the Officers of this Society consist of a President, Vice-President, a Secretary and Treasurer, who, with the Presidents and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10.—That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11.—That in the absence of the President the Vice-President, or in his absence a Member of the Council, shall preside.

12.—That the duties of the Secretary shall be to give notice of Meetings of the Society and the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13.—That the Treasurer's accounts, after the approval and signature of two Auditors, to be appointed at the last Meeting of each term, be laid on the table at the first Meeting of the succeeding term.

14.—That the Officers shall constitute for the time being the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15.—That the Secretary have power by a vote of the majority of Members present, at a Special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct should be adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of an ex Member to be permitted during the next term.

16.—That the Members of the Society on leaving the College become corresponding Members.

17.—That no alteration be made in these rules without calling a Special Meeting, of which notice must be given to each Member by the Secretary, and that such Meeting interfere with no ordinary business.

BALANCE SHEET FOR 1889.

Cr.

	£	s.	d.
Lent Term:			
16 Hon. Members at 5/-	4	0	0
88 Ordinary Members at 1/- ...	4	8	0
Summer Term:			
17 Hon. Members at 5/-	4	5	0
98 Ordinary Members at 1/- ...	4	18	0
51 for Sudeley Expedition at 1/- ...	2	11	0
38 for Chedworth Expedition at 2/- ...	3	16	0
Michaelmas Term:			
16 Hon. Members at 5/-	4	0	0
53 Ordinary Members at 1/- ...	2	13	0
	£30	11	0

Dr.

	£	s.	d.
Minute Book and Rules	1	0	0
Stadiometer	1	12	6
Arm Testing Machine	0	18	6
Sudeley Expedition	7	17	6
Chedworth Expedition	11	10	6
Sergeants for Measurement	1	0	0
Record Book and Form Measurements ...	1	16	0
Sundries	0	9	0
Balance	4	7	0
	£30	11	0

A. A. Bourne, } *Auditors.*
A. S. Davis, }

W. M. Baker, *Treasurer.*
G. G. Pruen, *Secretary.*

SUMMARY OF THE YEAR.

During 1889, the following Lectures were delivered to the Society.

March 8—On Flowers by Mr. Matthews.

„ 22—On Archaeology by Mr. Witts.

May 17—On Habits of Observation by Mr. Fowler.

October 4—On Archaeology by Professor Hughes.

Nov. 1—On the Spectroscope by Mr. Schwann.

Nov. 22—On a Tour in Algeria by The Principal.

Dec. 13—On Pond Life by Mr. Matthews.

Several members attended a lecture by Dr. Dallinger on Contrasts in Nature.

The lectures on Archaeology are given in the report of the Archaeological Section. The lecture on Flowers is given in the report of the Botanical Section.

The Society took two excursions (1) to Sudeley Castle, in which 51 joined (2) to Chedworth, in which 38 joined. These are also described under the Archaeological Section.

An Art Section will probably be added.

REPORT OF ORNITHOLOGICAL SECTION.

IN comparing the work done by the several Sections of our Society, it would be hard to say which has best proved the worth of its existence. There is one great drawback to the notices in our Section, that in the case of migration or habits of birds, we cannot bring the first swallow we see in the year, and thus prove it was a Swallow and not a Martin, nor can we bring home rare birds such as Crested Larks, to show up as notices. So we are reduced to birds' eggs, and in this limited branch most of the work this year has been done.

Looking over the forty species, whose dates of breeding were given in, we find that nests like those of Cirl Buntings, Grey Wagtails, Barn Owls, and Wood Wrens do occur round Cheltenham, though decidedly uncommon, and not to be found except by thorough searching.

The notices on migration and habits in general of birds are somewhat scanty, and it is to be hoped that more will be forthcoming in the year 1890, for they are far more valuable than mere collections of birds' skins or blown eggs.

In addresses and field days we came off rather poorly, though the quality of Mr. Fowler's lecture on the habits of observation, made up in part for the loss of quantity from others. The field day at the Crippetts was unsuccessful, chiefly because undertaken too late in the season.

The Prize for the greatest number of marks gained by notices was awarded by Mr. Tanner to V. C. Rolt, the books given being "A Year with the Birds," and "Tales of the Birds," by the lecturer mentioned above.

In conclusion we can only draw attention to the notices added after this Report, to prove that during the past year the Ornithological Section has done some really useful work.

Observations on Migration and Habits.

V. C. Rolt	... Feb. 11	... Rooks return to their nesting trees.
E. Wilson	... Apr. 15	... Willow Warbler arrived, Cheltenham.
V. C. Rolt	... „ 20	... Swallow arrived, Marle Hill.
„	... „ 20	... Cuckoo first heard, „
E. Wilson	... „ 26	... Nightingale first sings, Ipswich.
V. C. Rolt	... „ 28	... Swallows and H. Martin beg. building.
„	... June 20	... Cuckoo last heard.
E. Wilson	... Aug. 25	... Swift departed, Cheltenham.
V. C. Rolt	... „ 27	... Swift departed, Lancashire.
„	... Oct. 4	... Swallow begin to leave.
„	... „ 7	... Martins departed.
„	.. „ 8	... Fieldfare arrived.
„	... „ 12	.. Redwings arrived.
„	... „ 14	... Swallow last seen.

V. C. Rolt also observed (1) on May 23rd, the mobbing of a cuckoo by small birds, chiefly hedge sparrows; (2) the usurpation of swallow's nest by sparrows; (3) that meadow pipits may be ranked among the birds that feign lameness to preserve their broods.

Date.	Name of Bird.	Locality.	Observer.
March 19...	Blackbird	... The Park	... Alexander, R.
„ 22...	Thrush	... The Park	... Alexander, R.
„ 29...	Robin	... Cheltenham	... Anerseley, J.H.S.
April 6...	Hedge Sparrow	.. Hatherly	... Rolt, V. C.
„ 11...	Missel Thrush	... Woolwich	... Parker, A. H.
„ 12...	Plover	... York	... Whitehead, E.
„ 13...	Wren	... Woolwich	... Parker, A. H.
„ 16...	Wood Pigeon	... Tewkesbury	... Parker, A. H.
„ 17...	Jay	... Woolwich	... Parker, A. H.
„ 20...	Sparrow Hawk	... York	... Whitehead, E.
„ 25...	Kestrel	... Tenby	... Webb, D. C.
„ 26...	Partridge	... York	... Whitehead, E.
„ 29...	Meadow Pipit	... Tenby	... Webb, D. C.
„ 30...	Redshank	... York	... Whitehead, E.
„ 30...	Barn Owl	... Churchdown	... Rolt, V. C.
May 2...	Starling	... Hatherly	... Rolt, V. C.
„ 2...	Chaffinch	... Hatherly	... Rolt, V. C.
„ 4...	Jackdaw	... Leckhampton	... Rolt, V. C.
„ 5...	Tom Tit	... Tenby	... Webb, D. C.

DATE.		NAME OF BIRD.	LOCALITY.	OBSERVER.
May	9...	House Sparrow	... Tenby	... Webb, D. C,
„	9...	House Sparrow	... Cheltenham	... Mellersh, W.
„	11...	Moor-hen	... R. Colne	... Rolt, V. C.
„	14...	Redstart	... Cleeve	... Parker, Pà. M.
„	15...	Rock Dove	... Leckhampton	... Webb, D. C.
„	15...	Blackcap	... Crippetts	... Alexander, R.
„	15...	Longtailed Tit	...	... Alexander, R
„	18...	Cirl Bunting	... E.G.C.Ground	... Webb, D. C.
„	18...	Grey Wagtail	... Sandy Lane	... Whitehead, E.
„	18...	Green Linnet	...	... Alexander, R.
„	19...	Chiff Chaff	... Leckhampton	... Whitehead, E.
„	20...	Bull-finch	... Cleeve	... Whitehead, E.
„	20...	Wood Wren	... Cleeve	... Whitehead, E.
„	20...	Linnet	...	... Webb, D. C,
„	20...	White Throat	...	... Alexander, R.
„	20...	Swan	... Dowdeswell	... Rolt, V. C.
„	20...	Sand Martin	.. Charlton Kings	.. Parker, Pà. M.
„	26...	Spotted Flycatcher	... Leckhampton	... Waters, R.
„	29...	Red-backed Shrike	... Battledown	... Mellersh, W.
„	30...	Martin	... Cheltenham	... Rolt, V. C.
„	30...	Swallow	... Winchcombe Rd.	Rolt, V. C.
June	2...	Cuckoo	... Charlton	... Rolt, V. C.

REPORT OF GEOLOGICAL SECTION.

CONSIDERING the capabilities of the neighbourhood of Cheltenham it may seem surprising that so few members collected fossils during the past year Possibly there were more collections made, but owing to the bashfulness of the owners they were not shown up. The only collection exhibited was that of E. A. Wilson, which included some perfect specimens from the Lower Lias, and also from the Oolite of the surrounding hills, for which Mr. Bourne kindly gave the prize.

Cheltenham, as is well known, has a particularly interesting and well exposed Geological Section. Within a radius of about four or five miles you can get nearly every strata exposed from the Stonesfield slate on Sevenhampton Common to the Lower Lias, about half a mile from College at the Lower Brick Fields, where Ammonites and Belemnites may be found in many varieties. Proceeding from the Lower Lias, we go towards Leckhampton Hill and arrive at the Pilley Brick Fields, which give a good Section of the Upper Lias, and also yield very perfect Ammonites. Then before getting to the Oolitic Cliffs of the Hill itself, we pass over Marly Beds, a little of which may be found at the extreme end of the Hill, by following Leckhampton Road; here we find lumps of Micaceous Marl, containing a few imperfect shells; above this is a little known and less exposed seam of a dark grey hard rock, known as the Cephalopoda Bed; as far as we know there is only about 3ft of it exposed on the whole hill. Above this comes the well-known pea-grit, containing very pretty but small fossils and corals, the Coral Beds however being more developed and exposed on Cleeve Hill. Above this comes the Freestone, shelly below, but changing to a white and compact building stone above.

Then we get a seam named after Terebratula Fimbria, a fossil common in this particular bed, and higher still Unfossiliferous Oolite, passing above into Rubbly Oolite of a dark brown colour which contains very many and perfect fossils, and above all this, the Gryphite and Trigonia grits named after two well-known fossils found chiefly in those beds. Thus we have risen to the top of Leckhampton Hill.

Other quarries of Freestone on the Birdlip Road, of Rubbly Oolite at the top of Shurdington Hill, and of Ragstone and Stonesfield slate on Sevenhampton Common, often repay the walk there with good specimens of fossils.

In the summer Mr. Wethered conducted a party over Leckhampton Hill and explained the Geological formation of the neighbourhood. This is the only expedition of this Section which we have to record. though we hope to have more during the coming season, as well as more collections exhibited at the end of the year.

REPORT

OF ENTOMOLOGICAL SECTION.

In looking over the notices given in during the Season of 1889, we see that nearly all of the commoner species of butterflies and moths are to be found in or around Chelten-ten. There are one or two moths that come out exceptionally early; the clouded drab was the first given in on the 25th of Feb. There were 79 notices given in altogether, not only for butterflies and moths, but also for spiders, ladybirds and beetles. The field day to Birdlip was rather unsuccessful, as it was very dull and rainy. The Painted Lady was very common last year, though in other seasons we hardly see one; it is not certain, why this and other butterflies, the marbled white and clouded yellow, appear thus, and it is one of the things that must be found out, by that method so strongly urged by Mr. Cumming, namely, observation. There were no observations given in last year, concerning habits, and haunts of the Cheltenham butterflies and insects, but as this Society grows older, the more notices and observations we ought to expect. The Clouded Yellow was taken last year and many more were seen. And the Large Blue generally rare on these hills was taken. The Lime Hawk Moth, seemed to be the commonest of the sphingidae of Chelten-ham. The prize for the best collection of butterflies and moths presented by Mr. Griffin was awarded to E. A. Wilson, the bock was "Houghton's British Fresh Water Fishes."

The specimens taken by Wilson were very good, there were some rare ones in his collection that appeared in none of the others.

The following is a List of the notices of last year as they were given in :

DATE.		OBSERVER.	NAME.
February	25 ...	Burkill	... Taeniocampa Instabilis Clouded Drab Moth.
,,	26 ...	Parker, J. S.	... Mensurania Chenopodiata Small Mallow Moth.
March	16 ...	Burkill	... Phigalia Pilosaria Pale Brindled Beauty (female).
,,	27 ...	Parker, J. S.	... Pieris Rapæ Small Garden White (female)
April	1 ...	Burkill	... Taeniocampa Munda The Twin-spotted Quaker.
,,	4 ...	Wilson, E. A.	... Hybernio Amantiaria Scarce Umber.
,,	8 ...	Tweedie	... Vanessa Urticae Small Tortoiseshell.
,,	11 ...	Burkill	... Coccinello bipunctata
,,	13 ...	Burkill	... Coccinello septempunctata Coccinello quinquepunctata
,,	15 ...	Burkill	... Gerris Lacutris Water Fly
,,	18 ...	Burkill	... Gonopteryx Rhanni Brimstone Butterfly Cassida viridis Green Tortoise Beetle
,,	19 ...	Burkill	... Dytiscus Marquialis Water Beetle
,,	20 ...	Burkill	... Hydrometia Stagnorum Water Fly
,,	28 ...	Burkill	... Odontopera Bidentata Scalloped Hazel
May	3 ...	Parker, J. S.	... (Smerinthus) Sphinx Ligus-tris Privet Hawk Moth
,,	6 ...	Parker, J. S.	... Pieris Rapae Small Garden White (male) Anthocharis Cardamines Orange-tip (female)

DATE.		OBSERVER.	NAME.
May	7 ...	Parker, P. M. ...	Pieris Napi Green-veined White
,,	9 ...	Cade, F. J., Esq. ...	Vespa Vulgaris Queen Wasp
,,	9 ...	Parker, J. S. ...	Buff-tip Moth
,,	9 ...	Burkill ...	Apathus Rupestris (Bee)
,,	12 ...	Burkill ...	Puss Moth (male) Dicranura Vinula.
,,	16 ...	Parker, J. S. ..	Conmon Carpet Melanippe subsistrata Large Garden White
,,	17 ...	Parker, J. S. ...	Dark Umber Scotosia Rhamiata
,,	18 ...	Wilson, E. A. ...	Cock Chafer Lime Hawk
,,	19 ...	Burkill ...	Sericoris Euplorbiana
,,	20 ...	Burkill ...	Lunar Morn Moth Selenia Lunaria Chaddis fly Phyganea Grandis
,,	21 ...	Parker, J. S. ...	Mottled Beauty Moth Brimstone Moth
,,	22 ...	Burkill ...	Spilosoma lupricipeda Buff Ermine Moth
,,	24 ...	Parker, J. S. ...	Many Lined Moth
,,	25 ...	Burkill ...	Poplar Hawk Smerinthus populi
,,	27 ...	Parker, J. S. ...	Gray Daggar
,,	28 ...	Parker, J. S. ...	Swift Moth
,,	30 ...	Burkill ...	Bright line, Brown Eye Hadena Oleracea Scotosia dubitata The Tissue
June	1 ...	Burkill ...	Cinnabar Moth Euchelia jacobaeae Small Heath Caenonympha Pomphibus

DATE.		OBSERVER.	NAME.
June	3 ...	Burkill	... Ghost Swift
			Hepialus Humuli
,,	5 ...	Parker, J. S.	... The Dot
			Mamestra Persicariae
,,	4 ...	Wilson, E. A.	... Pearl Bordered Fritillary
			Wood Tiger Moth
			Green Forester
			Wall Butterfly
,,	10 ...	Burkill	... Figure of Eighty Moth
,	15 ...	Parker, J. S.	... Montanata Implicata
			Camptogramma Bilineata
			Decolorata Emmelesia
			Suffumata Piceata
,,	19 ...	Parker, J. S.	... Painted Lady
			Large Skipper (male)
			Large ,, (female)
			Grizzled Skipper
			Silver Y
			Common Blue (male and female)
			Brown Argus
			Knot Grass
,,	20 ...	Wilson, E. A.	... Burnished Brass
,,	29 ...	Parker, J. S.	... Yellow Underwing (common)
,,	30 ...	Burkill, H. J.	... Swallow Tail Moth
			Uropteryx Sambucata
			Yellow Shell
			Blood Vein
,,	1 ...	Burkill, H. J.	... Metrocampa Margaritaria
			Light Emerald
			Hemithea Thymiaria
			Common Emerald
			Tanagra Chaerophyllata
			Chimney sweeper
			Eucosmia Testata
			Chevron
,,	2 ...	Burkill	... Arctia Caja
			Large Tiger

DATE.		OBSERVER.		NAME.
June	4 ...	Parker, J. S.	...	Spinach Moth
				White Plume Moth
,,	6 ...	Parker, J. S.	...	Ringlet
				Meadow Brown
				Marbled White (male and female)
				Six Spot Burnet
				Five Spot Burnet
	8 ...	Parker, J. S.	...	Dark Arches

REPORT OF BOTANICAL SECTION.

THIS branch of the Society has done much during the past season in finding new habitats and confirming the old ones of the Cheltenham Flora.

Altogether 230 distinct species were given in from March 1st to July 18th.

It is unnecessary to enumerate all these, but some of the rarer ones are given below.

Helleborus viridis
Chrysosplenium alternifolium
Paris quadrifolia
Stellaria uliginosa
Corydalis lutea
Radiola millegrana
Listera ovata
Galanthus nivalis
Dipsacus pilosus
Chlora perfoliata

Hyoscyamus niger
Viburnum opulus
Iris Pseudo-acoris
Iris foetidissima
Atropa belladonna
Betonica officinalis
Lysimachia nummularia
Lychnis Githago
Verbascum nigrum
Lathraca squamaria

Ferns and Grasses were totally unrepresented. Of the various orders the Orchidaceae produced the most interest, as no less than 14 of 17 kinds to be found in the neighbourhood of Cheltenham were given in. A list is given below showing those which were not found by the members of the Section.

Altogether 3 expeditions were made.

The first was to Ullen and Short Woods, where some interesting flowers were found, including the Atropa belladona.

The President, Mr. Matthews, kindly accompanied the Section on its second expedition, to Birdlip and Cranham Woods. A very pleasant afternoon was spent; the rarest flower found in theCranham Woods was the Dipsacus pilosus, which is only known to grow in that one place in a quarry, anywhere near Cheltenham. Through the kindness of the Principal, tea was procured at Birdlip before the Section started home via Witcomb and Shurdington.

The last expedition was made with the whole Society to Chedworth and Foss Bridge, where some general work was done; the best flower found was the Vicia sylvatica.

Orchidaceae.

*Spiranthes autumnalis
Neottia Nidus-avie
Listera ovata
Epipactis latifolia
Cephalanthera grandiflora
Orchis Morio
,, mascula
,, ustulata
,, latifolia
Orchis maculata
,, pyramidalis
Gymnadenia conopsea
*Habenaria bifolia
Habenaria viridis
Herminium monorchis
Ophrys apifera
* ,, muscifera

Lecture by Mr. Matthews.

The study of Botany may be dry in the extreme, or it may be a matter of absorbing interest. To find it dry, get up a text book. To find it fascinating, turn to nature. In early spring the student will find much to engage his attention without finding himself lost in too great a wealth of flowers. What shall he do? Shall he commence the intellect-starving work of the mere collector, and take delight in possessing more dry and stuffy specimens than his dearest friend, or in having uprooted the only specimen within miles, of some rare and much persecuted plant; or shall he treat flowers like friends and profit by their acquaintance? If he elect to adopt the latter course, he cannot do better than begin his work by looking out for the numerous contrivances by which insects are compelled to work in the service of flowers and carry pollen from one to another. In the great majority of plants there is some device by which it is easy for the pollen of a flower to get away to the stigma of some other flower, but difficult, if not impossible, to

* Is marked against those which were not given in but are to be found near Cheltenham.

reach the stigma of the same flower; and it appears to be a natural law that the offspring of plants "cross fertilized" shall be stronger than those of similar plants if by any chance "self-fertilized."

"Cross fertilization" is largely accomplished by insect aid. Bees and other insects come to the flower in search of food and are made the unconscious servants of the plants. For an example hunt up the Common Furse—always in bloom. Observe the way in which the five petals are linked together, so that by pressing lightly just where an insect's weight would act, they become suddenly unlinked and the flower bursts to scatter a shower of pollen. Thus when a bee alights on a blossom sufficiently mature, he gets his breast covered with pollen, which he thereupon conveys to another flower at a more mature stage and rubs it against the stigma. The whole order of plants to which the Furse belongs—the Leguminosa—abounds with contrivances for the same purpose and the beginner is strongly recommended to make frequent observations in this direction.

Again, in the Primrose there are two sorts of flowers, which differ in the relative positions of the stamens and stigmas. In one, the stamens are at the top of the corolla tube and the stigma half-way down, and in the other these positions are reversed. It is easy by thrusting a long pointed pencil down the tube, to see that the proboscis of an insect will serve to carry away pollen from the stamens of the one kind to the stigmas of the other.

Among the Compositae—Daisy, Thistle, Coltsfoot, etc.,—the corolla tubes are very small and instead of the insects being required to dive into the flower in order to reach the pollen the latter is pushed up to the top by the growth of the stigma which, when the pollen is all gone, spreads itself out to catch the powder from neighbouring flowers as insects drag it along on their legs and bodies. In many composites a portion of the florets contain pistils but yield no pollen, while others produce pollen and have no pistils.

Another interesting spring study is to be found in the flowers of trees. They are often so small as to be overlooked, especially as they in many cases come before the leaves. The Mistletoe has its stamens on one bush and its pistils on another, the latter can of course only bear the berries. The Yew is another case of the same kind. Examples may be multiplied, but go and see for yourselves.

REPORT

OF ANTHROPOMETRICAL SECTION.

THE measurements for which the averages are given below were taken last term under the direction of the Natural History Society.

All boarders (with two exceptions) in both Senior Departments were measured. It is intended to measure Day Boys at some future time.

A comparison of our averages with the averages obtained by the Anthropometric Committee of the British Association, from about 7,000 measurements of Public School boys, is exhibited in Table I.

The British Association Averages—which may be called the "General Averages"—are published in Robert's *Manual of Anthropometry*, a copy of which book, the author, who is an O.C., has kindly presented to the Natural History Society.

TABLE I.

Showing the average measurements, for half-yearly intervals, of 244 boarders.

The colums headed $\triangle$ shew the excess above, (+), or the defect below, (−), the corresponding average for about 7,000 measurements of Public School boys, as determined by the Anthropometric Committee of the British Association.

Age.	Number Measured.	Height without shoes. (inches)	$\triangle$	Chest girth taken just after counting ten aloud. (inches)	$\triangle$	Weight with clothes. (lbs.)	$\triangle$	Strength of arm. (lbs.)	$\triangle$
19 — 0	8	67·9	− ·9	36·0	+ 1·2	148	0	99	+ 8
18½—19	12	68·8	+ ·2	36·6	+ 2·0	150	+ 3	87	− 2
18 —18½	13	68·0	− ·3	35·9	+ 1·5	144	− 1	83	− 4
17½—18	14	68·3	+ ·1	34·8	+ ·5	139	− 3	75	− 9
17 —17½	30	67·1	− ·6	33·7	− ·3	133	− 4	73	− 6
16½—17	25	66·3	− ·7	33·8	+ ·3	118	− 12	72	− 1
16 —16½	35	66·1	+ ·1	32·8	+ ·1	124	+ 2	67	0
15½—16	27	64·7	+ ·2	31·9	+ ·2	117	+ 2	61	− 2
15 —15½	33	63·3	+ ·3	31·4	+ ·5	112	+ 5	59	0
14½—15	23	61·1	− ·6	30·4	+ ·2	103	+ 2	52	− 3
14 —14½	17	61·8	+ 1·3	30·4	+ 1·0	106	+ 10	52	0
13½—14	7	59·0	− ·4	28·7	·0	88	− 3	45	− 4
All Ages	244		+ ·07		+ ·42		+ ·5		− 2

	Height	Chest Girth	Weight	Strength of Arm
Odds against our average for all ages exceeding (or falling short) of) the general average as much as it does, on the supposition that this excess (or defect) is due to mere chance.	2 to 1	5,000 to 1	2 to 3	160 to 1

REMARK.—In calculating the average excess for all ages above the general average, the weight to be attached to the average excess for any half-yearly interval must be proportional to the number measured for that interval; hence, the average for all ages is obtained by multiplying the excess for each interval by the number of measurements for that interval and dividing the sum by the total number of measurements, *i.e.*, by 244.

This table shews that, as regards height and weight, our average differs so little from the general average that the slight difference which does exist may be put down as the result of mere chance.

Our average strength of arm falls short of the general average by about 2 pounds, a result, as the calculation of the odds shews, which can hardly be ascribed to mere chance. It is probably due to boys not being able, all at once, to aquire the knack of pulling their strongest, for experience shews that a little practice generally enables any one to pull a few pounds more than he does at the first trial.

As regards chest girth, our average exceeds the general average by above $\frac{4}{10}$ths of an inch. Calculation shews that the odds are 5,000 to 1 against the excess reaching so high a figure as this, as the result of mere chance. A partial explanation of this high average will be seen further on.

The following fellows pulled more than 100 lbs.

C. H. Fowler	114 lbs.
E. Harding-Newman	110 lbs.
W. A. Baker	108 lbs.
G. L. Benwell	106 lbs.
E. M. Young	106 lbs.
F. E. Greatwood	105 lbs.
H. G. Bois	103 lbs.
A. A. Sanders	103 lbs.
V. A. W. G. Talbot	103 lbs.
P. S. Oswald	101 lbs.

It appeared to be a new and interesting subject of inquiry to ascertain what effect, if any, the fact of having been born in a hot climate has upon the future physical development. Thirty-one of the boys measured were born in India or some other hot country, and lived there on an average five years.

The following table exhibits the results of these measurements.

TABE II. shewing the deviation from the general average of 31 boys born in India or some other hot country.

Name.	Height. (Inches)		Chest Girth. (Inches).		Weights. (Lbs.)		Strength of Arm (Lbs.)	
	Above Average	Below Average	Above Averag	Below Average	Above Average	Below Average	Above Average	Below Average
Longden, C. ...	2·0	...	2·6	...	20	...	0	0
Longden, H. W. ...	·6	...	...	·1	0	0	...	11
Cordeaux, H. ...	·7	...	2·0	...	1	...	2	...
Thesiger, W. G. ...	3·2	...	2.5	...	7	...	...	9
Moore, P. L. ...	2·6	...	1·4	...	10	...	...	5
Chester, C. J. ...	...	·3	1·5	...	10	...	...	3
Beadnell, C. M: ...	2·4	...	1·5	...	...	5	...	4
Quinton, J. M. ...	5·7	...	6·6	..	44	...	33	...
Hall, B. A. ...	·2	...	2·6	...	7	...	2	...
Burne, K. A. ...	·7	...	1·0	...	18	...	9	...
Edmondson, A. ...	...	2·8	...	1·9	..	19	...	25
Percy-Smith, D. ...	·3	...	...	1·1	...	1	...	4
Davidson, N. ...	0	0	4·0	...	7	...	9	...
Riddell, R. B. ...	...	·7	1·5	...	...	16	...	6
Riddell, E. V. ...	...	2·1	·6	...	...	16	...	14
Lane, W. H. ...	...	5·0	...	2·0	...	13	...	12
Prain, R. P. ...	...	·1	2·5	...	13	...	9	...
Raby, C. F. ...	·3	...	...	·4	5	...	8	...
Fowler, C. H. ...	...	1·2	5·6	...	14	...	22	...
Grierson, G. F. ...	...	1·5	3·1	...	12	...	8	...
Hunt, C. D. V. ...	6·5	...	3·0	...	27	...	21	...
Benwell, G. L. ...	...	·1	1·0	...	16	...	26	...
Barnard, A. ...	·1	...	1·0	...	5	...	5	...
Spencer, C. E. ...	...	1·3	2·2	...	...	5	1	...
Bruce, A. G. ...	3·5	...	4.1	...	24	...	6	...
Hadow, D. S. ...	...	1·0	·9	...	...	6	5	...
Johnson, W. E. C...	...	4·8	...	3·4	...	30	...	22
Bois, H. G. ...	·4	...	4·7	...	15	...	36	...
Prendergast, G. W...	...	·9	3·4	...	...	1	2	...
Prendergast, H. Y...	...	2.2	5·0	...	0	0	...	5
Davy, R. E. ...	...	·7	...	1·0	...	11	...	15
Average ...	·17 above.		1·75 above.		4·3 above.		2·2 above.	
Odds against this average excess being as great as it is, on the supposition that it is due to mere chance.	about 2 to 1		above 1,000,000 to 1		about 7 to 2		about 5 to 1	

In this table, though the average of each measurement is above the general average, the excess may be due to mere chance, except in the case of chest girth measurements. A glance down the two columns of chest girth measurements shews, at once, the remarkably high average of this group of boys in this particular. It may be regarded as quite out of the question, that a group of 31 boys could by chance exceed the chest girth of the general average by $1\frac{3}{4}$ inches.

The result may be due to one or both of two causes; either birth and the early years of life in a hot climate are very favourable to the development of the chest, or these boys are sons of selected parents, it being probably the fact that men and women who go out to live in hot countries are, for the most part, of robust health and good physical development.

The average is however so high that it can hardly be due to this latter cause alone, for, as Mr. Francis Galton* has shewn, the sons of a group of men and women who are above the average in any particular are sure to be considerably nearer the general average in that particular than their parents.

There is one other point to be noticed. The proportion of boys born in India and other hot countries to the whole number of boys certainly exceeds in our case the proportion which exists in the case of Public School boys in general. The chest girth of these boys born abroad so much exceeds the general average, that it must affect our average found in Table I. Excluding all the boys of Table II., the average chest girth of the remainder turns out to be ·23 inch above the general average, in place of ·42 inch, which is the excess when all our boys are included, and the calculated odds against this smaller excess being due to mere chance are about 20 to 1 instead of 5,000 to 1, which were the odds when all the boys were included.

We thus see that the large average chest girth of Table I. is partly accounted for by the presence amongst us, in more than the usual proportion, of boys born in hot climates. There is, however, a strong presumption that some other influence is at work, favourably affecting our chest girth. Is it not to be found in our systematic gymnastic training?

*See Mr. Galton's Book on "Natural Inheritance."

REPORT

OF THE ARCHAEOLOGICAL SECTION.

THIS Section is slightly junior to the other branches of the Natural History Society. It had its rise in a Lecture delivered on March the 29th, by G. B. Witts, Esq., on the Barrows of the neighbourhood, a short resumé of which is appended below. Mr. Witts himself kindly took the post of President.

Lecture by G. B. Witts, Esq.

Mr. Witts began by a few general remarks on Archaeology, stating that, though it was by most people considered as a very dry subject, when examined closely, it proved to be most interesting.

Referring to the Barrows, he proved that the Long Barrows are older than the Round ones.

Bronze and stone implements are found in the Round Barrows but not in the Long Barrows. The pottery in the Round Barrows bears the marks of the Potter's wheel, while all in the Long Barrows are hand made.

The earliest Coins were introduced into England about 200 B.C. No coin is found in the Barrows, proving that the coins were introduced when the custom of forming the Barrows had died out.

There were two distinct races of human beings among the Ancient Britons when the Barrows were made.

The Long Barrows contain only the skulls of the Long-headed or Dolico-cephalic race, while in the Round Barrows, the Long and Round Skulls are found, shewing that the Round headed race were the more recent comers. Mr. Witts then gave a list of the Long

Barrows in the neighbourhood of Cheltenham, of which he mentioned the following: (1) Crippetts. (2) West Tump. (3) Near Notgrove. (4) On the Birdlip and Stroud Road near Througham. (5) Jack Barrow. (6) Belas Knapp near Winchcomb.

Among the Round Barrows are the following: (1) Two above the Crippetts. (2) In the copse above the Balloon Inn, on the left hand side of the Birdlip Road. (3) Hungry Field at West Tump.

The Belas Knapp Barrow is in a wood called Humbley How, or Humble Bee How Wood beyond Belas Knapp.

The road from Gloucester to Cirencester is a British Road. The present road differs from the Ancient track at Birdlip, where the old one instead of turning to the right and down a steep hill to Witcomb, turned to the left opposite what is now the Temperance Hotel, and through the present Lodge Gates down an easy slope through Witcomb Woods, where an old track shows the remains of the former way.

Among the Ancient Roads about here, may be mentioned

1. The Salt way from Droitwitch to the South Coast.
2. Western Track way from Carlisle to the South Coast passing through Tewkesbury and Coomb Hill.
3. The Duggild way.

Every camp except two near Dowdeswell within twenty miles of Cheltenham are British though occupied by the Romans.

The Leckhampton Hill camp has the ramparts composed of burnt stone and twelve feet high, while the one on the top of Crickley Hill has the ramparts made of the same material but higher than Leckhampton Hill Camp.

Among the Camps near here are: (1) Birdlip, (2) Cooper's Hill with an area of 300 acres, (3) Leckhampton Hill, (4) Crickley, (5) Kinsbury, near Painswick, (6) Two Roman Camps at Dowdeswell, (7) Above the reservoirs near Mr. Agg's house, Battledown, (8) Cleeve Cloud, (9) Nottingham Hill, (10) Charlton Abbotts, (11) Beckbury.

Tacitus says, that when Aulus Plautius conquered the British in 45 A.D. he built a line of forts from the River Antona to the River Sabrina.

The Antona has been proved to be the River Nen, but an objection was raised against this as it was said there were no forts in that direction. However Mr. Witts a few years ago traced the forts from Bristol to the Wash. All these forts are within signalling distance of each other.

Professor Rolleston once found some teeth in a Long Barrow stopped with gold. This puzzled him very much as the Ancients were not acquainted with the art of stopping teeth. One day he received a letter from a medical student who had found the skull, taken it home and practised stopping on the decayed teeth, then having placed the skull in the Barrow left the neighbourhoood. The skull belonged to the older race the Dolico-cephalic or Long headed men.

Some teeth and flint implements were then passed round the room.

The Lecturer produced two flint knives which cut up potatoes easily. The blades were of a triangular shape and curved towards the point.

On May the 11th, several members of the Section accompanied Mr. Owen and Mr. Pruen to Gloucester and had the privilege of being conducted round the Cathedral by the Dean. There is no Cathedral so well adopted for the study of Architecture as Gloucester, which, it is pretty certainly settled, is the home of perpendicular and of fantracery, and which possesses as grand an example of a Norman Nave as exists in this country. The peculiarity of the squat triforium, the largest East Window in the World, the tomb of Edward II. and of Robert Duke of Normandy, the Crypt and the Whispering Gallery, all combine to give Gloucester an interest which is surpassed by very few Cathedrals, while outside the actual Church we have the Chapter House where the Norman Kings held their Parliaments and where William I. spent the last Christmas before his death.

On June 18th a large party availed themselves of the kindness of Mrs. Dent to visit Sudeley Castle in the neighbourhood of Winchcomb.

The Mansion itself is architecturally one of the most interesting in the neighbourhood, but it is especially worth visiting on account of the pictures and relics of which it is full. Several who inspected them that day scattered through the noble halls at Sudeley have no doubt since seen them at the Tudor Exhibition. Additional interest is lent to Sudeley from it having been the home of Katherine Parr in her later days—she lies buried in the little chapel adjoining. Queen Elizabeth also stopped here when it was in the hands of the Seymours, and the bedchamber is shown which she is said to have occupied during her visit.

It was a very different period of history to that which is specially illustrated at Sudeley that made the interest of the place next visited by our Society on its second field day. We have only to deal with the part of the day devoted to archaeology and so need not describe the beauties of the country we passed through going and coming on the fine July day when we visited Chedworth. The Gloucestershire Archaeological Section had just completed their inspection of the Roman Villa when we arrived, but the Rev. W. Bazeley, who is a double Cheltonian both as boy and master, kindly took us round and explained the plan of this Villa of the 4th century. A.D. The bathing apparatus of the Romans is plainly indicated by the remains, some parts of the Hypocausture being in very good preservation. Possibly the most interesting part of the buildings is the Christian baptistery, for this is the explanation given to the Hexagonal tank in one corner of the Villa by those who are able best to decide about it. The Museum built in the centre of the grounds contain many interesting relics that have been dug up in the Villa, though it is hardly as full as the neighbouring Museum at Cirencester (Corinium).

On Friday, October 3rd, Professor Hughes gave a lecture to the Society on the subject of cranoges or lake dwellings. He satisfactorily proved to his audience the age of these dwellings, an age which makes the brain reel, and then exhibited portions of the wood and even some of the fruit of the period! He read a quotation from Herodotus about the lake dwellings in Romania and then showed that the historian is in this case quite correct on his statements.

In conclusion we would say that though this Section has worked fairly well in the first year of its existence, more ought now to be done. Whatever difficulties or disadvantages may beset the other sections, it cannot be denied that Gloucestershire is particularly well suited for the study of Archaeology. It is not every town that can boast in its immediate vicinity Roman Villas as at Birdlip and Chedworth, camps such as crown the summit of the Cotswolds, historic mansions like Postlip, Dixton, and Southam-de-la-Bere, and a country studded with such fine churches as Bishop's Cleeve, Stoke Orchard and Badgworth, to say nothing of Gloucester, Tewkesbury and Deerhurst. Yet all these places are within an easy walk from Cheltenham, and the Society ought to take shame to itself if it does not manage a visit to all of them during the coming year.

CHELTENHAM COLLEGE

Natural History Society.

REPORT

OF THE PROCEEDINGS OF THE SOCIETY FOR THE YEAR

1890

Sumptibus Editorum Cheltoniensium.

CHELTENHAM.
JOHN DARTER, COLLEGE BOOK AND STATIONERY DEPOT, NORTHWICK TERRACE.
MDCCCXCI.

CHELTENHAM:
THOMAS HAILING, OXFORD PRINTING WORKS,
1891.

CONTENTS.

INTRODUCTION.

THE SECOND YEAR of the Society has now been completed, and we are able to report steady growth both in the number of members, and in the interest taken. We notice with satisfaction the reading of original papers by boys themselves before the various sections. The two expeditions were well attended and much enjoyed. The reports of the sections shew the amount of work done,—this has been considerable; but at the same time we feel that now that the Society has existed for two years there ought to be, in a great School like Cheltenham, many more enthusiasts.

The Council, 1891.

President	The Principal.
Vice-President	Rev. J. Mugliston.
Treasurer	W. M. Baker, Esq.
Secretary	G. G. Pruen, Esq.
President of Anthropometrical Section	A. S. Davis, Esq.
Secretary ,, ,, ...	Hibbert Ware.
Secretary ,, (Lent & Summer)	A. S. Owen.
,, ,, (Michaelmas) ...	J. A. Inglis.
President of Botanical Section ...	H. Matthews, Esq.
Secretary ,, ,, ...	W. L. Mellersh.
President of Geological Section ...	J. H. Hichens, Esq.
Secretary ,, ,, ...	H. J. Burkill.
President of Entomological Section ...	W. Griffin, Esq.
Secretary ,, ,, ...	J. S. Parker.
President of Ornithological Section ...	M. Tanner, Esq.
Secretary ,, ,, ...	E. A. Wilson.

BALANCE SHEET FOR 1890.

Receipts.	£	s.	d.	Expenditure.	£	s.	d.
Lent Term :				Carriage of Lantern...	0	2	6
18 Honorary Members at 5/-	4	10	0	Sundries	0	6	0
67 Ordinary Members at 1/-	3	7	0	Botany Boxes	0	2	0
Summer Term :				23 Entrance Fees to Prof. Dawkins' Lecture	2	6	0
18 Honorary Members at 5/-	4	10	0	Grant—Forest of Dean Expedition ...	3	0	6
101 Ordinary Members at 1/-... ...	5	1	0	Berkeley Castle Expedition ...	2	5	0
Christmas Term :				Darter, Log Books, etc.	1	4	0
*5 Honorary Members at 5/-	1	5	0	Sundries	0	5	6
65 Ordinary Members at 1/-	3	5	0	Richardson & Stark for Measurements ...	1	0	0
				Annual Prize (awarded to Mellersh) ...	2	2	0
Balance from 1889	4	7	0	Balance	13	11	6
	£26	5	0		£26	5	0

A. A. BOURNE,
A. S. DAVIS, } *Auditors.*

W. M. BAKER, *Hon. Treasurer.*
G. G. PRUEN, *Hon. Secretary.*

* By an alteration of the Rules, members who have paid 5 consecutive terminal subscriptions are exempt from any further payment.

RULES.

1.—That this Society be called the Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That Ordinary Meetings of this Society be held on Fridays once in three weeks, at 5.30 p.m., or at such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

3.—That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4.—That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5.—That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-, and all Members who have paid 5 consecutive terminal Subscriptions, be exempt from any further payment.

6.—That any Member whose subscription shall be a whole term in arrears shall cease to be a Member of the Society.

7.—That Members be encouraged to join sections for the more accurate study of the different branches of Natural History: that the formation of these be arranged and the work settled at the first Meeting of each term: that each section be under a President, who is responsible for its Meetings and organisation, and that a Secretary be appointed by each section to keep minutes of its proceedings, of which a summary shall appear in the Report.

8.—That the Society issue a Report as often as the Council think fit.

9.—That the Officers of this Society consist of a President, Vice-President, a Secretary and Treasurer, who, with the Presidents,

and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10.—That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11.—That in the absence of the President, the Vice-President or, in his absence, a Member of the Council, shall preside.

12.—That the duties of the Secretary shall be to give notice of Meetings of the Society and the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13.—That the Treasurer's accounts, after the approval and signature of two Auditors, to be appointed at the last Meeting of each year, be laid on the table at the first Meeting of the succeeding year.

14.—That the Officers shall constitute for the time being the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15.—That the Secretary have power by a vote of the majority of Members present, at a Special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct should be adverse to the interests and objects of the Society. Fees and subscriptions are in no case to be returned, but re-election of an ex-Member to be permitted during the next term.

16.—That the Members of the Society on leaving the College become corresponding Members.

17.—That no alteration be made in these rules except at a General Meeting at which 21 Members at least are present, and then only provided it is carried by a majority of two-thirds of those present.

SUMMARY OF THE YEAR.

During 1890 the following Lectures were addressed to the Society.—

Feb. 14th...“On the rocks in the neighbourhood” by E. Wethered, Esq., F.G.S.

Feb. 1st...“Insect haunts,” by L. Cumming, Esq., M.A., Master of Rugby School, and formerly of Cheltenham College.

May 22nd...“On the Geology of the Forest of Dean,” by E. Wethered, Esq., M.A., F.G.S.

Oct. 29th...“A journey down a coal mine,” by J. H. Hichens, Esq., M.A., F.G.S.

Oct. 31st...“On the Study of Botany,” by H. Matthews, Esq., B.Sc.

The following Lectures were delivered *to the Geological Section.*

Nov. 6th...“On Sedimentary Rocks,” by J. H. Hichens, Esq., M.A., F.G.S.

Dec. 5th...“On Glaciers” by Mellersh.

To the Ornithological Section.—

Nov. 8th...“Birds and their every day life,” by M. Tanner, Esq., B.A.

Nov. 22nd...“Birds of Cheltenham,” by Mellersh.

By the kind invitation of the Council of the Town Natural Science Society members of our Natural History Society were admitted to the following Lectures at the Science School.

"On Birds," by Rev. J. Evans, M.A.

"Our early ancestors," by Prof. Boyd Dawins, M.A.

"Coral Islands," by J. H. Hichens, Esq., M.A., F.G.S.

Abstracts of the various lectures are given below under the Sectional headings.

EXPEDITIONS.—

May 24th...72 boys, 17 masters, and friends went to the Forest of Dean.

July 3rd...52 boys, 21 masters and friends visited Berkeley Castle.

May 28th...The members of the Geological Section visited the Cheltenham Gas Works.

The prize of £2 2s. given by the Society for the best essay done during the holidays was awarded to Mellersh. The subject was "The Birds of Cheltenham." Our best thanks are due to W. Fowler, Esq., Fellow of Lincoln College, Oxford, for examining those sent in. He very kindly gave a special prize to Burkill who was second.

Mellersh's Essay will be printed later on in connection with the Natural History Reports.

Number of Members in 1891.—

19 Honorary Members.

Ordinary Members.—

Lent Term...	...	67.
Easter ...	...	101.
Michaelmas	...	65.

REPORT

OF ORNITHOLOGICAL SECTION.

President - - - - MR. TANNER.

Secretary - - - - E. A. WILSON.

THE ORNITHOLOGICAL SECTION has made much improvement upon last year. This is easily seen by comparing the lists subjoined with those published before. Fifty-five species of birds were found breeding round Cheltenham this year, showing an increase of fifteen upon last; altogether fifty-eight have been discovered. There is still however plenty of room left for improvement in the list of dates of the migratory birds. The point is to get the earliest date each bird is seen, the latest it is seen, and the earliest and latest that it is seen in large numbers, besides a lot of other minor observations which are always turning up, and which should all be given in.

At present we very seldom have more than two or three dates to choose the best from, whereas if every one would give in a list the dates would be far more accurate.

Since November, 1890, five sectional meetings have been held. On November 8th, Mr. Tanner read a paper on "Birds and their Every Day Life." On November 22nd, W. L. Mellersh read a paper on "The Birds of Cheltenham" (an extract from the essay for which he gained the prize).

The Minutes of each meeting may be seen in a book kept for the purpose in the Museum.

On May 24th, 1890, a general expedition was made to the Forest of Dean, where little was done in the Bird line. A peregrine Falcon's nest with young was found by the President, several jays' nests, and a redstart's nest were also found.

The egg collection in the Museum will soon be revised and increased. For this purpose it is hoped that those who are interested in eggs will present duplicates, and that those who are not so interested will hand over any collections they may have. Several have already been promised.

The following are the notices which were given in, this year:

DATE.		NAME OF BIRD.	LOCALITY.	OBSERVER.
March	19...	Thrush ...	... Arle ...	... Bruce.
,,	29...	Blackbird ...	... Charlton	... Wilson.
,,	30...	Hedge Sparrow	... Cheltenham	... Bruce.
,,	31...	Rook ...	... Marle Hill	... Bruce.
April	4...	Missel Thrush	... Seven Springs	... Burkill.
,,	8...	Longtailed Tit	... Gloucester Road ...	Bruce.
,,	9...	Stockdove...	... Crippetts	... Wilson.
,,	10...	Moor Hen	... Charlton	... Rolt.
,,	11...	Robin ..	... Tenby ...	... Webb.
,,	18...	Kestril ...	... Tenby ...	... Webb.
,,	24...	Magpie ...	... Ireland ...	... Bruce.
,,	64...	Jay ...	... Ireland ...	... Bruce.
,,	25...	Starling ...	... Crippetts	... Wilson.
,,	27...	Chaffinch ...	... Crippetts	... Wilson.
,,	27...	Wild Duck	... Crippetts	... Wilson.
,,	28...	Jackdaw ...	... Cleeve Hill	... Burkill.
,,	89...	Linnett ...	... Crippetts	... Wilson.
,,	30...	Herring Gull	... Tenby ...	... Webb.
May	1...	Red-leg'd Partridge...	Leckhampton	... Wilson.
,,	5...	Wren ...	... Hatherley	... Bruce.
,,	6...	Blue Tit ...	... Cheltenham	... Wilson.
,,	6...	Pied Wagtail	... Winchcombe	... Rolt.
,,	7...	House Sparrow	... E. G. C. Ground ...	Webb.
,,	8...	Bullfinch ...	... Shurdington	... Wilson.
,,	10...	Lesser Whitethroat ...	Cheltenham	... Wilson.
,,	10...	Sand Martin	... Dowdeswell	... Rolt.
,,	11...	Greenfinch	... Leckhampton	... Wilson.
,,	11...	Chiffchaff ...	... Shurdington	... Wilson.
,,	11...	Swallow ...	... Shurdington	... Wilson.
,,	12...	Cole Tit ...	... Marle Hill	... Rolt.
,,	12...	Red Start...	... Shurdington	... Bruce.
,,	12...	Rock Dove	... Leckhampton	... Bruce.
,,	12 ..	Yellow Hammer	... Shurdington	... Bruce.
,,	13...	Blk-headed Bunting...	Leckhampton	... Bruce.

DATE.		NAME OF BIRD.	LOCALITY.	OBSERVER.
May	14...	White Throat	... Cleeve ...	... Bruce.
,,	14...	Meadow Pipit	... Cleeve ...	... Bruce.
,,	14...	Marsh Tit	... Winchcombe	... Bruce.
,,	16...	Great Tit ..	... Marle Hill	.. Bruce.
,,	16	Willow Warbler	... Crippetts	... Wilson.
,,	16...	Sparrow Hawk	.. Shurdington	... Bruce.
,,	17...	Tree Creeper	... Crippetts	... Wilson.
,,	17...	Black Cap	... Dowdeswell	.. Webb.
,,	17...	Swan ...	... Dowdeswell	... Rolt.
,,	17...	Winchat ...	... Leckhampton	... Bruce.
,,	17...	Stonechat ...	... Leckhampton	... Bruce.
,,	21...	Nightingale	... Shurdington	... Bruce.
,,	22...	Red-backed Shrike,...	Leckhampton	... Wilson.
,,	27...	Wheatear ...	... Leckhampton	... Bruce.
,,	28...	House Martin	...	... Bruce.
June	7...	Coot ..	... Dowdeswell	... Bruce.
,,	7...	Heron ...	... Rendcombe	... Bruce.
,,	7...	Goldfinch ...	... Whittington	... Bruce.
,,	9 ..	Tree Pipit...	... Dowdeswell	... Swiney.
,,	10...	Cuckoo ..	... Leckhampton	... Wilson.

March	30...	Chiffchaff arr...	... Cheltenham	... Wilson.
April	10...	Swallow arr. ...	... Tenby	... Webb.
,,	12...	House Martin arr.	... Tenby	... Webb.
,,	12...	Cuckoo arr. ...	... Rugby	... Mr. Tanner.
,,	13 ..	Redstart arr. ...	... Cheltenham	... Wilson.
,,	13...	Wheatear arr....	... Cheltenham	... Wilson.
,,	14...	Sand Martin arr.	... Cheltenham	... Rolt.
,,	14...	Cuckoo arr. ...	... Cheltenham	... Rolt.
,,	14...	Cuckoo arr. ...	... Cheltenham	... Burkill.
,,	14 ..	Swallow arr. ...	... Cheltenham	... Burkill.
,,	15...	Willow Warbler arr.	...	... Rolt.
,,	16...	Tree Pipit arr.	... Cheltenham	... Wilson.
,,	19...	Nightingale arr.	...	... Rolt.
,,	20...	Blackcap arr....	...	... Rolt.
,,	21...	Grasshopper Warbler arr.,	Cheltenham	... Burkill.
,,	23...	Landrail arr. ...	...	... Rolt.
,,	23...	Fieldfare dep...	... Cheltenham	... Wilson.
,,	26...	Lesser Whitethroat arr....	Cheltenham	... Wilson.

DATE.	NAME OF BIRD.	LOCALITY.	OBSERVER.
May 5...	Red-backed Shrike arr....	Cheltenham ...	Wilson.
„ 11...	Swift arr. ...	... Cheltenham ...	Wilson.
August 22...	Swift dep. ...	... Cheltenham ...	Rolt.
Sept. 21...	Blackcap dep...	... Cheltenham ...	Wilson.
„ 25...	Chiffchaff dep.	... Cheltenham ...	Wilson.
Octob. 5..	Swallows dep...	... Cheltenham ...	Wilson.
„ 5...	House Martins dep.	.. Cheltenham ...	Wilson.
„ 11...	Redwings arr...	... Cheltenham ...	Wilson.
„ 19...	Fieldfares arr....	... Cheltenham ...	Wilson.

Arr. stands for arrival or first seen.

Dep. stands for departure or last seen.

February 20...	Rooks began building	Rolt.
April 21...	Jays, which up to this have kept in companies of threes and fours, now scatter in pairs for breeding ...	Wilson.
June 2...	Cock and hen Lesser Whitethroat feigned lameness when their young were disturbed	Wilson.
February 22...	Falcon seen in Cheltenham	Rolt.
January 6 ...	Hawfinch seen	Wilson.

Nesting of Lesser Whitethroat.

May 7—25 ...	18 days from laying of first egg to hatching of young	
May 12—25...	14 days from laying of last egg to hatching of young	
May 25—June 3...	10 days from hatching to leaving nest	
May 7—June 3...	28 days altogether	Wilson.

Nesting of Blue Tit.

May 5—June 13...	40 days from laying of first egg to leaving nest	Wilson.

The Sectional Prize was given by the President to Wilson. The book was Wallace's "Darwinism."

GEOLOGICAL SECTION.

THE FIRST MEETING was held on Feb. 14th, when Mr. Wethered gave an address on Microscopic Geology. Magnificent slides, photographs of microscopical sections, were used to illustrate the lecture. Several views of rocks in the neighbourhood of Clifton were first shewn; some of the rocks in the gorge of the Avon being 300 feet high. These rocks are all made up of the remains of minute animals, which when dead fell to the bottom of the sea and the skeletons slowly and steadily produced the masses of rocks towering up above the bed of the river.

Then the great Black Rock was shewn, a cliff nearly 400 feet in height mostly made up of the little disks of Encrinites with a hole in the centre of each. These are the remains of skeletons which consisted of about 26000 joints, and they must have existed in enormous numbers to pile up such great masses of rock composed entirely of their remains. The joints consist of Carbonate of Lime which sank when the animals died. The Sea Anemone has no hard part or skeleton, consisting as it does of a soft fleshy body. The Coral has a skeleton of Carbonate of Lime which branches out in various directions, and if a bit gets broken off it grows to form fresh coral polypes. There is an ancient coral reef at Horsepool beyond Gloucester, and another at Clifton.

The small things known as Foraminifera are masses of living matter without any definite structure, but only oil globules encased in Carbonate of Lime. This is pierced with small holes, each of which sends out a kind of proboscis, which form a net and catch smaller organisms. The Cathedral Rocks at Cheddar are made up of the shells of Foraminifera.

The Oolite is composed of a nucleus with layers which have formed round it. This nucleus is either a minute shell or a grain of sand round which the Carbonate of Lime has collected. The Pea Grit consists of animal tubes grown round and round the central nucleus.

The Geology of the Forest of Dean, May 22nd, 1890.

Mr. Wethered gave this lecture a few days before the Society's visit to the district. The name Dean implies a clearing or open space in a forest, and may be ascribed to the Saxon tongue. The formation at the base of the Malvern Hills consists of Laurentian Rocks. May Hill is Cambrian, but the Forest of Dean consists of Silurian Rocks discovered by Sir R. Murchison, and named after the Welsh tribe that inhabited the district. On the Herefordshire border there is a Camp of Caractacus who so long defied the Roman power. In the Silurian Rocks we find a great quantity of Trilobites with their numerous eyes.

At the time of the formation of the Old Red or Devonian Sandstone, the Forest of Dean was the estuary of a large river. Near Drybrook and Coleford, in the Forest, there are beds of Old Red Conglomerate. Above this there are many coloured beds of sand and shale. Limestone occurs in one part, in the shale of which the remains of dragon flies are found. The Lecturer then put forward his own idea of the formation of a Coal bed. The plants grew thickly together and one upon another. In this struggle for existence the weakest had to yield and their victorious neighbours spread over them, in their turn to succumb to others stronger than themselves. So they went on layer upon layer of vegetable matter which as the pressure increased became coal.

Visit to the Gas Works.

On May 27th Mr. Hichens gave a lecture on Coal Gas to the members who had been selected to visit the Gas Works the next day. The lecture was illustrated by a series of experiments and diagrams.

When we arrived at the Gas Works the following afternoon we were received by the Manager, Mr. Coombes, who most kindly conducted us over the works and explained every detail. The Cheltenham Gas Works are often known as the "Model Gas Works," from the perfection with which the process is carried out.

The first and perhaps the most interesting thing to be seen was the "Drawing the Retorts" *i.e.* the operation of taking out the coke and of putting fresh coal in. The Retorts are arched ovens from six to nine feet in length made of fire clay. The mouth of the Retort is opened, and the coke raked out. Then the fresh coal is rammed in, large quantities of gas escaping after each shovelful is pushed in till the lid is placed again over the mouth. This lid consisting of a large plate of iron, is screwed tightly in, and moist clay is smeared round the edges to block up all the small holes through which the gas could escape.

The arrangements for separating the gas from the various liquid and gaseous impurities, which are simultaneously produced by the destructive distillation of the coal, are very perfect. The old hydraulic main is done away with, communication between the retort and the atmospheric condensers being shut off at will by means of a valve.

The atmospheric condensers, scrubbers, washers, and purifiers were all visited, and explained.

Last of all we adjourned to the testing room, a small room in which the quality of the gas is ascertained, by law it must reach a certain standard of illuminating power, and must not contain more than a certain percentage of sulphur inpurities.

A very pleasant afternoon was brought to a close by a vote of thanks, proposed by Mr. Hichens, being given to Mr. Coombes for his kindness.

On Wednesday, Oct. 29th, Mr. Hichens gave a lecture on "A Journey down a Coal Mine," in the Big Classical. Mr. Hichens began by describing the plants of the Carboniferous age, the remains of which constitute the greater portion of our Coal: huge club mosses, mare's tails, and tree ferns, with some pine trees allied to the Araucarian pine. The scene must have been somewhat dull—forests and vegetable growths of vast extent, but of monotonous sameness, consisting of plants of but very few kinds, and without flowers. The animal life was of comparatively low type—birds, and the animals that suckle their young, had not yet appeared on the earth; the largest creature was the Labyrinthodont, a gigantic frog; there were true reptiles and many butterflies, cockroaches, and other insects. Scorpions with stings have been found so that there were, presumably, other creatures to be stung.

Mr. Hichens then proceeded to trace the origin of the various strata seen in a vertical section through a coal area. The underclay with its uncompressed root like Stigmara, is the soil in which the forest grew. The seam of Coal is the débris of that forest accumulated during long years, the roof of the Coal consisting of sandstone, shale, &c., was deposited after the vegetable matter—the future Coal seam—had sunk below the level of the neighbouring waters. The conversion of wood into Coal was considered, as also were the climate, and the nature of the atmosphere of the Coal period. Attention was drawn to the distribution of Coal in England, and to the probable duration of these supplies. It was shewn that the question "How long will our Coal last?" is one of national importance, as our great industries have become concentrated upon Coal fields, and were this Coal to be exhausted, would pine away. In 20 years time the pinch will be felt in the Welsh Coal Fields, as all the thicker and more productive seams are being rapidly worked out. Possibly the developement of the Coal Measures which have recently been discovered in the East of England will do something towards resuscitating the industries which at one time flourished in that quarter.

In conclusion, Mr. Hichens gave an account of his own experiences in Coal Mines, and explained with some detail the necessity for good ventilation, and the means by which it is obtained, and the cause and prevention of explosions. The principle and use of Davy's Safety Lamp were demonstrated by chemical experiments, and throughout the Lecture the various points were illustrated with the aid of the Oxy-Hydrogen Lantern.

Meeting held Nov. 6th, for private business—The President proposed the following rule which was carried:—"That each member of the section must come to two meetings out of every three, or he shall cease to be a member of the Section."

Mr. Hichens then delivered an address on "Sedimentary Rocks." He began by explaining the different bases of classification of Rocks which are possible, Rocks might be arranged according to their chemical composition, or hardness or colour—as a matter of fact they are, by the way in which they were produced. Sedimentary Rocks are those due to the accumulation of sediment. The origin of a Sedimentary Rock such as sandstone was traced, details being given as to the carrying power of water, and the formation of deltas. During the Challenger Expedition it was proved that all sediment, no matter how fine it may be, reaches the ocean bed within a distance of 300 miles from the land. Attention was drawn to the milkiness of a glacier stream, due to the fine matter carried in suspension: when the current stops the matter naturally sinks to the bottom.

The loose sediment is turned into a solid rock by pressure, as layer accumulates upon layer, and partly by a process of infiltration by which material is deposited which binds the various pebbles or grains together.

The Lecture was illustrated by means of the Oxy-hydrogen lantern, and specimens.

The next Meeting was held on Dec. 5th, when a paper on Glaciers was read by W. L. Mellersh.

The Lecturer explained all the terms connected with Glaciers as, Snow line, Moraine and Crevasses, giving a short account of Avalanches and the motion of Glaciers which, like rivers, move faster in the centre than near the sides where they are retarded by the rocks over which they flow. A party of tourists were swept over a precipice by an Avalanche, and forty-one years later their bones came to the surface of the Glacier ten thousand three hundred feet below where the accident had happened.

The slides throughout were magnificent and very freely used, the principal Glaciers and noted mountains from which these ice-rivers start being shewn.

Mr. Hichens made a few remarks about the Great Ice Age, when Glaciers existed over the greater part of Europe. But at present the Glaciers are slowly retreating. A block of granite is to be seen near Filey which was carried across England from the Penine Range and deposited where it now stands.

REPORT OF

THE ENTOMOLOGICAL SECTION.

AGAIN we review the work of the Section for the past year, and we can record a distinct improvement, though we miss from the season's list Vanessa Cardui so plentiful on all the hills the year before, nor did Lycaena Arion fall a prey to any member acquainted with the haunts where twenty years ago it occurred freely. Among Sphingidæ, Smerinthus tiliæ again proved its frequent occurrence on the College Ground, six specimens being taken on May 21st, and many more during the season.

The collections in their turn compare favourably with the collections of the previous year; E. A. Wilson again won the prize, the others who competed being H. J. Burkill, J. S. Parker, and R. Bagnall, and W. N. Sagar-Musgrave. Wilson's collection was by far the most numerous and varied, including Argynnis Aglaia, Vanessa C-album and Cossus ligniperda. Bagnall's though deficient in numbers were all perfect and well set, his four Chærocampa elpenor being the best set exhibited.

Below is a list of the local notices, not in the order in which they were given in but in their natural sequence with the localities of a few rarer ones with their captors given. The earliest moth, the Pale Brindled Beauty, was recorded on January 4th by E. A. Wilson. Other members who gained notices were J. S. Parker, H. J. Burkill, W. N. Sagar-Musgrave, G. F. de Pledge, W. L. Mellersh, A. Balmer, F. Theobald, G. Hibbert-Ware, W. R. Fisher, and V. B. Ferguson.

RHOPALOCERA.

Pieris brassicæ
Pieris rapæ
Pieris napi
Euchloë cardamines
Gonopteryx rhamni

Argynnis euphrosyne	
Argynnis aglaia	
Argynnis adippe	
Vanessa C-album	Cleeve Hill. H. J. Burkill.
Vanessa urticæ	Crickley Hill. E. A. Wilson.
Vanessa io	
Vanessa atalanta	
Melanargia galatea	
Parage egeria	
Pararge megaera	
Satyrus semele	Crickley Hill. E. A. Wilson.
Epinephele janira	
Epinephele hyperanthes	
Coenonympha pamphilus	
Thecla rubi	
Polyommatus phlœas	
Lycæna icarus	
Lycæna argiolus	
Lycæna semiargus	J. S. Parker.
Syrichthus malvæ	
Nisioniades tages	
Hesperia Thaumas	
Hesperia sylvanus	

HETEROCERA.

Sphinx convolvulus	V. B. Ferguson. G. F. De Pledge.
Sphinx ligustri	
Chærocampa porcellus	G. F. De Pledge.
Chærocampa elpenor	O. R. Bagnall.
Smerinthus ocellatus	V. B. Ferguson.
Smerinthus populi	
Smerinthus tiliæ	
Ino statices	
Zygæna trifolii	
Zygæna filipendulæ	
Euchelia jacobææ	
Nemeophila plantaginis	
Arctia caja	
Spilosoma mendica	
Spilosoma lubricipeda	
Spilosoma menthrasti	

Hepialus humuli	
Hepialus lupulinus	
Cossus ligniperda	
Zeuzera pyrina	Cheltenham. W. L. Mellersh.
Porthesia similis	
Leucoma salicis	
Orgyia antiqua	
Pœcilocampa populi	
Bombyx neustria	
Odonestis potatoria	
Saturnia pavonia	E. Wilcox.
Cilix glaucata	
Dicranura bifida	College Ground. H. J. Burkill.
Dicranura vinula	
Phalera bucephala	
Thyatira batis	
Bryophila perla	
Acronycta psi	
Acronycta rumicis	
Diloba cæruleocephala	
Leucania impura	
Leucania pallens	
Tapinostola fulva	
Xylophasia lithoxylea	
Xylophasia monoglypha	
Mamestra brassicæ	
Mamestra persicariæ	
Apamea didyma	
Agrotis segetum	
Agrotis exclamationis	
Agrotis corticea	
Agrotis nigricans	
Noctua plecta	
Noctua xanthographa	
Triphæna janthina	
Triphæna comes	
Triphæna pronuba	
Mania typica	
Tæniocampa incerta	
Taeniocampa stabilis	
Taeniocampa munda	

Scopelosoma satellita		
Xanthia circellaris		
Calymnia trapezina		
Agriopis aprilina		
Euplexia lucipara		
Phlogophora meticulosa		
Hadena dissimilis		
Hadena oleracea		
Cucullia verbasci		
Gonoptera libatrix		
Plusia chrysitis		
Plusia iota	Cheltenham.	H. J. Burkill.
Plusia gamma		
Heliacea tenebrata		
Euclidia mi		
Toxocampa pastinum	Leckhampton Hill.	W. N. Sagar-Musgrave.
Uropteryx sambucaria		
Rumia luteola		
Metrocampa margaritaria		
Selenia lunaria		
Odontopera bidentata		
Himera penaria		
Phigalia pedaria		
Amphidasys strataria	Cheltenham.	E. A. Wilson.
Amphidasys betularia		
Hemerophila abruptaria	Suffolk Square.	H. J. Burkill.
Boarmia repandaria		
Boarmia gemmaria		
Tephrosia crepuscularia		
Geometra papilionaria		
Geometra vernaria		
Hemithea strigata		
Acidalia aversata		
Timandra amataria		
Cabera pusaria		
Ematurga atomaria		
Abraxas grossulariata		
Abraxas sylvata		
Lomaspilis marginata		
Hybernia marginaria		
Anisopteryx aescularia		

Cheimatobia brumata
Eupithecia castigata
Eupithecia subnotata
Melanippe rivata
Melanippe sociata
Melanippe montanata
Melanippe fluctuata
Phibalapteryx polygrammata
Triphosia dubitata
Cidaria populata
Cidaria fulvata
Eubolia limitata
Eubolia bipunctaria
Tanagra atrata

CONDITIONS FOR THE COLLECTING OF INSECTS FOR THE PRIZE THIS YEAR, 1891.

1.—No member may have any specimen given him for exhibition, they must be caught, killed, and set by himself only.

2.—If the egg, caterpillar or chrysalis has been given him, he may exhibit the perfect insect in the collections of the next season.

3.—The collector must send up with the collection a list of the insects stating where and when caught; also anything remarkable as to their habits, modes of concealment from birds, and anything he has noticed peculiar.

4.—The remarks must not be obtained from any book or other person, but must be solely the result of his own personal experience and observations.

REPORT
OF THE BOTANICAL SECTION.

THIS Section was at work much earlier in 1890 than in the preceding year. On January 7th the first flowers were given in, the Creeping Crowfoot and the Hazel, but the latter alone must be considered the harbinger of Spring flowers, since the above Crowfoot with a few other flowers such as the Daisy and Ivy-leaved Speedwell may be found in bloom all the year round, if only three or four mild days come in succession. The flowers at Scarborough were far in advance of those here, as can be seen from the fact that among the holiday collection made there in the early part of January by H. J. Burkill were the Read Dead-nettle, the Red Campion, the Germander Speedwell, the Wood Germander, and others.

The respective dates on which the various flowers were found were much earlier than those in 1889. About the same number of distinct species were given in as in the preceding year, from January 7th to July 23rd, but of these nearly 30 were different, so that the combined lists now number nearly 260 species. To the rarer flowers mentioned in the last Report may be added the Eranthis hyemalis, which was found near Salperton.

Many flowers were found by members of the section during the expeditions to the Forest of Dean and Berkeley, but none need a special notice.

During the winter term a lecture was given by Mr. Matthews the President, the substance of which has already been printed in the *Cheltonian*; and under his guidance three meetings were held when the members present dissected plants and examined them under microscopes.

H. J. Burkill did some capital work during the terms and gave in three holiday collections, winning the prize kindly given by the Principal.

REPORT OF THE ANTHROPOMETRICAL SECTION.

THE measurements, for which the averages are given below, were taken last term under the direction of the Natural History Society.

All Day Boys (with very few exceptions) in both Senior Departments were measured.

A report of the measurements of the Boarders in both Senior Departments will be found in the December number of the *Cheltonian* for last year.

TABLE A.

Showing the average measurements, for half-yearly intervals of age, of 102 Day Boys.

The columns headed Δ shew the excess above, (+), or the defect below, (−), the corresponding average for about 7,000 measurements of Public School boys, as determined by the Anthropometric Committee of the British Association.

Age.	Number Measured	Height without shoes. (Inches).	Δ	Chest girth taken just after counting ten aloud. (inches).	Δ	Weight with clothes. (lbs.)	Δ	Strength of arm. (lbs.)	Δ
19 —over	2	69·9	+ 1·1	35·1	+ ·2	159	+ 11	74	− 17
18½—19	6	67·9	− ·7	32·6	− 2·0	135	− 12	77	− 12
18 — 18½	4	70·0	+ ·6	35·0	+ ·6	157	+ 12	81	− 11
17½—18	10	67·7	− ·5	32·7	− 1·6	134	− 8	74	− 12
17 — 17½	9	68·8	+ 1·1	32·8	− 1·2	135	− 3	74	− 5
16½—17	8	66·9	− ·2	31·8	− 1·7	126	− 5	70	− 3
16 — 16½	14	65·1	− ·9	31·0	− 1·7	115	− 7	64	− 3
15½—16	13	63·9	− ·6	30·3	− 1·6	112	− 3	61	− 2
15 — 15½	11	66·2	+ 3·1	31·7	+ ·7	122	+ 14	60	+ 1
14½—15	13	60·8	− 1·0	28·7	− 1·5	97	− 5	51	− 4
14 — 14½	7	62·3	+ 1·8	28·0	− 1·4	97	+ 1	48	− 4
13½—14	2	58·6	− ·8	27·2	− 1·6	88	− 3	52	+ 3
13 — 13½	3	60·4	+ 2·2	27·2	− 1·0	91	+ 5	41	− 4
All Ages	102		+ ·2		− 1·2		− 1·8		− 4·8

It will be seen that our Day Boys slightly exceed the general average in height whilst in the other three measurements they fall short of it.

One Day Boy pulled more than 100lbs., namely H. C. Foster, who pulled 105lbs.

In Table II. of last year's Report the deviation of the average of 31 boys born in India or some other hot country, from the general average, was exhibited.

This Table shewed a remarkable excess in each measurement especially an excess in chest girth, which was 1¾ inches above the general average.

Of the 102 Day Boys measured, 17 were born in India and one in South America. The average of these 18 boys has been calculated with the following result.—

A defect of ·1 inch in height below the general average.
A defect of 1·8 inch in chest girth ,,
A defect 1·3 lbs. in weight ,,
A defect of 6·9 lbs in strength of arm ,,

The curious result of last year's measurements of Boarders born in India or some other hot country is, it will be seen, not repeated in the case of the Day Boys so born.

EXPEDITIONS.

ON May 24th the Society planned an outing to the Forest of Dean. The expedition started at 12.40 to go via Berkeley Road and the Severn Bridge to Speech House Station. The journey was slow but this was compensated for by the beauty of the scenery. Arriving at the Station the party broke up into little detachments, one going with Mr. Wethered to learn about a neighbouring coal-mine (though as it was Saturday they could not go down), and collect the fossils of the Sigillaria and Lepidodendroids which are the origins of coal-formations. Others penetrated the Forest to get botanical notices, or obtain rare entomological specimens. At 5.30 the whole party collected in the large hall of Speech House for tea. A train at 6.15 brought the members back by half-past eight.

The second expedition took place on July 3rd, when the Society went to Berkeley Castle. Passing through the town we first went through the Church, where the party, too numerous to be taken all together, was divided, one half going inside the Castle gates, while the others returned to the Church. The exact date when it was built is uncertain, but Robert Fitz-Hardinge is supposed to have erected a church during the twelfth century, which has been re-built, altered and added to since, so that now only the slightest traces of the original structure remain. In a wall near the Lectern there is a tile or brick bearing a Roman inscription said to refer to the Sixth Legion.

The Church tower is built about 50 yards away from the rest of the edifice, as owing to the proposed height it would have afforded a good opportunity for an attacking party to shoot the defenders of the Castle in time of war, if situated within range.

Some curious epitaphs are to be found in the Churchyard. The following one is the work of Dean Swift :—

Here lies the Earl of Suffolk's Fool,
Men called him Dicky Pearce;
His folly served to make Folks laugh
When wit and mirth were scarce.

Poor Dick, alas! is dead and gone,
What signifies to cry?
Dickys enough are still behind
To laugh at bye and bye.

Buried June 18th, 1728. Aged 63.

In the Castle grounds near the gate a large bell covered with Chinese characters attracts attention. It formerly hung in a Buddhist temple near Ningpo. Passing through the Great Hall, a handsome room now used as the family dining room, we come to a large staircase of dark oak where a collection of portraits adorn the walls.

Inside the courtyard there are two enormous ribs of a whale that was stranded in the estuary of the Severn. Over the steps into the keep, a small room is pointed out as the prison of Edward II. There is a deep well where tradition says an enormous toad, nearly 16 inches in breadth, lived for some years and was fed on flesh thrown into the water for it.

From the top of Thorpe's tower a magnificent panorama is to be seen; wooded hills rising here and there, on one side beyond them the shining waters of the Severn, while beyond the River, the Forest of Dean and Welsh Hills close the view in the far distance.

The Botanical Section found several flowers and ferns growing on the walls, the keep in several parts being covered with Perforated St. John's Wort and Red Valerian.

When all had been through the Castle we walked to the Kennels and into the Park; then after tea in the town we returned to the station.

Several ladies accompanied the Society on each expedition.

SOME MEANS OF PROTECTION IN THE LOWER FORMS OF LIFE.

By H. J. Burkill.

"EAT TO BE EATEN," is a saying of Frank Buckland's which well deserves to be remembered. In this struggle for existence it is always the case of "The weakest must go the wall," not only members of each species, but individual species themselves, as the Great Auk and the Dodo, which not being able to fly were consequently eliminated from the struggle which always terminates in the survival of the fittest.

The fittest are those which are best calculated to live without being preyed upon by others. Thus each species as it requires a method of protection adopts the one most suited to its wants. Thus we have the case of the Hornbill, which has learnt to close up the entrance to its nest with a wall of mud, to keep the eggs safe from snakes.

The methods of protection can all be classified under three heads:

1. Habit.
2. Colour.
3. Armature.

The first two are closely connected, both colour and habit occurring often in the same individual.

The second of these, with which I shall begin, is perhaps the most interesting, following the classification of Mr. E. B. Poulton in his recent work on the Colours of Animals. He divides the colours into groups:

1. Apatetic Colours, (deceitful,) *i.e.* Protective and Aggressive mimicry.
2. Sematic Colours (sign) by which enemies may be warned away by the similarity of the object to some other, which they have attacked before and found objectionable; or the colours by which one species may recognise their friends.

3. Epigamic Colours, or colours displayed in courtship.

This last we have not to deal with, as the most striking instances are from America; but the bright colours of the upper side of butterflies wings in the males may be taken as example, while the underside serves for protection.

Returning to the First Group, the protective resemblance, we have to notice in Ornithology the striking resemblance in the colour of partridges to heather; how difficult it is for the eye to follow them in their flight over the dark crimson masses.

The colours of birds' eggs form an interesting subject. Most of the eggs that are concealed in holes away from the light are white. Some of those that are exposed only to a small amount of light are pale bluish green as the Starlings' or Redstarts', while the Jackdaws' are the same ground tint with darker blotches, and the eggs of Tits are white with small reddish brown spots. The Larks' and Nightingales' eggs closely resemble their surroundings. Thus those eggs which do not need to be protectively coloured are white. The eggs of the Domestic Fowl are in no need of protection and so have not retained the brown colour they originally possessed, and which is still the colour of the eggs of the Asiatic Jungle Fowl, the ancestor of our Domestic Fowls.

A hare sitting motionless resembles closely a lump of earth or a heap of soil like a mole hill.

Lizards resemble the general appearance of their surroundings when remaining motionless upon a bank, but immediately they move the eye is attracted to them and the colours are seen not to be those of the ground.

Newts are brightest underneath, but seen from above they are hard to distinguish as they slowly skim over the muddy bottom of the pond. The underside is very conspicuous with its bright orange.

Fish are generally lighter underneath than above, as the Whiting (Gadus merlangus), the Mackerel (Scomber scomber), and Herrings (Clupea harengus). Seen from below the fish is inconspicuous against the sky and seen from above the darker shades harmonise with the rocks or sand at the bottom of the sea.

The Nudibranchs or Sea Slugs which are to be found on rocks near low water mark when they come up to spawn are well protected. The Doris tuberculata is inconspicuous with its brown shades on the rocks; but the Eolis Drummondii is perhaps more protected by habit and powers of defence than by colour, but I have thought it best to insert it here as it is allied to the Doris. It buries its body in the sand when left exposed by the retiring tide, while the short flesh-coloured tentacles, which are the breathing organs, protrude through the sand. These readily come off, so that if the Eolis were to be seized by a fish it has some chance of escaping while its assailant endeavours to get rid of the small tentacles which only tickle its mouth, without appeasing its hunger. Most probably the fish learn by experience not to attack these helpless looking objects.

Those common shellfish, the Purpura lapillus, which are so well known to every visitor to the sea-side, are mostly protectively coloured, as the following numbers will shew, those that do not need protective colour being situated under very thick fucus are white, but this is more particularly due to being continuously rubbed by seaweed.

Purpura in a thick bed of fucus. Out of 25 examples collected,

23 were quite white.
2 greenish yellow from thin growth of green algæ.

On rocks covered with green and small red sea-weeds, the numbers were

23 brown.
6 dirty yellow.
1 grey.

On rocks thinly covered with green weeds and small fucus there were

43 overgrown with sea-weed.
41 not overgrown.

Of these the majority were, when the sea-weed had been pulled off, of a dirty yellow colour.

The colours of those on rocks partly overgrown with Fucus Serratus and Vesiculosus, where there was no green algæ were

134 yellowish.
25 white.
2 dark yellowish brown.
1 orange.
1 greenish, but not by algæ.
5 worn.

The Limpets (Patella Vulgata) are protected by the sea-weed from the action of the waves; those which are surrounded by weeds being much fresher than the unprotected ones, though some of the larger ones get worn at the top.

But it is from Entomology that most instances of Protective Resemblance can be taken.

The Privet Hawk Caterpillar (Sphinx ligustri) harmonises well with the bright green leaves of the lilac; the purple and white bands serving to make the resemblance more perfect by dividing the green mass into several parts. When the larva becomes full fed, the back becomes brown, and then the sides change colour, but not so completely as the back. Then it descends the tree and wanders over the earth, with which its new colour harmonises fairly well, to seek a soft spot to burrow into, where it can pass the winter in safety.

All but one caterpillar that I have taken have been near the foot of the tree when discovered, passing over the greenish part of the trunk near the ground, where they are more conspicuous than if on the ground or browner bark. Only one specimen that I have taken as a chrysalis was near a purple lilac. Two other chrysalides were near the foot of a white lilac, but all the caterpillars have been on white lilac, with one exception, and that was on the snowberry shrub. Poulton says that those that feed on privet are brighter than those feeding on lilac, but nothing could exceed the bright emerald colour of those found on the white lilac, in the parts where they had not begun to turn brown.

The Caterpillars of the Six-spot Burnet (Zygæna filipendulæ), feed upon Bird's-foot Trefoil (Lotus corniculatus), and closely resembles a common Carex (Carex glauca) which generally is to be found growing with the Trefoil.

The colour of the Caterpillar is yellowish green, with rows of black spots which correspond to the seeds of the Carex.

Some clothes-moth caterpillars were found feeding upon black cloth. They were tried on red, blue, black, and white cloth or wool. The colour of the devoured cloth, looking like a thin bit of wool, could be plainly seen through the transparent skin. These spin cases out of the fragments of wool which are very hard to detect, so neatly are they constructed.

The Caterpillar of the Mullein moth (Cuculia Verbasci) is well concealed among the bright flowers of the yellow mullein upon which it feeds.

The Caterpillar of the Small Tortoishell Butterfly (Vanessa urticæ) possesses the power of changing the colour of its chrysalis into something like harmony with its situation, as the following instances will shew.

On the 29th June, I got nine caterpillars, and placed them in a dull blue box.

On July 1st, one turned into a chrysalis, yellowish-green with pink on the points.

On July 2nd, another turned dull green with pinkish purple points.

July 4th, the third turned into a light purple chrysalis.

I got thirty more caterpillars, and one chrysalis of a bright golden colour on nettle.

July 5th, two more turned darker purple.

July 6th, 7th, three more turned, gradually getting darker.

Thus eight of the nine first found had varied in colour from yellowish-green to dark purple, according to the time the caterpillar was in the box before it turned.

Then I placed four caterpillars in a bright red box, five in a bright yellow box, and four in a bright blue box, leaving fifteen in the dull blue box,—two having died from ichneumon.

These were the caterpillars obtained on July 4th.

Those in the red box gradually became light purple, while those in the yellow box varied from purple back to greenish yellow, and those in the bright blue box became a brighter purple.

All the caterpillars had evidently been affected by the dull blue box, the most marked difference being in the yellow box.

Many moths resemble common objects, as the Herald Moth (Gonoptera libatrix) which resembles a withered leaf with a few spots of red and white fungus on it. The antennæ being laid back close to the body. At the base of each there is a small tuft of hairs which cover the bright eyes.

The Goat Moth (Cossus ligniperda) is like a lump of mud, so that not only is it protected by habit in its former stages, but by colouring it often escapes in the perfect form. The larva has a very disagreeable smell.

The Marveil de Jour (Agriopis aprilina) resembles the lichen on oak bark.

The Lime Hawk (Smerinthus tiliæ) requires sharp eyes to distinguish it on the green bark of lime trees, when it has just emerged.

Habit is of more use than colour in protection, and in some instances we find that both habit and protective colouration have been adopted.

The wavy flight of birds and butterflies, rising up and down, or flitting from side to side.

These, however, differ considerably, for while the bird has the advantage of speed, the butterflies' flight is more wavy, as the bird moves both wings at the same time, but the butterfly only moves those on the same side together, and produces an up-and-down flight much slower than the birds'.

When a bird pursues a butterfly it generally approaches from behind, and usually misses at the first attempt, owing to the uncertain flight of its prey. Perhaps the butterfly escapes untouched, but more often the bird just succeeds in touching the butterfly, and takes a piece out of or tears the hind wings at the back. This does not affect the flight, but if a piece were to be taken out of the front part of the wings it would render the butterfly helpless, as the veins and whole framework of the wings would be broken. Therefore it is manifestly to the butterfly's advantage to be pursued from behind. But this is more like one of Nature's secrets in protection, for we cannot suppose that butterflies formerly flew backward, and have learnt from experience to fly forward. The bird, ignorant of the most vital part of its prey's means of escape, probably endeavours to take its prey by surprise from behind, so as not to be seen.

The habit of many beetles and spiders in shamming death often preserves them from their foes, who would immediately devour them if they shewed signs of life.

Many spiders when hanging by a thread, if disturbed straighten out the six front legs close together to a point in front of the head, while of the two hind legs, one holds the thread, and the other is doubled up close to the body.

Butterflies and moths settle on things which closely resemble their wings, as:

Peppered Moth (Amphidasis betularia) on lichen on a lime tree.

The Autumn Thorn (Ennomos angularia) on yellowish bricks.

Willow Beauties (Boarmia rhomboidaria) on old wood.

Blues with their wings folded may sometimes be found resting in the evening on plaintain heads (Plantago lanceolata).

Orange Tip (Euchloe cordamines) settles for the evening on the flowers of white Umbelliferæ.

The Grey Dagger (Acronycta psi) on ash bark.

Carpet Moths on mortar.

Scorch Wing (Eurymene dolobraria) on loose stones.

The Yellow Underwing (Tryphæna pronuba) generally rests in thick foliage, and rises immediately when disturbed, with a strong rapid flight, like a yellow leaf driven rapidly by the wind, rising suddenly and then slowly descending lost to sight in the thickest shelter it can find. Often I have picked up dead leaves in summer, and carrying them in both hands, suddenly a yellow underwing has darted out and rapidly vanished near the ground.

Against this argument it may be said that the moths frequently fly when there is no wind, so they could not be mistaken for leaves blown about: but it is hard for the eye to follow them in their wild flight, and harder still to see them amongst the grass, where they look exactly like a dead leaf. The spots on the upper wings adding to the disguise.

Thus protective colouring is of use when habit with its disguises is discovered, and so of no avail.

Together with the Underwing we may mention the Small Heath (Cœnonympha pamphilus), the Small Copper (Polyommatus phlœas), and numbers of the smaller moths, which fly into the grass and hide among the thickest parts.

Grasshoppers can change to either green or brown, according to the colour of the locality.

The Stick Caterpillars resemble the twigs of the plant on which they feed, — Hawthorn (Cratægus oxyacantha), Yellow Jasmin, Snowberry Tree (Lycium barbatum), Privet (Ligustrum vulgare), Currant (Ribes rubrum), and Gooseberry (Ribes grossularia). Fixing the two pairs of claspers firmly and closely to the twig they stand out perfectly stiff for hours at a time. The strain is relieved by a thread of silk fixed to the branch and held by the front legs, whence it passes to the mouth.

Larvæ about to change to Pupæ are protected by burying, or by spinning a cocoon. These cocoons are generally formed between leaves, or in crevices of bark or wall. Some cocoons formed in the crevices of the bark are perfectly impossible to distinguish, formed as they are of chewed fragments of wood, till after the moth has emerged. There are plenty of these cocoons in the bark of the poplars at the top of the ground.

The Puss Moth (Dicranura vinula) makes a cocoon of the sub stance which best suits its situation. I had five of these caterpillars, which were kept in a blue cardboard box. When the time came for them to turn, refusing willow bark, they chewed up bits of cardboard and constructed very hard cocoons out of the fragments. Those cocoons made of wood are harder, the strength varying of course in proportion to the material used.

The larvæ of the Caddis flies make cases out of grains of sand with minute shells or bits of stick. These they drag about with them, only the forepart of the body appearing outside, and all attempts to pull them out fail, as hooks at the tail enable them to resist till pulled in pieces.

Leaving Entomology we have next to notice the Hermit Crab (Pagurus Prideauxii) snugly lying in the shell of a whelk, or smaller individuals in the shells of the purpura.

Patella pellucida lives on seaweed, the brown shell with its blue dots being in harmony with the brown leaves of Laminaria, besides being only uncovered at very low tides.

The Pholas constructs its dwelling in a neat circular hole in solid rock. How it does this is still an open question: it has been supposed to do it either by using an acid which softens the rock, or by turning round its rough shell and so wearing away the rock.

Chitons and Limpets are sometimes found covered with Algæ.

The Limpets, where there is no seaweed as Fucus Serratus or Fucus Vesiculosus to cover them, are worn at the top. Those surrounded by the weeds are not so much worn, but are lighter in colour, thus showing that the weeds protect the shells from the action of the water.

The larger Limpets wear for themselves holes in the rock. (At Scarborough it is mostly soft sandstone, which can easily be cut with a penknife.) These holes are visible in very soft rock, and in some of them the shells are almost buried. The smaller fish will sometimes take possession of the vacated holes, which are often too big for their new occupants.

A fairly common Sea Anemone (Tealia Crassicornis) covers itself all over with grains of sand and fragments of shells, so that not a bit of its green and red warted surface is to be seen, owing to its adopted coat which conceals its owner so well that it is rarely noticed unless expanded.

Limax Agrestis setties on the underside of light coloured pieces of dead grass.

But now we cone to the third method of protection,—Defence. In this the Puss Caterpillar, mentioned above, is one of the most interesting, as it possesses several means of defence. First there is the terrifying appearance, which is to prevent the caterpillar being touched; the head is withdrawn into the next segment, while the red margin is prominently shewn. There are two black spots, one on each side of tbe body, which appear like eyes. If touched on one side it immediately turns its face towards the spot where it was touched. From the forks of the tail two pink cords can be pushed out and waved about like whips. Beyond this the caterpillar also secretes a powerful acid, which it can eject with considerable force. Hairy caterpillars are not so often devoured by birds as those without hairs.

Gold Tails (Porthesia Auriflua) and Vapourers (Orgyia Antiqua) possess several tufts of hairs on the top of the body. When attacked, they place the head underneath and present these hairs to their foe. If these are seized they readily come out. This decidedly would not be pleasant to anything, which instead of a bite out of the caterpillar's back received only a mouthful of hairs, which were not easy to get rid of, and instead of gratifying the palate only tickle it.

Hairs also serve as a protection when the caterpillar falls. Most noticeably perhaps in the case of the Large Tiger Moth (Arctia Caja) which when falling curls up, and the bump is received on the long hairs which break the force of the shock.

The question has been asked, "Have the spines of the caterpillars of the Vanessæ any protective influence against nettle stings?" I do not think so, for I have seen the caterpillars of the Peacock Butterfly (Vanessa Io) place their hind feet, which cannot be said to be in any way protected by spines, on the sharp points of the hairs of the nettle leaves without any sign of discomfort or pain. The spines on the Vanessæ are exactly like the hairs on the nettles.

The Wooly Bear (Arctia Caja) is not protected by spines, but the hairs are very much thicker, and form a better protection.

Also I have kept other caterpillars in the same case as the Peacock or Small Tortoishell, and have not noticed them suffer from nettle stings.

Sea Anemones and Jelly Fish are armed with minute threads, called cnidæ, which produce the stinging. The former can also squirt out water.

Limpets can fix themselves firmly down to the rock by means of mucus secreted in the foot.

The bristles of the Bearded Mussel (Mytilus barbatus) would serve to protect it if a larger animal tried to devour the contents of the shell.

The Gurnet is not protectively coloured to harmonise with its surroundings, but is defended by spines pointing backward towards the tail, which is the point first seized by a larger fish, so that the spines would stick in its throat.

I have given these instances, all of which I myself have observed, to show how valuable a part Protective Colouration plays in Nature.

Several other instances could be brought forward, but this paper is limited to personal observation. Some of the examples may seem to be out of their places, but it is decidedly puzzling to know where to put some insects, whether protective colouration or habit is more used.

CHELTENHAM COLLEGE

Natural History Society.

REPORT

OF THE PROCEEDINGS OF THE SOCIETY FOR THE YEAR

1891

Sumptibus Editorum Cheltoniensium.

CHELTENHAM:
DARTER'S COLLEGE BOOK AND STATIONERY DEPOT,
1892

CHELTENHAM:
THOMAS HAILING, OXFORD PRINTING WORKS,
1892.

CONTENTS.

INTRODUCTION.

We are glad to be able to record further development of the Society in certain directions :—

Two new sections have been started—an Art one, in which good work has already been done ; and a Photographic, which will, no doubt, be strongly supported by the many photographers there are already in the College. A dark room for the use of the members of the latter is being built in the old racquet court near the Chapel.

Another most valuable feature is the extension of the Society to the Junior School.

We have to regret the loss of two of our most energetic members—E. A. Wilson, and H. Burkill—who have left College since the publication of our last Report.

THE COUNCIL, 1892.

President	THE PRINCIPAL.
Vice-President	REV. J. MUGLISTON.
Treasurer	W. M. BAKER, ESQ.
Secretaries ...	J. H. HICHENS, ESQ., G. G. PRUEN, ESQ.
President of Art Section ...	S. P. NESBIT, ESQ.
Secretary	L. C. TAYLOR.
President of Archaeological Section ...	W. H. D. ROUSE, ESQ.
Secretary	L. C. ADAMI.
President of Botanical Section ...	J. R. WYNNE-EDWARDS. ESQ.
Secretary	W. L. MELLERSH.
President of Entomological Section ...	W. GRIFFIN, ESQ.
Secretary	J. S. PARKER.
President of Geological Section ...	J. H. HICHENS, ESQ.
Secretary	A. H. PARKER.
President of Ornithological Section ...	M. TANNER, ESQ.
Secretary	D. C. WEBB.

BALANCE SHEET FOR 1891.

Receipts.

		£	s.	d.
Jan. 1891.	Balance in hand	13	11	6
April ,,	Subs., 2 Honorary Members ...	0	10	0
	80 Ordinary Members ...	4	0	0
June ,,	3 Honorary Members ...	0	15	0
	145 Ordinary Members ...	7	5	0
Nov. ,,	4 Honorary Members ...	1	0	0
	100 Ordinary Members ...	5	0	0
		£32	1	0

Expenditure.

		£	s.	d.
June 1891	Grant for Tintern Expedition ...	13	13	9
July ,,	,, Mayhill ,, ...	1	14	9
Dec. ,,	Ex. of Lectures, (Mr. Hichens,)	0	16	2
,, ,,	Ex. of Principal's Lecture ...	0	11	4
,, ,,	Ex. of Mr. Kirby's Lecture ...	0	5	0
Balance	... ...	15	0	6
		£32	1	6

W. M. Baker, *Hon. Treasurer.*
G. G. Pruen, *Hon. Secretary.*

A. A. Bourne, } *Auditors.*
A. S. Davis, }

* By an alteration of the Rules, members who have paid 5 consecutive terminal subscriptions are exempt from any further payment.

RULES.

1.—That this Society be called the Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That Ordinary Meetings of this Society be held on Fridays once in three weeks, at 5.30 p.m., or at such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

3.—That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4.—That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5.—That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-, and that all Members who have paid 5 consecutive terminal Subscriptions, be exempt from any further payment.

6.—That any Member whose subscription shall be a whole term in arrears shall cease to be a Member of the Society.

7.—That Members be encouraged to join sections for the more accurate study of the different branches of Natural History: that the formation of these be arranged, and the work settled at the first Meeting of each term: that each section be under a President, who is responsible for its Meetings and organisation, and that a Secretary be appointed by each section to keep minutes of its proceedings, of which a summary shall appear in the Report.

8.—That the Society issue a Report as often as the Council think fit.

9.—That the Officers of this Society consist of a President, Vice-President, a Secretary and Treasurer, who, with the Presidents

and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10.—That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11.—That in the absence of the President, the Vice-President, or, in his absence, a Member of the Council, shall preside.

12.—That the duties of the Secretary shall be to give notice of Meetings of the Society and the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13.—That the Treasurer's accounts, after the approval and signature of two Auditors, to be appointed at the last Meeting of each year, be laid on the table at the first Meeting of the succeeding year.

14.—That the Officers constitute for the time being the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15.—That the Secretary have power by a vote of the majority of Members present, at a Special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct should be adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of an ex-Member to be permitted during the next term.

16.—That the Members of the Society on leaving the College become corresponding Members.

17.—That no alteration be made in these rules except at a General Meeting at which 21 Members at least are present, and then only provided it is carried by a majority of two-thirds of those present.

Reports from Sections.

ARCHAEOLOGICAL SECTION.

President - - - - Mr. Rouse.

Secretary - - - - L. C. Adami.

During the school year two lectures have been given, and two expeditions made. The first lecture, given in the Lent Term, was upon the Man in the Moon. Examples of this legend were given from several European nations. In all of them he is a Sabbath breaker and in most of them a thief. Was this story then invented since the introduction of the Christian Sunday? To find out the answer to this question, a number of savage myths were passed in review.

What is the Moon, and how did it get into the sky? The Moon is sometimes a bundle of lighted reeds, thrown up into the air to keep the animals from treading on each other's toes. Or it is a manufactured article, made in a workshop, and carried all night by a dumb old man under his arm. Or he is a living being, a woman or a man. The Sun and Moon are brother and sister; or they are husband and wife, and the stars their children. The Sun eats all his children up (what we see is his stomach, full of them); and the Moon goes into mourning when he does so. By degrees she gets cheerful (and round) again; then the Sun eats some more. The spots on the Moon are explained as all manner of things; ashes smeared on her face, groves of trees, a toad, a cat, a frog, a rabbit, a man, a woman, a haystack, a bundle of sticks, and a cabbage—what not, indeed! the list is not half done. The eclipse give rise to the most astonishing stories. Mostly it is a monster trying to eat the Moon, and he must be frightened away with all possible noise. Sometimes the people catch all the dogs they can find, and beat them ; it is believed that the big dog in the sky will leave off out of sympathy with the little ones. Here is a mass of evidence, drawn from all the lands of the earth, shewing that the moon is regarded as either a living being, or the home of one of them. The man, the dog, and the bundle of sticks all find their parallels. It is thus clear that our nursery tale goes back to the infancy of the world; the Sabbath-breaking is an addition which belongs to some period within the last 1800 years.

The lecture closed with a word of warning. Everyone should be careful not to have his hair cut at full moon ; as the moon wanes, the remaining hair on the head will wane ; and when the moon disappears, the head will be bald. Also linen shirts washed at the new moon will bulge out and pucker as the moon waxes.

The second lecture was given in the Summer Term, in preparation for an expedition to the remains of a Roman Villa at Whitcombe. A sketch of the history of Roman Houses was given. The Romans originally lived in huts made of a framework of poles, roofed with the branches of trees, which were tied together at the top, and the interstices filled in with wattling plastered with mud. One of these huts used to be preserved in Rome as a sacred relic. It was called the hut of Romulus (*casa Romuli*), and stood on the Palatine Hill ; it was afterwards removed to the Capitoline. A very good idea of these huts may be got from a very curious kind of cinerary urn found in Latrium and Etruria. It is well known that savages often bury a man in his house, which they shut up with all his possessions in it and use it no more. The ancient Italians hit on an economical way of satisfying their scruples without expense. They made a miniature clay hut, and placed the man's bones or ashes in it. The structure of it is perfectly clear; it is built as described above, and has a door closed by a bar. [Specimens are in the British Museum.] These huts idealised gave the shape of the Temple of Vesta, in which, as is often done in the chief's house of a savage tribe, fire was kept burning day and night.

The Roman Villa of the classical period, however, was a Romanised Greek house. It consisted of an inner court surrounded by buildings, following more or less a fixed plan, yet must not suppose that the plan was never varied. There was as as much variety in Roman houses as there is in English. Plans were shown of a typical Roman villa in Pompeii, and the use of the different rooms explained. A restoration of the interior and general view was shown; and copies of some extremely interesting mosaics. These belonged to the palace of Pompeianus, Proconsul of Africa in the reign of Honorius (the modern name of the place is Oued-Atmenia—see *Trans. Royal Inst. British Architects*, 1884-5, p. 139). This man was so proud of his house that he had a picture of it done in mosaic and put down on his dining-room floor. It shows the outside aspect, with a noble disregard of perspective. The place looks like a large College or even Castle. It is three stories in height, not reckoning the ground-floor. Along the upper stories ran rows of windows, of different shapes, with shutters. Every here and there are high towers. The roof slopes, and there seem to be chimneys along the top. At the top of the towers is an awning. Over the roof are seen the tops of fir and other trees which grow in the interior square. The owner was a sporting man; and he has elaborate pictures of his stables; inside are seen the horses tethered in their stalls, each with his name over him. The Roman house has one other interesting point. The earliest monastic houses were modelled upon it, because it so happened that one was actually used as a monastry. Hence our Colleges are lineal descendants of the Roman villa. A few words were then said of the gigantic palaces of some of the Roman Emperors, such as Nero's Golden House.

The next day an excursion was taken to Whitcomb. The remains of the villa are the floors of two bath-rooms. Both are in fairly good preservation. One is of a rather common kind, without any fine mosaic, and was perhaps meant for the servants. The walls are standing about two or three feet high. Underneath the better bath can be seen the hypocaust. The floor is supported on pillars built of flat square bricks. In the field adjoining can be traced the foundations and part of the walls of the dwelling rooms; while large unshapely mounds show that there is plenty to be found here. It is a lasting disgrace that the ruins are not properly excavated and cared for.

In the Summer Term, a party visited Deerhurst. The sights of interest are the Church and a Saxon Chapel. The Church itself dates from the Saxon period, but contains work of other dates as well. There are several doors and windows made in characteristic Saxon style. One in particular is remarkable for its ornamentation.

The church contains a very ancient font, and a little old stained glass. The chapel forms part of a farm house, where it was found by accident during alterations. It has for centuries been divided, and used part as a bedroom, part as the kitchen. Some curious carvings were found in it, and a Latin inscription of Saxon date. Rubbings were taken of the brasses in this Church. One is an interesting example of the thirteenth century costume,—it is the monument of Sir John Casey, Chief Baron of the Exchequer.

ART SECTION.

President - - - - MR. NESBIT.

Secretary - - - - L. C. TAYLOR.

THIS section was created in September, 1891. The number of members is 38. Its object is to encourage a love of Art, and to facilitate a study of its various branches. To this end it is desirable to:

1. Arrange for lectures bearing upon Painting, Sculpture, and Architecture.
2. Organize expeditions from time to time to places having Picture Galleries, Museums, Buildings, and other objects of Art interest.
3. To give every encouragement to the study of Art in detail.

Under this head the section has already had the advantage of a most interesting Lecture, given by Mr. Rouse, on "Greek Vase Paintings."

It is to be hoped that this will be followed by a lecture on Greek Sculpture, by a historical sketch of the Old Masters of Painting, or by a lecture on Gothic Architecture.

This latter would seem especially appropriate now that efforts are being made to build a new Chapel for the College.

Some twenty members, last November, visited the Birmingham Art Gallery, where, in addition to the permanent collection, the members were able to contemplate a loan collection comprised mainly of the works of the Pre-Raphaelites, Burne Jones, Millais, Holman Hunt, etc.

Through the courtesy of Mr. Councillor Bradley, the party were on the same occasion enabled to visit the Town Hall and Municipal Buildings.

A visit to the Worcester Potteries should be of interest.

If a rendezvous could be arranged, a meeting at the National Gallery, during the early days of some vacation, would be instructive.

A trip up to the Royal Academy of Arts during next term should, if possible, be organized.

A few members have met together in the drawing room, and worked at drawing for one hour a week, after school. This work should receive every encouragement. It is a pity that there is no other room available for these meetings, for if a proper studio could be provided a great impetus would be given to Art study.

Some Art periodicals should be supplied for the members to study, and a few casts and pictures should be placed in the room. A prefect should be appointed custodian of the studio

In the coming term it is proposed to give every encouragement to Sketching from Nature. One naturally thinks of the half-holiday as a most suitable time for the practice, but it is to be feared that compulsory games will make it necessary to choose some other time.

Later on in the year, it is hoped that some members may be interested in practical lessons in Etching on copper.

PRIZES:

1. The best Painting from Nature of a Boat, a Building, a Tree Stem, or a Group of Rocks.
2. The best Drawing in Pen or Pencil of one of the above subjects.
3. The best Drawing or Painting from a copy of any kind.

In all cases the work submitted must be entirely produced by the member.

SIDNEY NESBIT.

ENTOMOLOGICAL SECTION.

President - - - - MR. GRIFFIN.

Secretary - - - - J. S. PARKER.

THE weather during the past season has been most unfavourable for much work to be done during the day. This we hope is the cause of only two collections being shown up for the Prize. H. J. Burkill (O.C.) took dycaena bellargus plentifully in one glade near Cranham, though dycaena arion was not to be found in the haunts where it was so plentiful twenty years ago. This capture of bellargus may be considered really as an addition to our lists, as the one recorded last year was only seen and not taken. Hypialus sylvanus reappeared near Shurdington, and Cymatophora octogesima was dug near Swindon. This latter insect seems to occur every year though in small numbers.

The Prize Collection by J. S. Parker was chiefly made during the holidays, so the majority of Insects were taken away from Cheltenham. Of those taken near here we may add the following to our lists :—

Spilosoma urticae.
Halia vauaria.
Melanippe procellata.
Anticlea nigrofasciaria.
Coremia ferrugata.

Perhaps the most interesting specimens in the collection were the Lime Hawks (Smerinthus tilae) which included two varieties.

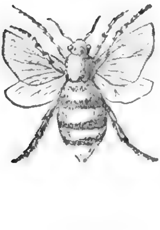
(1) Upper wings : light silvery grey with green markings. Hind-wings. Dark sepia. Body : grey-green with green markings.

(2) Upper wings : pale reddish-yellow with dark red markings. Hind wings : smoky brown. Body : reddish yellow with orange coloured markings.

Parker, in Notes sent up with his collection, says " Lime Hawk Moth on the trees on the College Ground, just out of the chrysalis. This Moth is very liable to variation, but the one placed just below the four is I think a distinct variety ; in no way except in shape is it like the rest, wherever it ought to be green it is red. It was caught hanging to a red brick wall : a lime tree was growing just over it. Could the red brick dust at the foot of the wall in which it was most likely buried, have anything to do with its remarkable change of colour ? "

O. R. Bagnall was the other exhibitor, with a small collection though every specimen was perfect and well set. We have not had to record the following before :—

Leucania lithargyria.
Mamestra furva.
Apamea basilinea.
Caradrina alsines.
Caradrina taraxaci.
Cleoceris viminalis.
Haprostola tripartita.
Anticlea badiata.
Cidaria miata.
Cidaria truncata.
Cidaria prunata.



THE GEOLOGICAL SECTION.

President - - - - MR. HICHENS.

Secretary - - - - A. H. PARKER.

ON FEBRUARY 13, 1891, Mr. Hichens delivered to the Geological Section a lecture on "How long has man lived on the earth?" Tracing his way backwards, the lecturer dismissed with a word the last four thousand years. In 4450 B.C. one comes to the famous Prisse papyrus, the most ancient papyrus known. [The nature of a papyrus was explained.] The Priss papyrus is interesting as showing how little human nature has changed during the long lapse of years—in it the writer "laments the good old days that have passed away!"

To 4500 B.C. belongs the oldest writing in the world—Hieroglyphic inscription (diagram) from a tomb erected by Sent, King of Egypt, during the Second Dynasty, to the memory of Sherd. The slab of limestone which constitutes the inscription is, at present, in the Ashmolean Museum at Oxford. On it is represented a feast. The apparent incongruity of the representation of a feast in a tomb, was explained as due to the old belief that after death a man took pleasure in and required those things which he had enjoyed during life, and it was shown how this belief still lingers in certain places. In Brittany, on All Souls' Day, the peasants bank up the fire, and leave the fragments of the supper on the table for the dead of the family, who, they believe, will visit their home that night. In India, some years ago, a British officer, to whom the natives had become much attached, died, and it was discovered that for long afterwards his friends were accustomed to bring and lay on his tomb the two things of which he was most fond during life—namely, cheroots and brandy! The same belief survives in funeral rites, In German villages shoes are put on the feet of the corpse for his dread journey to the next world, and a needle and thread are added for him to mend his clothes with. Similarly at an Irish wake a piece of money is put into the dead man's hand, and in our own country the war horse is led in a general's funeral.

The Hieroglyphic writing is an entremely complicated kind of picture writing. Examples of picture writing were shown : one, the record of an expedition across a lake, and the other an Indian petition which was actually presented to the United States Government not many years ago. The fact that the Hieroglyphics are so complicated is of itself a proof of man's existence at a time long before 4500 B.C., this inscription being the oldest writing which has survived. For proof of man's existence at a still earlier time, one must look to other sources. Human bones, or things bearing the mark of human workmanship, would be sufficient.

Attention was drawn to the presence in many of our limestone hills of winding passages, or caves—due to the erosion of the rock by trickling water, and not necessarily bearing any connection with the sea at all. Under the floors—*i.e.*, the stalagmite—of the caves are to be found the teeth and bones of animals which are no longer living in Enlgand, and often quite extinct.

One of the most celebrated of such caves is Kent's Cave at Torquay. An account was given of the first attempt to systematically explore it by Macenery, and of the facts which led him to the conclusion that man had been living in Britain at the same time as the mammoth, hyæna, rhinoceros, Irish elk, etc. Macenery's "finds," and the deductions he drew from them, were submitted to Professor Buckland, of Oxford, who at once accepted the flint implements as of human workmanship, but held that they had come to lie side by side with the remains of extinct animals by accident, and not in the natural course of events ; and that, therefore, Macenery's conclusions were not to be accepted. The question lay in this unsatisfactory condition for more than 30 years. People could not believe that man had been contemporary with races of animals, many of which have since disappeared from the face of the earth by the slow process of extinction. [In connection with this part of the subject the lecturer shewed flint implements, the remains of cave fauna, and diagrams of harpoons made of reindeer antler, bone bodkins, &c., and explained the points by which one distinguishes between the flint implements and frost nipped flints, and the modes in which the implements were probably manufactured.]

In 1858 the question as to the contemporaneity of man and the mammoth was settled beyond question by the discovery and exploration of Brixham Cave, some six miles from Torquay. Its first discovery by Philp, the formation of a Committee, including Professor Prestwich, Sir Charles Lyell, and Mr. Pengelly, to work it out, and the mode of exporing it, were dealt with by the lecturer. Its importance lay in the fact that it was a virgin bone cave, and the method of working it out was such as to compel belief. This method was explained by Mr. Hichens, with the aid of a section of the cave.

The cave itself was due to erosion; in its bottom came a layer of gravel; consisting of water-worn pebbles, and upon this lay the reddish cave earth, varying in thickness from two to four feet, and containing flint implements and other works of man mingled with the bones and teeth of animals; lastly the whole was sealed down by a layer of stalagmite. A detailed account was given of the things that came from the cave earth, and also of the very interesting "finds" in similar positions in the caves of Dordogne, explored by M. Lartet and Christy.

Attention was drawn to the sculptured mammoth tusks and reindeer antlers which go to prove that the old Stone age men had reached a high pitch of artistic culture, and to the discovery of the whole mammoth, with its flesh and hide intact, in Siberia, corresponding exactly with the sculpture on the mammoth tusk.

But few of the actual remains of the Palaeolithic man himself have been brought to light. An account was given, and diagrams shown, of the Neanderthal and Engis skulls, and it was pointed out that skulls speak with an uncertain sound, as the absolute bulk of the brain is not necessarily much less in savage than in civilized man, for Esquimaux skulls are known of 113 cubic inches capacity, *i.e.*, hardly less than the largest Teutonic one. As to the way in which human remains became mixed with the bones of extinct animals, many things suggested that the caves had been used as a den by hyænas—namely, the abundance of hyæna remains, forming 30 to 40 per cent. of the whole of Kent's cave, the correspondence of their teeth with marks on the bones, the presence of their coprolites, the absence of complete long bones, and skulls—and further probability was lent to this view by Buckland's experiments at Wombwell's menagarie, and "Pengelly" at the Zoological Gardens, which shewed that the fragment of the long leg bone of the ox after it had been "eaten" by a hyæna corresponds almost exactly with the long bone of the extinct ox found in Kent's cave (diagrams of the long bones of ox and extinct ox, hyæna jaws, rhinocerus skull, &c.) From time to time, however, the hyæna had to give place to roving bands of savages, who would use the cave as a shelter. That man and the hyæna do alternately make use of the same cave was observed by Canon Tristram during his travels in Morocco and Syria. Moving about in the poor light, the men would drop their implements, which would thus become mingled with anything that might be already lying on the floor. Finally, the whole was sealed down with Stalagmite. [Stalagmites and Stalactites were shewn, and their origin explained—diagram of Stalactite cavern.]

Mr. Hichens then proceeded to consider what is suggested as to the date of man's first appearance on the earth by these caves and by other lines of evidence. Wherever we look it points to great antiquity. First, the Stalagmite. Its nature, consisting of thin liminæ, shews it to have been formed slowly, and if the percolation of water through the rock became too rapid, not only would there be no formation of Stalagmite, but any which had been already formed would tend to be washed away. Again, in the Stalagmite of Kent's cave there are certain inscriptions cut : "Robert Hedges, of Ireland, Feb. 20, 1688," and "William Petre, 1571." If these inscriptions are genuine, and if the rate of formation of the Stalagmite has been uniform from the first, it is clear that it is exceedingly slow. It was shown that the rate of formation had probably been uniform : where there is copious drip now, there is the Stalagmite thick : where there is little drip, there is next to no Stalagmite : and the reasons for believing the inscriptions to be genuine were given. Maccenery's account of the "Robert Hedge's" one almost accurately describes it as it stands now, and yet it was written more than fifty years ago ; and with regard to the older of the two, the three questions, "Was Kent's cave known in 1571 ?" "Did William Petre exist ?" "Was William Petre, if he existed, likely to have cut the inscriptions ?" were all answered on the affirmative, so that the inscription is probably genuine. Mr. Pengelly considers that here the Stalagmite is formed at the rate of 1-20th of an inch in 250 years ; and yet in Kent's Cave in one place it reaches a thickness of twelve feet !

Next, the consideration of the animals which were contemporary with man leads to the same conclusion. They belong to three different groups—those, *e.g.*, horse, still living in England, those, *e.g.*, the brown bear and reindeer, living in other parts of the world, but no longer in England, and those, *e.g.*, the mammoth and cave lion, quite extinct. Now, every known fact suggests that the causes which lead to the extinction of groups of animals act very slowly, and that therefore the disappearance of so many genera implies a long lapse of time.

Similarly with the archæological evidence. Between the Old Stone age man—to whom the unpolished flint implements belonged—and the Historic period, come the New Stone age, the Bronze age, and a portion of the Iron age, and each of these probably represents a long interval. That this is so is emphasised by the peat bogs of Denmark; they prove the vegetation of the country to have changed three times—from pine to oaks with sessile leaves, from oaks with sessile leaves to others with pedunculated leaves, and finally to beeches, which are now the dominant race. There is evidence to show that the beech was already in full possession at the time of the Romans, so that perhaps 2,500 years may be taken as the minimum for the beech period; and so with the oak and pine periods, yet not a trace of any extinct animal has been found even at the bottom of the pine deposit of the peat bog; and it takes us back at the most to the limit of the New Stone age—*i.e.*, to the period subsequent to the cave earth deposit of Brixham and Kent's caves.

Mr. Hichens also discussed the theories that have been put forward in explanation of the Ice age. Man seems to have been at least Glacial, and some people consider that there is sufficient evidence to justify the belief that he was pre-Glacial. On Croll's theory the Glacial period in England died away not less than 80,000 years ago. So it is with regard to the changes that have taken place in physical geography since man's first appearance. Implements are to be found in river gravels as much as 200ft. above the present level of the river, and every known fact goes to show that the rate at which a stream cuts its way to a lower level is extremely slow.

Wherever we look—whether we consider the cave deposits themselves, or the changes that have taken place in the animal life, or the periods that come in between the Old Stone age and our own time, or the probable date of the Glacial period, or the alterations in physical geography—everything points to the same conclusion, that the time since man's first appearance on the earth is to be numbered by many thousands rather than hundreds of years.

On May 20th Mr. Hichens gave a Lecture on "Life in the Primary Period," illustrated by Fossils from the Museum, and by Lantern Slides.

On Thursday, November 12th, Mr. Hichens gave a lecture on "Darwinism." The interest of the subject and the popularity of the lecturer combined to produce a crowded room. The lecture was most interesting, the subject being handled in a very masterly manner. The following is a fairly accurate account of what was said.

From time immemorial up to the end of last century, it was the opinion of all that every species of animal and plant owed its present form and its original existence to a distinct act of special creation. The Creator, it was held, had formed each kind after a particular pattern, had endowed it with special organs, and had bestowed upon it the power of reproducing its like in its own image for all generations. This is the doctrine of the "fixity of species."

On the other hand it is now believed that all animals and plants were not originally created as we find them, but that, instead, there were brought into existence a few simple forms endowed with the power of developing into higher and more complex ones, and that from these few forms all living things have descended. This is the doctrine of "descent with modification" or "evolution," and it is often popularly, though wrongly, known as "Darwinism,"—the two things, "doctrine of descent" and "Darwinism" being distinct. The doctrine of descent is the theory that all living organisms are related to one another by blood ties—that they are all descended from common ancestors—changes in their structure, etc. having appeared as generation succeeded generation, whereas "Darwinism" is merely an explanation of the way in which these changes in structure, and ultimately of one species into another, were brought about.

Mr. Hichens having given a brief sketch of the theory of Natural Selection, pointed out that there are many lines of evidence in favour of both Organic Evolution and Darwinism, for example—the possibility of a classification of animals and plants,—the similarity in structure of members of the same class no matter what their habits may be,—the existence of rudimentary organs,—the existence of fossil forms intermediate between distinct living ones,—certain facts in the Geographical distribution of animals, Embryology, etc. Mr. Hichens, by reason of the shortness of time, dealt with only one of these arguments—that from Palaeontology.

A. The testimony of the rocks shews that from the beginning of Geological time up to the present there has been a gradual advance from low forms of life up to higher, and that the higher the group of animals the later does it appear : thus the Eozoon appears in the Laurentian period, Fish in the Upper Silurian, the Frog tribe in the Carboniferous, Birds in the middle of the Secondary, and Man himself not until the end of the Tertiary.

B. If Evolution be true, all groups of animals and plants must have been connected by intermediate forms, i.e., there must have been a perfect chain from the highest to the lowest.

To-day, of living creatures there are no two groups more distinct than birds and lizards—if they have always been so, the theory of Evolution falls! but links between the two are to be found in the toothed birds Hesperornis and Ichthyornis, in Archaeopteryx with its reptilian tail and clawed wings, and in the Deinosaurs of America which correspond in structure with the unhatched chick, and are intermediate between crocodiles and the hatched chick.

Though there must have been a perfect series of such gradational forms between all organisms, but few of them will be found because of the necessary imperfection of the Geological record, and it is almost impossible to over-estimate this imperfection, for there are many animals—e.g., sea-anemones—without any skeleton or hard parts and such cannot become fosilised, and will therefore be unrepresented ; again the life of large areas will be missing ; it was shewn by the Challenger expedition that over thousands of square miles of the deep oceans there is but the slightest deposit accumulating in the sea bottom, though the surface waters teem with life : and lastly even though the remains should become entombed there are causes at work which tend to obliterate every trace of them—e.g., the percolation of water and Metamorphism.

Still more rare will it be to find rocks containing a series of links showing the development of any given animals, for one would require firstly an area in which an unbroken series of strata were deposited for a long time, secondly, animals so numerous as to furnish the requsite remains, thirdly, the nature of the deposit must be such as to secure the preservation of the remains. As a matter of fact all these conditions are best satisfied in the case of the horse, in which the traces of its development from a generalised mammal with five separate toes are forthcoming. The structure of the horse and every stage in its development were explained.

The various points in the Lecture were illustrated by large paintings and diagrams.

ORNITHOLOGICAL SECTION.

President - - - - MR. TANNER.
Secretary - - - - D. C. WEBB.

AGAIN we review the work of the Section and may record an improvement, although this year we miss from the list of eggs some that are rare, such as the Heron, Goldfinch, Swan, and Red-legged Partridge, yet during the past season an addition of no small worth has been made to the list of Cheltenham Birds by the discovery of a pair of Marsh Warblers breeding in the neighbourhood. Since last February there have been six sectional Meetings held. On February 21st, Mr. Scot-Skirving read a Paper on "The Migration of Birds." On March 7th, A. H. Parker read a paper on "Colours of Birds." On March 28th, E. A. Wilson read a paper on "Structure of Birds." On October 31st, D. C. Webb read a paper on "Gulls and their Haunts." On February 20th, N. McCall Smith read a paper on "Swallows." On March 12th, the President read a paper on "Some Pleas for the Rook and the Small Birds." Since last year the proposal of renewing the Egg Collection in the Museum has several times been brought forward, but since the eggs required do not seem to be forthcoming the old collection still remains. It is hoped therefore that those who are interested in eggs will present any duplicates they may have in their possession. The point in which this section most needs improvement, is in collecting dates of the arrival and departure of migratory birds and getting together the minor observations, which are always turning up. The following are the notices gained this year:—

DATE.		NAME OF BIRD.	OBSERVER.
March	28	Thrush	Wilson
April	10	Blackbird	Wilson & Webb.
,,	10	Robin	Webb.
,,	10	Hedge Sparrow	Webb.
,,	10	Stock Dove	Wilson.

DATE.		NAME OF BIRD.	OBSERVER.
April	13	Missel Thrush	Webb.
,,	13	Lapwing	Webb.
,,	16	Carrion Crow	Wilson.
,,	27	Magpie	Webb.
,,	29	Long-tailed Tit	Wilson.
,,	29	Sky Lark	Wilson.
,,	29	Wild Duck	Wilson.
May	3	Starling	Webb.
,,	3	Chaffinch	Wilson.
,,	6	Great Tit	Webb.
,,	6	Blue Tit	Webb.
,,	6	Sparrow	Webb.
,,	7	Jackdaw	Wilson.
,,	9	Jay	Wilson.
,,	9	Kestrie	Wilson.
,,	9	Marsh Tit	Wilson.
,,	9	Tree Creeper	Wilson.
,,	9	Rook (young)	Webb.
,,	9	Redstart	Wilson.
,,	10	Moorhen	Wilson.
,,	10	Tree Pipit	Kerr.
,,	10	Cuckoos	Parker.
,,	11	Pied Wagtail	Parker.
,,	12	Bullfinch	Persse.
,,	12	Linnett	Parker.
,,	12	Chiff Chaff	Kerr.
,,	14	Black Cap	Kerr.
,,	15	Willow Warbler	Parker.
,,	17	Whitethroat	Innes.
,,	17	Lesser Whitethroat	Baines.
,,	17	Wren	Baines.
,,	18	Red-backed Shrike	Wilcox.
,,	19	Whinchat	Wilcox.
,,	21	Yellow Hammer	Wilson.
,,	21	Swallow	Wilson.
,,	22	Sedge Warbler	Webb.
,,	24	Meadow Pipit	Powell.
,,	25	Sand Martin	Wilson.
,,	25	Greenfinch	Fisher.
,,	31	Reed Bunting	Webb.

DATE.			NAME OF BIRD.		OBSERVER.
June	1	...	Garden Warbler	...	... Wilson.
,,	6	...	Spotted Flycatcher	...	... Kerr.
,,	11	...	Marsh Warbler	...	... Wilson.
,,	13	...	Wood Pigeon	...	... Webb.
,,	16	...	Swift ...	...	... O.C.
,,	17	...	Green Woodpecker	...	... Wilson.
,,	18	...	House Martin	...	... Wilson.

April	10	...	Chiff Chaff arr.	...	... Wilson.
,,	15	...	Willow Warbler arr.	...	... Wilson.
,,	18	...	Swallow arr. ...	...	... Wilson, (Cheltenham)
,,	22	...	Swallow arr. ...	...	... Webb, (Liverpool)
,,	19	...	Wheatear arr.	...	... Wilson.
,,	20	...	Redstart arr. ...	...	... Wilson.
,,	23	...	House Martin arr.	...	... Webb.
,,	25	...	Cuckoo arr. ...	...	... Wilson. Webb.
,,	25	...	Sand Martin arr.	...	... Wilson.
,,	28	...	Tree Pipit arr.	...	... Wilson.
May	3	...	Blackcap arr....	...	... Wilson.
,,	4	...	Corncrake arr.	...	... Wilson. Webb.
,,	5	...	Wood Warbler arr.	...	... Wilson.
,,	8	...	Red-backed Shrike arr....		... Wilson.
,,	10	...	Swift arr. ...	...	... Wilson. Webb.
,,	9	...	Lesser Whitethroat arr....		... Webb.
,,	21	...	Spotted Flycatcher arr....		... Wilson.
August	28	...	Swift dep. ...	...	... Webb.
Octob.	12	...	House Martin dep.	...	... Webb.
Nov.	3	...	Swallow dep ...	...	... Webb.
Octob.	12	..	Redwings arr.	...	... Webb.
Octob.	19	...	Fieldfares arr.	..	... Webb.

Arr. stands for arrival or first seen.

Dep. stands for departure or last seen.

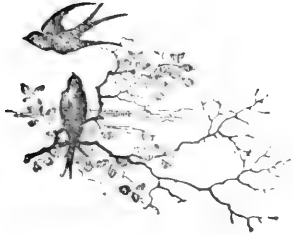
February	20	...	Rooks began building	...	Webb.
March	16	...	Jackdaws began building	...	Webb.
March	28	...	Starlings began building	...	Webb.

Nest of Great Tit.

April 28—May 6 ..	9 days from beginning of building to laying of first egg.	
May 6—June 16...	42 days from laying of first egg to departure of the young	
April 28—June 16...	51 days altogether	Webb.

On September 7, a flock of Swallows numbering over a thousand was observed at Stratford-on-Avon hovering over a willow plantation. It was learnt that the birds annually congregate at this spot preparatory to migration. ... ... Webb.

The Sectional Prize was given by the President to Webb. The book was "British Birds" (Saunders).



THE DISPERSION OF SEEDS.

On September 29th, H. Burkill, Esq., B.A., Keeper of the Herbarium, Cambridge, gave a most entertaining lecture upon "The Dispersion of Seeds," of which the following is a resumé :—

On Leckhampton Hill are two cleared patches—one of these has been done for the sake of the turf, and the other was caused by the Jubilee Bonfire of 1887. When we examine these areas we are struck by the different proportions between the various kinds of plants on them, and on the neighbouring surfaces; in one grass is relatively abundant, in the other it is relatively scarce. We must consider why it is so. Well you say it is because just those plants have sprung up there and the grass has not had time yet to grow densely. But why has not the grass had time to grow dense and matted as yet? This is the point in studying dispersion of seeds, for we thereby find out how new seeds are carried to new places, and why some plants get there before others.

The first prominent fact in considering this point lies in this statement—*That all plants produce more seeds than will eventually grow.* This is shewn by the following table:

Name of Plant.	No. of Seeds to each Flower.	Total No. of Seeds to one Plant.
Gentiana campestris	50	1,000
Angelica	2	13,200
*Ceyhalanthera grandiflora (Lady's Slipper)	6020	24,080
Plantago major (Plantain)	10	35,500
Sambucus infra (Elder)	3	80,400
*Orchis maculata (Spotted Orchis) ...	6202	186,300
Betula alba (Birch)	1	1,593,600
*Maxillaria (Foreign Orchids)	1,756,440	10,538,640
*Acropera " "	371,280	74,000,000

* From Darwin's "Fertilization of Orchids."

Let us take our English Spotted Orchid with its one hundred and eighty six thousand three hundred seeds.

Each plant occupies about a square of six inches and thus we can have 174240 plants in one acre. Now since some seeds are sure to be bad and incapable of germinating, let us for convenience assume that one plant produces 174240 good and 12060 bad seeds. This I think seems a fair supposition. The children of our one plant will cover an acre, but the grandchildren must cover 174240 acres—an area which would occupy most of the Vale of the Severn from Gloucester to Worcester and from Cheltenham to Malvern. The great-grandchildren further would cover 174240 times the space of their immediate parents, or nearly the land of the whole globe (47 : 50).

Now take Acropera, we have children 74 millions, grandchildren 5,476 billions, great grandchildren upwards of half a trillion or 405,224,000,000,000,000,000,000 plants.

Allowing the same percentage of bad seeds as in the Spotted Orchis, these great-grandchildren would being larger plants suffice to cover the land of the whole world twelve million times over.

From this nothing can be more obvious than *that most of the seeds produced can never grow to anything.*

A second point is brought forward by the fact that seedlings growing too closely kill one another—the stronger starving or shading the weaker: hence *it is to the benefit of a plant to scatter its seeds widely.* Thus in our Spotted Orchis, for the progeny of one individual to cover an acre, some of the seeds must travel to a distance of 25 yards. Similarly requirements must act in other plants, and it is this which produces the following main methods whereby plants disperse their seeds.

1. Wings or folds to the fruit or seed.
2. Parachutes to the fruit or seed.
3. Hooks or barbs to the fruit or seed.
4. Bladders to the fruit or seed.
5. Minuteness of the seeds or fruits.
6. Hurling of the seeds by the parent.
7. Fleshy fruits attracting birds, etc.
8. Floating of seeds or fruits.
9. Simulation of insects.
10. The blowing about of the dead plant or of a part of it.

Wings are flat light structures which offer a large surface and so enable the wind to blow the seeds farther than it would otherwise. The seed which has the largest wing known belongs to a Tropical Vegetable Marrow, by name Zanonia It is a pretty sight to see one of these seeds sweep round in a big circle more easily than any broad-backed Gull. Bignonia indica has a wing which is almost as effective. Another point worth noticing in this connection is how many of our English trees use this method to distribute themselves, as the Birch, Elm, Ash, Pine, Maple, Sycamore, Lime, and here as the seed has farther to fall than in a low plant, the wind must be able to blow it away from the shade of the parent.

Parachutes occur in many plants, all our Thistles, our Dandelions, Bullrushes, Willows, Cotton-grass, Willow-herbs,—and their effectiveness is quite obvious when we see a field overgrown with thistles, rank on rank like the armed men which sprang up from the Dragon's teeth in the old legend of Cadmus.

There is a common little English plant which has two kinds of fruit, one for sailing abroad with a parachute and the other without, and this latter kind reproduces the parent at home.

Of the third class we have many representatives in England,—such as Burdock (Arctium), Agrimony (Agrimonier), Forget-me-nots (Myosotis arvrusis and others), Enchanter's Nightshade (Circea) Horehound (Cynoglossum), Cleaven (Galium), Herbbesist (Getne), Bidsus.

Uncaria, the grapple plant, or Wait-a-minute Thorn of South Africa, has very formidable seeds with long hooked thorns. It has been known to kill a lion indirectly, by causing a wound which when inflamed lamed the unfortunate beast to such an extent that it was starved to death.

Blumenbachia, a plant from the Andes, has fruits covered with stinging hairs, but when the seeds are ripe these stinging hairs have done their duty, and wither ; but besides these there are very many knobby barbed hairs, and these stick to any passing animal and so are distributed without any great inconvenience to the carrier. Similar to this is the arrangement of backward directed bristles in the Barley, whereby the ear after once entering the wool of a sheep is forced to penetrate deeper and deeper till disintegration occurs. In this connection may be mentioned a grass from Mid and South Europe which forces its way into the wool of sheep by means of the twisting and untwisting of the bristle, according as whether it is wet or dry ; a long plume hinders any retreat, and as the fruit is sharp-pointed it penetrates into the back of the animal frequently.

Bladders are generally formed by a loose calyx and are well seen in Colutea, the bladder Senna Staphylea Physalis, the Cape Gooseberry, and in a little English Clover (Trifolium fragiferum).

Seeds are distributed abundantly by being blown about with the dust. For this they must be small,—such seeds we get in Orchids, Gentians, Campanulas, Broom-rapes, and Chickweeds. M. Richard, a French Botanist, has found on the seven great churches of Poitiers no less than seventy six different species of plants, many of which must have reached those old roofs and towers with the dust blown there.*

The sixth method is explosive,—a tension is set up somewhere in the fruit whereby it bursts violently. In England we have three common plants provided with this mechanism, Dog-violet, Broom, and Gerania (these should not be confused with the so-called geranium of gardeners which is a true Pelorgonium). Amongst exotic plants we get Hura, the Sandbox tree, which explodes when dry with a noise like a pistol shot. The Squirting Cucumber (Ecbalium) of the shores of the Mediterranean when ripe becomes so full of a shiny mucilage that it bursts, breaking away from the stalk and ejecting the seeds violently. All fruits which open only at the top such as Poppy, Cowslip, Sweet William, scatter their seed by being shaken by the wind ; hence when the wind is strong enough the seeds may be thrown to some distance.

Those fruits which are fleshy attract birds by the brightness of their colours : the seeds are provided with a hard coat whereby they can often defy the gizzard of the swallower. It may be noted here that the stones swallowed by birds are the mill stones which grind the food, and as the hard parts of some fruits, as Holly and Hawthorn, are nearly as hard as these pebbles they can escape whole and undigested. The Misletoe is always distributed by birds, the sticky nature of its fruit enabling it to stick on the bark when dropped.

Some fruits resemble insects, and so may be carried away by insectivorous birds and dropped as soon as the deception is found out, such are Surpiurus vermiculatus, like a fat green caterpillar, —Surpiurus villorus and Dactylockuium, like Crutipedes,—Ricuius, the castor oil plant,—and some Spurges like beetles.

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* O. Richard.—Florule des Clochers et des Toitures des Eglises de Poitiers en Viennel Similar Floras have been published of Cologne Cathedral, the Colosseum, and of the Pavement in Paris.

Floating naturally disperses many water plants, some seeds can stand well salt water for some months,—especially Coker Nut Palms as we can judge from pictures of Coral Islands.

The Rose of Jericho (Anastatica) is the best instance of our last division. In autumn as the plant dies it rolls itself into a ball and is blown thus across the sandy plains near the Dead Sea. Contact with water makes it unroll, and so on reaching a sufficiently damp spot it uncurls, the seeds drop out and germinate, being so to speak sown only in proper places. Another instance may be taken from a Sumach (Rhus) not uncommon in gardens in which the feathered stalks of a number of barren flowers break off together and carry with them one or two seeds.

Such are the methods by which plants migrate, but we have plants which sow their own seeds, which make them stay at home and not trust to chance,—such as Cardamine chrnopodifolia, Trifolium subterraneum, Arachis, and sometimes Lathyrus. These all push their seeds down among their roots before they die in the autumn. The Carline Thistle with a parachute, and the Pine with a winged seed, only allow these to fly in fine weather as some large thunder-drop might ruthlessly dash them to the ground almost before their travels had begun.

Some of these points may seem trivial, but though the fruits and seeds may be dry the subject is not. "True it is that he who once learns to see that which is little in nature will never cease to find interest in observing her ways."

READING CHARACTER IN THE FACE.

On December 5th, the Rev. J. H. Kirkby, M.A., of Radley College, very kindly came over to give us a most interesting lecture on "Reading character in the Face," of which the following is a resumé : Lavater, the authority on the science of Physiognomy, which seeks to estimate a man's character from indications in his face, or person, was Pastor of Zurich, in Switzerland. He was of a quite retiring disposition, by no means wanting in ability or force of character, when circumstances stirred him to effort. He had artistic gifts, and was a man of taste and cultivation. He died from a wound given him by a violent French soldier during the troubles which succeeded the French Revolution in 1801.

A few of the general principles from which Lavater drew his conclusions follow : Distinction must be drawn between the hard parts of the head and the soft. The former remain unchanged by a man's habits, the latter are moulded as time goes on by the mode of life. The bony parts give information as to the disposition inherited, the softer fleshy parts as to the use that has been made of the natural endowments. Features marked by straight or nearly straight lines, suggest hardness or strength of character ; softly curved and flowing lines indicate softness, effeminacy. The face must be considered as divided into three parts, defined by the forehead, the nose and thence to the point of the chin. The forehead is significant of the mental intellectual powers, the nose of taste and capability of culture, the lowest part of the more animal tendencies, such as courage, determination, and sensual propensity. Space forbids us here to follow Mr. Kirkby in his description of the varying shapes of each feature, and to point out the conclusions as to character which each variation suggests. A set of portraits taken chiefly from Lavater's book was used in illustration of the lecture and the conclusions regarding them to be drawn from Lavater's principles were compared with the known character of each person.

At the conclusion of the Lecture a cordial vote of thanks was proposed by the Principal and carried unanimously.

TOUR IN SPAIN.

ON Thursday, November 19th the Principal gave a most interesting lecture in Mr. Tillard's class-room descriptive of a Tour in Spain. He began his lecture by depicting the fine old town of Barcelona, famous for its orange trade, and its beautiful cathedral. From Barcelona, he journeyed to a large monastery of Montserrat, situated at the centre of a group of peaks, and here he heard the following legend concerning the monastery's foundation. It seems that in the old cathedral at Barcelona, there used to be an image of the Virgin, which, report said, S. Luke had executed, and S. Peter brought over from Italy. When the Moors captured Barcelona, the image was concealed in one of the many caves which are to be found in the neighbourhood of Montserrat. One night, some centuries later, two shepherds were attracted to the cave by the appearance of a mysterious halo, and finding the image, conveyed the joyful intelligence to the Bishop of Barcelona. Accordingly, the image set out in state for the return journey to Barcelona. But all of a sudden, it became impossible to move it. So a chapel had to be built over it, and in the neighbourhood of this sacred spot, for doubtless the image performed great miracles, the monastery of Montserrat sprang up. The image was moved from the original chapel to the monastic church, where it is still to be seen. On their way to Montserrat their driver, a shrewd fellow, made two very voracious and characteristic remarks. He said that he did not like Englishmen, they were so conceited, but he liked the English ladies they were so very beautiful. He also remarked that the difference between England and Spain was that England had a bad climate (?) and a good government, whereas Spain had a good climate and a bad government. The next place of interest they visited was Valencia, where the Principal was very much struck by the service held on Fridays in the Cathedral, and the very enobling effect it seemed to have on the worshippers. It seems that in this cathedral there is a more than life sized silver crucifix, which is usually veiled. At this service everything is in darkness, except just at the east end; the organ peals forth the most solemn and measured music, and gradually you see the purple veil at the east end drawn slowly aside, disclosing a gray veil, which in its turn yields place to a black veil; and all this time the solemnity of the music has been increasing, till it culminates at the point, when, the black veil dividing, the great cross is at length visible; but only for a short time, for slowly the veils are replaced, and the service ends as it began in solemn silence and darkness. After leaving Valencia the Principal visited the ancient Saguntum; he then passed on to Cordova. Cordova is a very picturesque old town in itself, but the beauty of the town is quite swamped by the grandeur of its peculiar treasure, the old Moorish Mosque built ten centuries ago, which covers four acres of ground, and the interior of which is upheld by eleven hundred beautiful pillars, no two of which are alike, though they all resemble each other. These pillars were brought from different parts of the world. A very zealous bishop spoilt the value of this unique specimen of architecture somewhat by building within the mosque a Christian Church, itself very remarkable and beautiful. Only one place of any great interest now remained to be visited, and that place is the most interesting in some respects, as it was the last stronghold of the Moors—Granada, which was captured by Ferdinand and Isabella A.D. 1492. The town of Granada itself is not very interesting, but the same cannot be said of the world-famed Alhambra and the hill on which it stands. Nothing could well be more picturesque than the woods and the apparently impregnable fortress which they surround. Viewed from a distance the Alhambra is picturesque only in conjunction with its surroundings; taken by itself it is not so striking. It is only when you get inside it that you realize its manifold beauties. The striking effect about the Alhambra is the exquisite and often beautifully coloured tracery with which the Moors used to fill in their arches and cover their walls: it looks exactly like finely worked lace. The pillars and arches are also very light and graceful. The Principal arrived at Granada by chance on the very day which is the best in the whole year to see the town—on the Anniversary of its capture by Ferdinand. The festivities were concluded in the evening by a grand historical performance in the theatre, when two different actors appeared, each once, on horseback, among the audience. From Granada the Principal returned home viâ Seville, where there is a magnificent cathedral of great size and beauty; Madrid, which contains, in one of the best picture galleries of Europe, most of the works of the Spanish master Murillo, and a great many by Raphael and other Italian masters; Toledo, near which is the great half monastery, half palace of the Escorial, built by Phillip II., who himself died in its abbey church. The last place of interest the Principal told us about was Burgos, which has a very beautiful cathedral. Spain indeed is chiefly interesting through the picturesqueness of its towns, peasantry, and landscapes, and through the grandeur and magnificence of its cathedrals and palaces.

The lecture was illustrated by the best slides it has ever been our lot to see, which brought out the peculiar architectural beauties of each building in all their fulness. King contributed much to the clearness of the views by his very skilful manipulation of the magic lantern. At the end of the lecture the Rev. J. A. Owen in a short but graceful speech proposed a vote of thanks to the Principal for his very interesting Lecture, which was unanimously accorded.

SINGING FLAMES.

Mr. Davis said the phenomena which he was about to bring under their consideration were for the most part instances of vibrations, maintained by heat, which gave rise to continuous sounds.

Before proceeding to the phenomena themselves, he would, as shortly as possible, state a few elementary principles of acoustics on which they depended, in the hope that by so doing the explanations he should give would be readily understood by those present who might happen to have little previous knowledge of the subject. The air was a very elastic substance, and like other elastic substances was readily put into a state of vibration, and, the effect of these vibrations on the ear was to produce the sensation of sound. When a disturbance was caused at any point in an elastic medium the disturbance spread outwards, giving rise to a wave. Now, there were two kinds of elasticity, and those two kinds of elasticity gave rise to different kinds of waves. There was the elasticity which arose from the tendency a substance had when put out of shape to recover its original form. Such was the elasticity of a steel spring, a piece of indiarubber or a mass of jelly. Air had no elasticity of this kind. The other kind of elasticity was that which arose from the tendency a substance had when squeezed together or opened out to recover its original volume. This kind of elasticity air possessed in an eminent degree; and it gave rise to waves of compression and rarefaction.

The difference between the two kinds of waves, corresponding to the two kinds of elasticity, was illustrated by a model consisting of a strip of wood from which were hung a row of bullets, each bullet being hung from a thread about a foot long. By pushing the bullets aside by a board, tilting the board so that it was higher at one end than at the other, and then lowering it, the bullets were released one after the other, and the swing given them was such as to cause a succession of waves to run along the line of bullets. The kind of waves so produced corresponded to distribution waves, or waves arising from the force with which a substance resists a change of form. Waves of compression and rarefaction, such as sound waves, were illustrated by raising all bullets in a long grooved piece of wood, then shifting the wood in the direction of the line of bullets, then tilting it so as to be higher at one end than at the other, and then lowering it so that the bullets were released one after the other, and were set swinging in the direction of the line of bullets. In this way waves of compression and rarefaction were caused to run along the row of bullets. It was pointed out that the essential difference between the two kinds of waves lay in the fact that the to and fro motion of particles was in the one case perpendicular to and in the other along the direction in which the wave was being transmitted.

It had been found that sound is transmitted at the rate of about 1100 feet per second. If then the vibrations which were producing a sound took place at the rate of 526 vibrations per second, there would be 526 waves of compression in a length of 1100, and therefore each wave of sound would be rather more than two feet long. Now waves of air striking on the ear at regular intervals at the rate of 526 per second gave rise to the sensation of a musical sound of definite pitch, the middle C of the piano. Waves causing the sound of the middle C of the piano were therefore rather more than two feet long. Waves an octave higher were half as long, and those an octave lower double the length. In order to produce a sustained note it was necessary to reinforce the vibrations of the body producing the sound by the expenditure of some form of energy, for every vibration, if not thus reinforced, would from friction, resistance of the air, and other causes, come quickly to a rest. He would shew them how vibrations might be reinforced by the expenditure of energy derived from heat. The piece of brass he held was called a Trevelyan rocker. It was of such a shape that when put on a block and slightly displaced it rocked backwards and forwards a great many times before coming to rest. The fact that it did so shewed that very little of the energy of its motion was lost at each vibration, and consequently a very little energy imparted at each vibration would keep the rocker in a state of continuous vibration. Now, if he heated the rocker and then placed it on a lump of rocksalt, they would notice that the vibrations were maintained and gave rise to a musical note. The rocker would rock almost equally well upon a block of lead. It would also rock upon many other materials. The explanation which had been given by Faraday and others of this phenomenon was as follows. The rocker as soon as it comes into contact with its support heats that support just underneath where it rests upon it and consequently expands it; this expansion jerks the rocker up again and maintains the vibration. The conditions which had been found to be necessary for the successful maintenance of the vibrations were quite in accordance with this view of the way in which they arose. Thus it was found that, except under peculiar conditions, to be noticed soon, the rocker would not vibrate upon a block made of the same material as itself. A little consideration would show that this should be so. For it must be noted that the block was heated at the expense of the heat of the rocker. Consequently coincident with the expansion of the block by heating there must be contraction of the rocker through cooling. Now, if the rocker and block were of the same material the expansion of the block must be exactly equal to the contraction of the rocker, and as the contraction must act to damp the vibration, the transference of heat would on the whole have no re-inforcing effect upon the vibrations, which could not therefore in this case be maintained. In fact, the point of support must rise by expansion more than the point of the rocker, which touched the block, shrunk into the block by cooling. This would generally be the case if the block were made of material more expansible by heat than that of which the rocker is made. This was found to be the case. There were other circumstances which had considerable influence upon the vibrations. Thus the smaller the conducting power of the block and the greater the conducting power of the rocker, the more readily would vibrations occur. For if the block be of material which conducts heat badly, more of the heat which passes into the block will be confined to that part of the block directly under the point of contact of the rocker than if it were a good conductor, and it was this portion only of the heat which was effective in jerking the rocker up. A like consideration would shew that the rocker should be of good conducting material. It was for these reasons that copper and brass formed good materials for a rocker, and rock salt and lead good materials for a block. He had already said that under certain conditions the rocker and block might be of the same material. If the rocker be made to rock upon thin sheets or projecting points of metal of the same material as itself, vibrations, it was found, could be maintained. This clearly arose from the fact that, in these cases the heat which flowed into the support was necessarily confined to places directly below the point of contact of the rocker, while this heat had much of it been derived from parts of the rocker not directly above the point of support. The points of the support into which heat had passed were then in a better position for reinforcing the vibrations than the parts of the rocker which had lost heat were for damping the vibrations. There could be but little doubt then, that the explanation given by Faraday and others, was the true explanation of the cause of the vibrations The amount by which the surface of the block would be raised must in all cases be exceedingly minute. Calculations shewed, for instance, that for a difference of temperature between the block and rocker of 200° C, and for a rate of vibration corresponding to the C below the middle C of the piano, the surface of the lead would be raised about 1-50,000th of an inch.

He would now pass on to the case of the sound produced by a jet of hydrogen burning in a tube. But he would first of all call attention to the motions by which the column of air within a tube was affected when the tube was giving out the lowest note which it was capable of producing, *i.e.*, when it was sounding its fundamental note. The particles of air in such a tube were all simultaneously moving either towards or away from the centre of the tube. The air about the centre of the tube was alternately expanding and contracting ; the air at the ends was alternately moving out of and into the tube. The alternate condensation and rarefaction of the air was greatest in the centre of the tube ; the motion of the air was on the other hand greatest at the ends. The length of the tube was half the wave length of the sound it produced. Thus the shorter the tube the higher the note. On placing tubes of various lengths over a jet of burning hydrogen notes of different pitch were produced. They would, doubtless, notice that the appearance of the flames became greatly altered directly the sound began. The flame was, in fact, very rapidly increasing and diminishing alternately : in some cases becoming diminished almost to the point of extinction. Owing to the persistence of the image of the flame on the retina, this could not be perceived directly. By looking, however, at the flame in a rapidly rotating mirror, the image of the flame on the retina of the eye was continually shifting, and they were thus enabled to see what was really taking place. Those who were near enough to the mirror would notice that when the flame was at its lowest, its position was reversed ; it was in fact burning some little way down the tube. Owing to the alternate compression and rarefaction of the air in the tube, the hydrogen was alternately escaping from the jet and being sent back into it. Thus the sound-producing waves of air were the cause of the alternating motions of the burning jet. He should now endeavour to show that when once a sound, however small, was started in the tube, the alternating motions of the jet themselves reinforced that sound, increased it, and maintained it. They might suppose that to start the sound, a very small disturbance of the column of air in the tube accidentally arose. This disturbance acted upon the jet, and the disturbance caused in the jet reacted upon the disturbed column of air, increased it and maintained it.

A complete and satisfactory explanation of the way in which the flame acts to maintain the vibrations had been given by Lord Rayleigh. His explanation was as follows. The effect of the jet burning in the tube was by its heat to expand the air in the tube. If now the conditions under which the jet was alternately growing large and small were such that the jet was giving most heat at the time when the column of air in the sounding tube was expanding and least heat when contracting, the heat of the jet was helping the expansion during the expansion more than it was hindering contraction during the contraction. The effect of the alterations in the jet on the whole would then be to reinforce the vibrations. The question then arose, *Does* the flame impart most heat to the air during the expansion? Are the conditions such that they might conclude that the flame *is* giving most heat during the expansion, or just at the commencement of the expansion? Now they might at first be disposed to say that the greatest issue of gas, and therefore greatest development of heat, would take place when the pressure in the sounding tube was least or at the moment of greatest expansion, and just after it, *i.e.*, during contraction. If this *were* so, the flame would be alternating in a manner unfavourable for the maintenance of vibrations. But it has been noticed by Seeback and others that the length of tube delivered the jet of hydroden has a great effect in determining the excitability of the flame. The tube must be of certain length before the flame will maintain the vibrations. The length of the tube, there can be doubt, acts to retard the moment of greatest development of heat after the moment of greatest rarefaction of air in the tube, so that it shall take place during the expansion or at a moment favourable for maintaining the vibrations.

The lecturer then showed a piece of apparatus lately devised by Lord Rayleigh for illustrating the mechanics of this subject. A piece of fine platinum wire, enclosed in a flask, was alternately caused to become white hot and cold, by intermittent passing an electric current through it. The arrangement was automatic. The expansion of the air in the flask produced by the hot wire cause the surface of a column of mercury in a U tube connected with the flask to become lowered, and this lowering caused the current heating the wire to cease. The heat occurred at a moment favourable for the maintenance of the vibrations of the mercury column. He passed on next to consider Rijke's notes. The glass tube he held contained at an inch or two from the bottom a piece of iron wire gauze. He now heated the gauze to a red heat by holding it over the blow-pipe flame and quickly removed the blow-pipe. Whilst cooling, the tube gave forth a note lasting for a few seconds. The explanations of these notes was similar to that of the sounding flames. The sound developed in a large tube was very striking. He had there a drain pipe six feet long and four inches in diameter. At about a foot from the lower end a double thickness of wire gauze was inserted. On heating this gauze to a red heat, and removing the lamp, a very powerful note is produced. The notes thus produced lasted only for a short time. By the device of using a piece of platinum wire gauze instead of iron wire, and holding the gauze, after being heated, over an unlighted Bunsen burner, the sounds might be made continuous. This was effected by taking advantage of the property possessed by clean platinum of becoming red hot when exposed to a mixture of air and coal gas, which property it owes to its causing a slow combustion of the mixed gases in contact with it.

He would now shew another way of causing flames to produce a sound in a tube, and by way of distinction he would call these shrieking flames; as the sounds produced were both louder and harsher than those given by the hydrogen jet. Into the middle of a glass tube was put a piece of iron wire gauze; the tube was then held over the mixture of air and gas issuing from an unlighted Bunsen burner, and the gas issuing from the top of the glass tube lighted. The flame at first remained on the top of the tube; but by carefully lowering the gas, the flame passed down the tube until it met the wire gaze, when it was arrested and gave rise to a loud note.

The lecturer said he then came to the last division of his subject—Sensitive Flames. The flames were very readily produced. All that was necessary was to have a supply of coal gas at a high pressure, and a burner made of a piece of quill glass tubing drawn out fine at the end. Here they had a flame produced in this way about eighteen inches long. The gas being turned on just to the point of roaring, the flame was in a condition to roar at a very slight noise. The flame was only sensitive to noises of a certain kind, such as the noise produced by hissing, by rattling a bunch of keys, and generally by noises of a high pitch. Holding a watch near the flame its ticking was made visible to the whole room. A musical snuff box caused the flame to bob in a curious manner, the bobbing being most pronounced when the highest notes were sounded.

An interesting observation had been made by Mr. Barrett who found that some flames were sensitive to notes beyond the limits of human audibility. It was well known that there were notes so high that no human ear could detect them. The limit of audibility of high notes was different for different individuals. This might readibly be shewn by means of a little instrument called a Galton's whistle. It was a whistle which, by turning a screw might have its pitch altered and made so high as to pass beyond the limits of audibility. When the pitch was so high as to be quite beyond the limits of audibility, the flame was still found to respond to it, and thus to prove the fact that there was a sound, or, to speak more correctly, there were vibrations passing through the air though no human ear could detect them. In seeking for an explanation for this sensitiveness to sound, it was to be observed that the flame was brought just to the point of roaring without actually roaring. Thus it was in a very unstable condition and ready to roar at the slightest disturbance of the air. Professor Tyndall had found that the seat of sensitiveness was at the mouth of the burner. Lord Rayleigh had found that when the flame was placed in a stationary wave, formed by simultaneous presence of a sound wave, and its reflection from a board placed near the flame, the flame was more sensitive when placed at loops than when placed at nodes, that is, it is greatest at places where the *motion* of the air is greatest, but its *pressure* most uniform and least at places where the motion of the air is least, but its alternating variation of pressure greatest. This shews that the disturbance in the flame is caused by the to and fro motion of the air across the mouth of the burner. This to and fro motion probably causes the gas to become mixed to a small extent with air as soon as it issues from the mouth of the burner and thus to become more inflammable, and consequently to become burnt sooner than it would when undisturbed, and therefore not to rise so high before being burnt. The lowering of the flame by the sound would be thus accounted for. The lecturer concluded by saying that flames of gas issuing at the ordinary pressure of the gas mains might be made sensitive thus: let the gas issue from a pin hole burner, or from a piece of glass tube drawn out so as to have a small opening, fix a piece of iron wire gauze a few inches above the burner, and light the gas above the gauze, The gas would only burn above the gauze, and by trial a position is readily found, for which the flame becomes sensitive to high sounds.

The Lecture was illustrated by a series of admirable experiments.

EXPEDITIONS.

Expedition to Chepstow Castle and Tintern Abbey.

ON May 30th about 120 members made an expedition to Chepstow and Tintern. We left Cheltenham by the 12.35 train on the G.W.R. in lovely weather—the first really bright day for the Term. At Gloucester we were met by the Rev. W. Bayley, who is a great authority on matters archæological. At Chepstow a visit was paid to the Castle, and Mr. Bayley gave a most interesting account of its history. The Castle belongs mainly to two periods—the Norman and the Decorated—a portion of it is built with the characteristic thin Roman bricks and with stones cut to a uniform size. Mr. Bayley had kindly prepared a ground plan of the Castle.

From Chepstow we walked to Tintern, crossing the Wynd Cliff en route, and paying a visit to Moss Cottage—from the top of the Wynd Cliff we were favoured with one of the most beautiful views we have ever seen. On arriving at Tintern one half of our party proceeded to explore the Abbey, while the other section refreshed itself with tea at the Beaufort Arms, and the village band discoursed sweet music in front of the Hotel—later on the two sections changed places.

About eight o'clock we collected together and proceeded to make our way back to Chepstow, and the train landed us at Cheltenham at half-past eleven, and so ended a very pleasant day. We are much indebted to Mr. Bayley for his kindness.

Expedition to May Hill.

On July 7th about 75 members made an expedition to May Hill. We drove from Gloucester to the base of May Hill, and then paid a visit to the Wenlock limestone quarries near Huntley, which consisted of beds of limestone full of nodular concretions, and containing a large number of fossils characteristic of the Wenlock series. Close to the quarries there were found several different kinds of orchids.

We then made our way up the hill, passing over the well-known May Hill sandstone—and from the top of it was to be seen one of the finest views in Gloucestershire—to the north one could see far into Worcestershire, with the Malvern range rising out of the Severn valley, not far off from the foot of the hill lay the historic town of Ledbury, where Colonel Massey, the defender of Gloucester against Charles I., was nearly captured by Prince Rupert. To the south lay the Forest of Dean, and to the east the Severn, and the Cotswolds.

In the evening we drove to Gloucester for tea, and reached Cheltenham about half-past nine.

Our very best thanks are due to Mr. Wethered, who kindly conducted the whole expedition, and gave us the benefit of his wide knowledge of the geology of the neighbourhood.

CHELTENHAM COLLEGE

Natural History Society.

REPORT

OF THE PROCEEDINGS OF THE SOCIETY FOR THE YEAR

1892

Sumptibus Editorum Cheltoniensium.

CHELTENHAM:
DARTER'S COLLEGE BOOK AND STATIONERY DEPOT,
1893.

CHELTENHAM:
THOMAS HAILING, OXFORD PRINTING WORKS.
1893.

CONTENTS.

THE COUNCIL, 1893.

President	THE PRINCPAL.
Vice-President	REV. J. MUGLISTON.
Treasurer	W. M. BAKER, ESQ.
Secretaries ...	J. H. HICHENS, ESQ., G. G. PRUEN, ESQ.
President of Archaeological Section ...	W. H. D. ROUSE, ESQ.
Secretary	E. B. LEACH.
President of Art Section ...	S. P. NESBIT, ESQ.
President of Botanical Section ...	J. R. WYNNE-EDWARDS, ESQ.
Secretary	E. W. SPARROW.
President of Entomological Section ...	W. GRIFFIN, ESQ.
President of Geological Section ...	J. H. HICHENS, ESQ.
Secretary	C. MELLOR.
President of Ornithological Section ...	M. TANNER, ESQ.
Secretary	D. C. WEBB.
President of Photographic Section ...	W. M. BAKER, ESQ.
President of Junior School ...	C. J. CADE, ESQ.

BALANCE SHEET FOR 1892.

Receipts.

		£	s.	d.
Jan. 1892.	Balance in hand … …	15	0	6
Lent Term	Subs, 4 Hon. Members …	1	0	0
	101 Ordinary ,, …	5	1	0
Summer Term	6 Hon. ,, …	1	10	0
	154 Ordinary ,, …	7	14	0
Michaelmas Term	7 Hon. ,, …	1	15	0
	149 Ordinary ,, …	7	9	0
Photographic Dark Room—				
Mid-summer Term	20 Subscriptions …	5	0	0
Xmas Term	19 ,, …	4	15	0
		£49	4	6

Expenditure.

		£	s.	d.
April, 1892.	To A. S. Davis, Esq. Expenses of Lectures	0	12	0
	To King (Assistance at do)	0	7	6
	Hire of Slides (Mr. Baker's Lecture) …	0	4	6
June ,,	Stratford Excursion (per G. G. Pruen, Esq.) …	17	7	0
July ,,	Ex. of Mr. Rouse's Lecture	0	10	6
Dec ,,	Ex. of the Principal's ,,	0	12	10
	Ex. of Mr. Kitchin's ,,	1	0	0
	Potter (Assistance at Lantern Slides Exhibition)	0	9	6
	King (Assistance at Lecture)	0	10	0
Sept. ,,	King (for materials and attendance in Dark Room)	4	5	4
	,, ,, ,, …	5	5	3
June, 1893	Balance in hand …	18	0	1
		£49	4	6

Audited, Feb. 3rd,

ALFRED A. BOURNE.

Feb 3rd, 1893, W. M. BAKER, *Hon. Treasurer.*

G. G. PRUEN, J. H. HICHENS, *Hon. Secretaries.*

Average No. of Members during the year :—Honorary (15 Life), 21, Ordinary (including Life Members) 160.

Life Member—one who has paid 5 consecutive terms.

RULES.

1.—That this Society be called the Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That Ordinary Meetings of this Society be held on Fridays once in three weeks, at 5.30 p.m., or at such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

3.—That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4.—That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5.—That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-, and that all Members who have paid 5 consecutive terminal Subscriptions, be exempt from any further payment.

6.—That any Member whose subscription shall be a whole term in arrears shall cease to be a Member of the Society.

7.—That Members be encouraged to join sections for the more accurate study of the different branches of Natural History: that the formation of these be arranged, and the work settled at the first Meeting of each term: that each section be under a President, who is responsible for its Meetings and organisation, and that a Secretary be appointed by each section to keep minutes of its proceedings, of which a summary shall appear in the Report.

8.—That the Society issue a Report as often as the Council think fit.

9.—That the Officers of this Society consist of a President, Vice-President, a Secretary and Treasurer, who, with the Presidents

and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10.—That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11.—That in the absence of the President, the Vice-President, or, in his absence, a Member of the Council, shall preside.

12.—That the duties of the Secretary shall be to give notice of Meetings of the Society and the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13.—That the Treasurer's accounts, after the approval and signature of two Auditors, to be appointed at the last Meeting of each year, be laid on the table at the first Meeting of the succeeding year.

14.—That the Officers constitute for the time being the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15.—That the Secretary have power by a vote of the majority of Members present, at a Special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct should be adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of an ex-Member to be permitted during the next term.

16.—That the Members of the Society on leaving the College become corresponding Members.

17.—That no alteration be made in these rules except at a General Meeting at which 21 Members at least are present, and then only provided it is carried by a majority of two-thirds of those present.

Reports from Sections.

ARCHAEOLOGICAL SECTION.

President - - W. H D. Rouse, Esq.

Secretary - - E. B. Leach.

OUR Expedition and Lecture arranged for last summer term had to be put off, owing to unforeseen circumstances, one of which was the unsettled state of the weather.

In the Michaelmas term, a lecture on Ancient Burial customs was given by the President, which will be found reported under Lectures. Drawings were shown, and sepulchral urns from Egpyt, Italy and Peru.

Some papers on Archælogical subjects were put in the *Cheltonian.*

A suggestion has been made that members of the section should note down any instance, they may come across of popular superstition or traditional practice. To this some have responded, and it is hoped others will respond.

A lecture on Greek Vase Paintings has also been given, illustrated by Lantern slides, to the Art and Archaeological Sections combined.

ART SECTION.

President - - - S. P. NESBIT, ESQ.

Two Expeditions were made this year, the first in June to Worcester for the purpose of visiting the Cathedral and the Porcelain Works. Unfortunately these latter were closed for stock-taking, but the Cathedral gave great interest, the more so since Canon Melville was courteous enough to act as guide in person. Fourteen members attended. The second excursion was to Eckington on the Avon, to visit Woollas Hall, Nofford Mill, and Eckington Church, and Bridge. The chief interest centred in Woollas Hall, which contains a wonderful collection of old carved oak furniture. The old Stone Bridge over the Avon had admirers among the lovers of the picturesque. Twelve members attended.

Some few members, take advantage of the one hour a week devoted to drawing during the Winter and Spring Terms.

A most interesting lecture was given by the Principal in October, entitled "A Tour in Greece."

SIDNEY NESBITT.

BOTANICAL SECTION.

President - - - - J. R. WYNNE-EDWARDS, ESQ.

Secretary - - - - E. W. SPARROW.

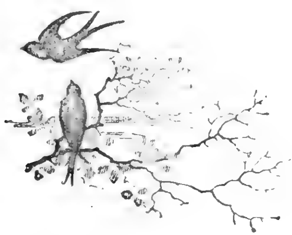
A PRIZE will be given for the greatest number of plants in flower, found and identified during the Summer term. Plants should be brought to the Museum on whole-school days, between 2 and 2.30, and placed in the pots provided foı the purpose. The Secretary will be there on Mondays and Fridays to give any information required. Those who intend to compete should speak to Mr. Wynne-Edwards about it, as early as possible in the term.

It was decided at the beginning of the Lent term that the Ornithological and Botanical Sections should unite forces, and three very successful meetings have resulted.

On Saturday, the 18th of February, about thirty members were present at a meeting at Christowe. Mr. Wynne-Edwards gave an introductory lecture on Botany. He began by explaining the uses of the different parts of a flower. The stamens and pistil are necessary for the production of seeds, but the bright petals only served to attract insects. A little study of these parts is the only necessary prelude to the study of Botany. Mr. Wynne-Edwards advised those who intended to start the subject to compete for the prize offered next term. A thorough knowledge of the names of flowers, and the way of identifying them can be got most quickly and pleasantly while making a collection. A Summer's flower hunting, with the necessary indentification and classification. would make the foundation of a sound Botanical knowledge. For those who had the time it would be interesting to start a collection of dried plants at the same time. It is a pursuit of which the interest never flags. New flowers are to be found in every part of England, and even when these are exhausted there is the joy of tramping through Swiss pastures with a pocket press in one's knapsack. Mr. Wynne-Edwards shewed specimens that he had collected in this way during a Swiss walking tour. He then mentioned some of the wonderful things to be observed in the relation of flowers to insects. The common Primrose flowers are of two kinds,—those in which the stamens, and those in which the pistil blocks the corolla or throat. In each case the other member is found at the bottom of the tube, and by this simple arrangement insects effect cross fertilization as they thrust their tongues into one flower after another.

Again in the common Pyramidal Orchid the pollen is borne on pollinia which can be detached from the flower by the touch of the moth's tongue, and attach themselves securely to the insect. As it flies to another flower they diverge considerably, so that when the new flower is reached they should strike the sticky stigmatic surfaces.

On March 18th, another Botanical meeting was held at Southwood House. It was wholly of a practical nature. All present were provided with specimens of some of the common flowers out at this time, and were able to identify them for themselves by the aid of the "School Flora." With this help and the use of Sowerby's Botany, which the Principal has so kindly placed at the members' disposal, fellows ought to be able to get on next term. It is hoped that members will also freely avail themselves of the help to be got at the Museum.



ENTOMOLOGICAL SECTION.

President - - - W. GRIFFIN, ESQ.

THE notices given in during the past year were few in number, but among them were some which should encourage others to commence collecting. The alder moth (æronycla almis) and swallow prominent (notodonta dictæa) were both taken in the playground. The former of these, though widely distributed, is common nowhere, and, as far as can be ascertained, has not been taken in the neighbourhood during the last seven years.

A badly damaged specimen of the humming bird hawk moth was taken in the Thirlestaine Road. Clouded Yellows (colias edusa) were as common here as is other parts of England, and it will be interesting to watch whether they will be found again this year.

A hibernated specimen is reported as having been seen, fortunately it was not captured. It is hoped that all members of this branch will as far as possible refrain from taking these forerunners of a richer harvest later on, and comfort themselves with the thought that most of them are specimens too much damaged to be worthy of a place in a good cabinet.

The conditions to be observed by those competing for the prize offered by Mr. Griffin for the best collection are :—

(1) All specimens shown must be bred or captured, and set, by the exhibitor.

(2) Not more than four specimens of each kind to be shown.

In awarding the prize credit will be given for neatness in setting and correct naming of specimens.

The following were among the notices sent in :

DATE.	OBSERVER.	NAME.
May 20	F. W. Buckle	Notodonta Dictæa.
21	Fowler	ditto
21	Sanders	Acronyeta Alni.
29	Sagar Musgrave	Vaneria Cardini.
June 1	,,	Smerinthus Populi.
1	,,	Smerinthus Tiliæ.
1	Sanders	Sphinx Ligustri.
6	Bagnall	Chærocampa Elpenor.
9	Sanders	Cohas Edusa.
July 3	Goodlake	Macroglossa Stellatarum.

GEOLOGICAL SECTION.

President - - - - J. H. Hichens, Esq.

Secretary - - - - C. Mellor.

Sectional Meetings were held on Feb. 10th, March 9th, March 30th, Sept. 27th and Oct. 11th, at which the President gave a series of short lectures on the Animal and Vegetable Life of the Primary, Secondary, and Tertiary Periods, illustrating the various points with lantern slides, and fossils from the Museum.

ORNITHOLOGICAL SECTION.

President - - - M. Tanner, Esq.

Secretary - - - D. C. Webb.

Since the last report of the Society was published, we regret to notice that the work in this section of the Society has greatly deteriorated. Though the number of notices given in during the past season has not been lessened, there was not the same competition that there has been in former years, and during the past year only two members tried for the prize.

Since last year there have been three sectional meetings held. At the first meeting in November, at Thirlestaine Villa, Mr. Tanner read a paper entitled "A Plea for the Rooks and Small Birds." The second meeting was held at Christowe, in February, when a paper was read by D. C. Webb on "British Birds of Prey." In March a very interesting meeting was held at Thirlestaine Villa, at which Mr. Cade read out the notes he had made during the past season on the song and habits of our common migratory and resident birds.

Members who wish to compete for the prize this year should make a note of the earliest date on which an egg is found or a migratory bird seen, and the list should be given in either to the President or Secretary. Any observations made on the habits of various birds should also be kept, as these are really of more value than the actual finding of eggs.

Webb and Braddell were the two members who competed for the prize and as nearly all the notices were gained by Webb, and no new eggs found, it is thought unnecessary to publish the list. The sectional prize was awarded to Webb, who obtained 48 notices.

The subjoined is a list of the dates of arrival of our various migratory birds, for nearly all of which we are indebted to Mr. Cade.

March 25	...	Chiff Chaff arrived.
April 14	...	Sand Martin arrived.
April 16	...	Swallow arrived.
April 18	...	Fieldfare departed.
April 18	...	Willow Warble arrived.
April 19	...	Wheatear arrived.
April 20	...	Redstart arrived.
April 23	...	House Martin arrived.
April 25	...	Cuckoo arrived.
April 25	...	Blackcap arrived.
May 4	...	Swift arrived.
May 4	...	Landrail arrived.
May 5	...	Whitethroat arrived.
May 7	...	Tree Pipit arrived.
May 7	...	Whincat arrived.
May 9	...	Lesser Whitethroat arrived.
May 17	..	Spotted Flycatcher arrived.
May 18	...	Redbacked Shrike arrived.
Sept. 10	...	Chiff Chaff departed.
Oct. 12	...	Redwings arrived.
Oct. 19	...	Fieldfares arrived.

PHOTOGRAPHIC SECTION.

President - - W. M. BAKER, ESQ.

THE new dark room was ready soon after the beginning of the summer term, and this of course gives a great stimulus to photography in the College. Hand cameras have become very common, possibly too much so. A considerable amount of good work has been turned out during the year, but too many fellows think that photography consists in taking 'snap-shots' at the College or a passing master. We should like to see a more general wish to make a picture. When the object to be photographed has been settled upon, care should be taken that the camera is placed so as to get a good light and an effective foreground; and if the object is near at hand the right time of day should be chosen. For instance, it is little use trying to get a photograph of the College from the end of College Road in the middle of a bright day. The result will be a series of unpleasant black-and-white patches, whereas the enthusiast who takes out his camera about 7 a.m. may have secured a really good picture. If details of this sort were attended to, we should see better results.

During the summer term there was an expedition to Tewkesbury, but we were a little unfortunate in having a perfectly cloudless afternoon, and many of the photographs taken were consequently hard, but good views were taken of the Old Avon Bridge, and in the fields south of the Abbey.

Mr. Thomas kindly offered a prize for the best series of views taken during the term or summer holidays, and although there was a very small field, some of the work was of considerable merit. (Where were all the Tewkesbury photographs, by the way?). We append the report which was most kindly drawn up by the President and Vice-President of the Cheltenham Photographic Society. In conclusion, if it is not too late, let us give a word of warning against over-exposure in May and June—it is the natural temptation, for it is easier to make something out of an over-exposed than an under-exposed negative, but it is fatal to all artistic work.

Gordon's and Ferguson's prints were sent up to a Public School competition at Uppingham, where their order was reversed, G. Ferguson taking the second, and Gordon the third place.

Remarks upon Three Sets of Photographs.

These are submitted to me as being pictures in some competition, but what the nature of the competition is I am not informed. In all competitions rules are laid down, but as I am ignorant of these I will simply take the pictures as they are and remark upon them. First I must say that pictures are judged in three ways, viz :

1. Composition.
2. Light and shade.
3. Technical excellence.

These three are sometimes demanded in every competition, sometimes 1 and 2 are criticised to the exclusion of No. 3, and where any doubt exists as to the merits of 1 and 2, No. 3 would have the casting vote.

1. The best series is marked G. F. C. Gordon, mounted half-plate pictures.
2. The second best : quarter-plates, mounted, and marked Ferguson.
3. The third are in an envelope, T. G. R. Reeves.

In the three series one picture only has any approach to composition : viz. a view of a mountain torrent, signed on the back with my initials, F.D. ; but it is under-exposed and the light and shade marred by an over headlight. I am aware that when out for a holiday it is not always possible to chose one's time, but in a competition possibilities are not taken into account, we can only judge by results. With this exception Gordon's series err on the side of *over-exposure.* For technical excellence the series is far ahead of the others, and to him as well as the other young dabblers in the black art I offer my congratulations, particularly that they are not too proud to submit their beginnings to be torn in pieces by a relentless judge

The next series marked Ferguson are nearly all under exposed, consequently the quantity of the light and shade is difficult to determine : the composition is marred by endeavouring to get too much of the subject into the picture. The technical excellence has not been thought of by this competitor, some of the pictures are printed on *pink paper* and some are toned with *sulphur* and not gold: pink high lights and black shadows hardly make a good combination.

J. E. R. Reeves is evidently a younger hand and a more careless one than the others. The horse is without hoofs and is standing against a door that is not upright. The animal has only 3 legs. The church is desperately over exposed, the hotel is too large for the sized plate and is lighted equally on front and sides. The Black Horse Hotel is not in focus and under exposed: I more particularly notice this competitor's pictures, not with a view to dishearten but to encourage and as he is not above showing his failures I feel sure he will be glad to be told how he has failed and will persevere.

JUNIOR SCHOOL.

President - - - C. J. Cade, Esq.

During the past year a branch of the Natural History Society has been established in the Junior Department and has been well supported. The work that has been valuable chiefly as a training for the future, so that there has not been much that is worth recording. Three sections were formed, for Ornithology, Botany and Entomology. In the Ornithological section Glenny did good work, and the finding of a kestrel's nest apparently built by the birds themselves is worth mention. The increase in numbers of the redstart is also observable.

By the Botanical section the finding of Herminium monorshio and Campanula hybrida should be recorded.

In the Entomological section some good work has been by several boys. The collection made by Hibberd though containing nothing rare, deserves special mention for the excellent manner in which all the specimens were set.

LECTURES.

"THE EAR AND HEARING,"

BY DR. E. T. WILSON.

Dr. E. T. Wilson kindly gave a most interesting Lecture on "Hearing and the Ear," on Dec. 6th, and showed an admirable series of Models, etc. illustrative of the various points.

We are indebted to Dr. Wilson for the following resumé:

The Special Senses act as feelers to keep the 'ego' within in touch with the world outside it. Hearing is perhaps the most important as carrying with it the power of articulate speech. To be born deaf implies dumbness in the individual. For Hearing it is essential that there shall be a nerve or nerves capable of appreciating sound.

What is sound? It consists of vibrations in the air, however set in motion,—and these may be regular as in music, or irregular as in noise. When vibrations in music are large we call it a loud note; when small, a low or soft note.

When the number of vibrations are many in a second we term it a high note or of a high *pitch*; when few we term the note low or bass.

The lowest note appreciable is the lowest bass C on the pianc with 33 vibrations in a second, the highest on the piano is the highes treble C with 4224 vibrations in a second, the highest on any instru ment is the piccolo with 4752 vibrations.

Besides *intensity* and *pitch* there is the *quality* or *timbre* of a not by which we can tell the nature of the instrument from which it pro ceeds.

The average human ear can appreciate sounds from 30 vibration in a second up to 16,000,—some persons go up to 35,000 or eve

40,000, but the power of hearing high notes is rapidly lost with age, and few persons over 50 can hear the cry of a mouse or a bat.

The essential part of the human ear where the hearing nerve comes in contact with the sound vibrations lies deeply buried in the bony structure of the skull, and sound may be brought to it from without either through the solid bone, as happens when the head is under water, or by the conducting apparatus which we call the Ear.

This may be divided naturally into the Collecting portion, the Conducting portion, and the Receiving portion.

We have only to observe a nervous horse to understand the use to which the outer ear is put in collecting sound. Our own ears do not move, but we instinctively increase the collecting area by our hollow hand when sounds are indistinct.

Sound thus collected strikes the drum which takes up the vibrations and transmits them by three small bones,—the mallet, the anvil, and the stirrup bones, (which serve the double purpose of transmitters of sound and dampers to the drum) across the air-space of the middle ear to a second membrane by which the vibrations are passed on to the fluids immediately surrounding the auditory nerve fibres in the semicircular canals and the Cochlea.

The connection of the semicircular canals with the power of maintaining the equilibrium of the body was explained, as well as the intricate cell and fibre arrangement of the Cochlea, which is intimately connected with the power of appreciating musical notes, and makes its first appearance in birds. How the vibrations conveyed to the nerve fibrils, and carried by them to the brain, are there interpreted and converted into ideas, it is impossible even to conjecture ;—but it is in the brain that the true organ of hearing lies, and excitement from within, whether from disease or other source of excitement, may produce sounds as real to us as any heard from without ; and voices thus produced are not an uncommon experience, as many as 1 in 90 persons having acknowledged themselves subject to hallucinations of the kind.

The Ear is by far the most complicated of all the organs of Special Sense, and presents a fertile field for further investigation.

On the conclusion of the Lecture a most hearty vote of thanks to Dr. Wilson was proposed and carried unanimously.

"CONSTANTINOPLE,"

BY THE REV. P. HATTERSLEY SMITH.

ON Tuesday, March 15, 1892, the Rev. P. Hattersley Smith gave a Lecture on Constantinople. The subject was an attractive one, and the members of the Society who assembled in large numbers, notwithstanding the counter-attractions of Fives, Running, Gymnasium, etc., enjoyed a most interesting lecture. Mr. Hichens' lecture room was full to overflowing, and it seemed a pity that the lecture did not take place in a larger room, as many were obliged to stand throughout. In addition to the members of the Society, a considerable number of friends availed themselves of the opportunity of hearing a lecture on a subject of which so few can speak from actual personal experience. It seems a pity that Mr Hattersley Smith did not give two or more lectures on his trip to Constantinople, as he was much pressed for time and obviously omitted much of his information in connection with the magic lantern slides, of which an unusually large and excellent collection was shown, the lantern being managed by King.

The Lecture was delivered in a most attractive, conversational, and informal manner, and the amusing way in which Mr. Hattersley Smith related a few of his personal experiences was much appreciated.

He said that he had seen from the calendar that he was to have the pleasure of giving the Society a lecture on Constantinople. He perferred, however to use the less ambitious term "chat" on a very interesting subject. He hope to transport his hearers for a brief period to a land of brightness and sunshine, and more fortunate than in his own case to bring them back without malarial fever.

After describing his route the lecturer said that he obtained his first view of Constantinople by night. A pretty view of the "Golden Horn" was shown. We were told that the harbour formed thereby was deep, commodius, and safe; there, the flags, as in the city itself the costumes of all nations might be seen. Then followed a very striking picture of Priests proclaiming the hour of prayer from the 300 mosques simultaneously. They "howl in a minor key" (of which an amusing imitation was given.)

Unfortunately there is not sufficient space to dwell on the many views shown, and the legends and facts in connection with them. The pictures of cemetries were numerous, the tombstones are quaint looking slabs, those of the males having fezes on the top: while those of the females are ornamented with palm branches. The Turks are teetotalers. Before going to worship they are obliged to wash; a slide showing them at their ablutions was shown. The dogs of Constantinople being its principal scavengers, are a recognized part of its population; and those from one quarter fiercely repel canine intruders from another. The dogs shown did not look sweet tempered animals. The streets in the interior are not pleasant, if somewhat picturesque. They are generally narrow, dirty and steep. Fire is so frequent among the wooden houses that a watchman is ever on the look-out from a tower built on the highest ground in the city and called the "Seraskierat," to give notice of the first spark that might prove a conflagration.

The lecturer continued: "I had the good fortune to be in Constantinople on the Sultan's birthday; the illuminations from one end of the Bosphorus to the other were the most beautiful I had ever witnessed; as I sat in a steam launch the view was like fairy land. The boats used in Constantinople called "caïques" were very small and swift. The rowers were excellent; they would hardly disgrace the "College Boat"; these caïques were so light that we had to sit in the exact middle of them"; in fact, during his stay in Constantinople, he (the lecturer) being constantly obliged to use them, was compelled, in order to be completely balanced to part his hair in the middle! He went several times to witness the "Dancing Dervishes"; he was three times told that they were not performing; he never succeeded at all in seeing them perform, but he was enabled to witness the well-known "Howling Dervishes." He then proceeded to give a description of the service accompanied by an imitation of the "Howling." At the "Selamlik" he saw the Sultan, whose attendants, aged pachas and others, ran alongside of his carriage, in a state resembling runners at the conclusion of the famous "Shurdington." The "Selamlik," when the Sultan goes to worship at a mosque, takes place every Friday at 12.

He witnessed an imposing ceremony: the Greek Patriarch died; he was not buried for three days, at the end of which a service took place. During this period members of the Greek Church came from all parts of Constantinople to kiss the hand of their revered Patriarch. He (Mr. Hattersley Smith) was within a few yards of the body, which was sitting in a dignified upright position, and was arrayed in magnificent robes. The day was exceedingly hot; the service was perhaps ritualistic, but certainly "*high.*" Then ensued a description of the transport of the body, still seated on a throne, through six miles of city, and through dense masses of spectators, to its final resting place at Baluki. The Turkish ladies spent all their time smoking and drinking coffee. And also, he doubted not, like ladies of all classes, gossiping and talking scandal. The plain ones wore thick veils up to their eyes; it was a remarkable fact, however, the prettier the lady, the thinner the veil. When walking in a street apparently empty, hundreds of bright eyes were gazing down from the windows. It was considered bad form to look up at the windows.

Then followed a most interesting account of the Mosque of St. Sophia. The dome had lost its silvery splendour which once, according to the Greeks, made it visible from Mount Olympus. Within, above the dome gallery, there were forty arched windows. On the top is written the sentence, "Allah is the light of Heaven and Earth." The church was originally built by Constantine in A.D. 325; burnt down in 404; rebuilt in 415; again burnt down in Justinian's reign 532, by whom it rebuilt in 538.

Several interesting legends were then told in connection with the Mosque of St. Sophia. The lecturer added, "It was said that when Mahomet II. took Constantinople in 1453, Saint Sophia was crowded with a huge mob of terror-stricken refugees of all classes who had sought safety in the sacred building (then a Greek church) from the fury of the Turks. The latter ruthlessly broke into the sacred building and committed all sorts of excesses. At that particular time a Bishop was engaged in offering the mass at the high altar. He had to leave off in the middle of the ceremony, and marching away in a dignified manner he walked through a door in the wall, which immediately turned into a solid mass of masonry. The infidel horde rushed after him with scimitars and daggers, but all to no purpose. Then a mason was set to work with the implements of his profession. His labours were equally futile. Then all the masons in Constantinople were summoned, but the wall still resisted their united efforts. The legend was that the Bishop was still waiting behind his mural fortress for the restoration of St. Sophia to the Christians, and that when that happy consummation took place, he would emerge from his resting place, walk to the high altar, and resume the service at the precise point where he had left off. Might all be there to see!"

Then followed views of various parts of the city; the fortifications; pictures of evil looking scoundrels and beautiful Turkish ladies; dogs and cafés, bridges and "Howling Dervishes."

At the conclusion of the lecture, which was listened to with great attention and interest, Mr. Hichens proposed a vote of thanks to the lecturer, and amid loud applause and utter darkness (for the gas had been put out) the meeting broke up, all being very sorry time had compelled the lecturer to hurry over the concluding slides, which caused much curiosity, without much comment.

"A TOUR IN GREECE,"

BY THE PRINCIPAL.

On Oct. 25th the Principal gave the Society a most interesting account of his travels in Greece. The Lecture was held in the Big Classical before a crowded meeting. We much regret that we have not an abstract sufficiently good for publication.

"SOME INTERESTING FACTS IN ASTRONOMY,"

BY W. M. BAKER, ESQ.

On March 3rd Mr. Baker gave an entertaining lecture on "Some Interesting Facts in Astronomy." The various points were illustrated by lantern slides, and the subject was dealt with in so popular a way that even the least mathematical amongst us could follow the Lecturer in all that he said.

"FERTILIZATION OF FLOWERS,"

BY J. R. WYNNE-EDWARDS, ESQ.

THIS question is one of the most interesting opened out to us by Darwin's researches into the Origin of Species. At the same time—owing to a few preliminary difficulties—it is comparatively little studied by those interested in general science. But it is one which offers special attractions to the amateur for this very reason ; the subject is still in its infancy, and a rich field for observation and experiment is open to every one of us. Some of the phenomena which I shall bring before you need further explanation, and many kindred ones are waiting for examination.

Before entering upon our subject, there are one or two general facts of which I would remind you. You are all familiar with the outlines of what has been called Darwinism,—the principle of Natural Selection. A great conflict is raging throughout nature. Many more individuals are born than can possibly survive. Every organism must work for its own good, and only those which are better fitted for the strife than their neighbours may live ; *e.g.*, Mathematics tells us that a pair of robin redbreasts should produce a family of some 20 millions in ten years, and yet the whole number of British birds probably does not exceed this figure. Again, out of 350 seedlings that came up on a patch of ground, Mr. Darwin found that nearly 300 were eaten by slugs and insects. We shall have to explain our facts by this great principle.

Again, let me remind you of the simpler botanical facts. Of the four concentric rings of which a perfect flower consists, the central pair, viz., the pistil, with its one or more styles and stigmas, and the stamens bearing little pouches or anthers filled with pollen, are necessary for reproduction. (The pollen dust falling on the stigma developes a little tube which finds its way down to the ovary, and so forms the seed. This union of pollen and stigma constitutes the process of fertilisation). The outer pair, viz., the corolla of petals and the calyx of sepals must serve other purposes into which we shall inquire.

The insects which visit flowers do so for one or both of two purposes,—to seek honey or eat pollen. The *Coleoptera* (beetles) and *Diptera* (flies) visit them in great numbers, but as a rule they are not specialised for the purpose. Their proboscises are short and undeveloped (not more than 2 m.m. long), and they are easily baffled in their search if it presents any difficulties, such as the concealment of pollen or honey in tubes.

The *Hymenoptera* (Bee family) and *Lepidoptera* (Butterflies and Moths) on the other hand depend mainly on flowers for their subsistence, and show all grades of adaptation for the purpose. It may be worth while to touch upon some of these adaptations The simplest bees (*e.g. Prosopis*) are burrowing insects, and live in sand. Their bodies are for the most part smooth, and the tibiæ of their hind legs are furnished with two sharp spurs which help in digging. Their tongues are comparatively short, and have a spade-like termination for the same purpose. The *Macropis* has a larger tongue, and exceedingly hairy legs, on which honey can easily be collected. In *Bombus* the tibial and tarsal hairs are better arranged, so as to serve as collecting baskets, and their tongue has developed into a marvellous set of surgical instruments, for sucking, gathering pollen, or piercing tissue. It attains a length of 21 m.m. in *Bombus Hortorum*, but by a perfect system of hinges, can still be withdrawn under the projecting spout. In *Apis* (the honey bee) the hairs of the leg are arranged in rows to suit its mode of collecting pollen moistened with honey, and the now useless tibial spurs have disappeared. The *Lepidoptera* have proboscises, which sometimes attain the extraordinary length of 80 m.m. (3in.) which can be rolled up into spirals and put away when not in use.

For purposes of research, a knowledge of the names of flowers and insects is all that is necessary. As a beginner I have found Watts' *School Flora*, and Bentham's illustrations a useful combination for identifying flowers, and for general purposes Hooker is excellent. With regard to the insects I cannot offer any advice, and would be glad to know of the best simple books on the subject.

So much by way of introduction. And now let us ask the question which gives the key-note of the subject, "How can flowers afford to spend so much of their energy in cultivating beautiful petals, and in making honey? Sprengel, a German botanist of the last century, was the first to attempt to answer it, and to say that flowers arrayed themselves so brightly to attract insects. The use of flowers to insects has been recognised from time immemorial, but here was the first distinct recognition of the complementary fact. The first flower to be examined was *Geranium sylvaticum* (Wood Cranesbill). He noticed that little hairs covered the lower parts of the petals, and confident "that a wise Author of Nature had not created a single hair without a definite purpose," he soon assured himself that their purpose was to protect the honey of these flowers from rain for the sake of the insects which visited the flower. By a laborious course of experiment, he further assured himself that the majority of conspicuous flowers showed the following features (1) a honey gland or nectary which secretes honey; (2) a receptacle for the honey; (3) a contrivance to shelter the honey from rain; (4) lines or spots to guide the insects in their search for honey; (5) means to prevent the flower from fertilising itself without the help of insects. He even recognised that insects carry pollen from one flower to another of the same species, and observed that the two sets of sexual organs in the same flower are often not developed simultaneously. So near was he to the recognition of the fact that self-fertilisation leads to worse results than cross-fertilisation, but he failed to show why this uncertain fertilisation by means of insects was more advantageous than the obvious and certain self-fertilisation, and so the weakness of his theory threw all his patient observations and interpretations into obscurity.

The subject was revived after more than half a century by Knight and Darwin, who laid down the law that in no plant does self-fertilisation occur for an unlimited number of generations. This was found to be too wide, and later Darwin only concluded that in no organism does the structure or situation of the reproductive organs prevent an occasional cross. The discovery of the extreme ingenuity of devices to ensure cross-fertilisation tended for a time to throw too much stress upon it, and Henslow's work on self-fertilisation, which pointed out that many of our most persistent species (*e.g.* chickweed and groundsel) depended on it, was a useful antidote. Axell's statements that though cross-fertilisation is better than self-fertilisation, the latter is infinitely better than nothing at all, seem to sum up the case. Finally, H. Müller, by collecting all the researches of others and adding an immense number of his own (in his book he has a record of nearly 14000 insects belonging to 2000 species which had been taken on flowers) set the seal to the conclusions of former observers, and once more restated Darwin's law in a more restricted form, "Wherever a cross-fertilised species comes into conflict with a self-fertilised one, it will always be victorious." The fact seems to be that a constant change of conditions of life is necessary for a species, so there is a struggle between the new vigour which springs from cross-fertilisation, and the certainty of reproduction which self-fertilisation alone can give.

We must remember that studying fertilisation means studying plant development, and it will be well to have before us a notion of what constitutes a primitive flower. Botanists believe that the features are (1) a simple, regular corolla and calyx, each consisting of five members; (2) petals and sepals all separate, so that any honey lies exposed to all comers; (3) a large number of achenes or seed vessels; and (4) a great quantity of pollen. We see that the buttercup (*Ranunculus*) and Cinquefoil (*Potentilla*) fulfil this definition. As flowers develop, there is an economy of pollen, a production of honey (more or less concealed), of a tube to keep off certain insects, and in some cases of irregularity of form, accompanied by variegation of colour.

We said that an insect visiting flowers is seeking for pollen or honey, and as a rule it finds by experience that only flowers which advertise themselves by bright colour or smell keep a store of honey at home. Some flowers, it is true, are not above deceit—the herb Paris has a shining black pistil, which looks as though it were covered with honey, although it is quite dry, and the beautiful grass of Parnassus has four little pouches at the base of its corolla, which present the appearance of drops of honey.

We will now examine one or two orders, noticing as we go the bearing of cross-fertilisation on development :—*Ranunculaceæ.*—This is termed a primitive order, because all the members fulfil some and many of them all the conditions of a primitive flower. I think the chief interest of the order lies in noticing the different ways in which cross-fertilisation has been accomplished by the more advanced members of the order, in spite of the fact that they have retained most of their primitive conditions, the result being that, with a large basis of resemblance in the essential parts, we have a great variety of form in the petals and position of the honey. This is quite different from what we should find in an advanced order, such as the *Compositæ*, where the individual members have all in a body departed from the original primitive type, the variation produced tending to favour cross-fertilisation, (*e.g.*) an aggregation of flowers in a head, a tubular corolla, etc.) Consequently, in order to put on the finishing touches, only very slight changes are necessary, and we find a similarity between all the mechanisms. Three species of *Ranunculus*, *acris*, *repens*, and *bulbosus* are known by the name of Buttercups. They are visited by insects in equal abundance, and even the hive bee cannot distinguish between them. The outer stamens dehisce (or open) before the stigmas are ripe, and they open away from the centre of the flower. In this stage the flower cannot be self-fertilised, while the pollen can be carried to older flowers. Afterwards the stigma ripens, and self-fertilisation is possible ; but still the chances are about even, for an insect is equally like to alight on pistil or petals ; in the former case cross-fertilisation is almost certain, and in the latter, though self-fertilisation is probable, it is not certain, for an insect may dust only one side of its head with pollen, and on approaching the stigmas, rub them with the other.

In the Meadow Rue (*Thalictrum*) the stamens play the part of petals. *T. minus*, which is sometimes cultivated in gardens owing to the resemblance its leaves have to Maidenhair Fern, grows in exposed places, and it is fertilised by the wind ; but *T. flavum* frequents rich meadows which abound in insects, and its stamens are bright yellow, and attract pollen-feeding flies. In Anemone and Marsh Marigold (*Caltha*) the sepals play the part of petals Anemone has no honey, but probably provides succulent juices for its visitors, and we all know how honey shines on the carpels of *Caltha.* In all these cases self-fertilisation is not certain without insect aid, but it seems to be effective. The Columbine (*Aquilegia*) shows a great advance in adaptation for insects. The five petals are hollowed out to form spurs 15 to 22 m.m. long, which act as nectaries, while the sepals which encase them are bright blue, and make the flower conspicuous. The flowers are distinctly proterandrous (*i.e.*, the anthers are ripe before the stigma), and so long are the spurs that only one humble bee (*Bombus hortorum*) can reach the honey in the proper way. The position of the stamens and stigmas is such as to ensure cross-fertilisation during the process ; but here we have an instance of incomplete adaptation, for the pirate humble bee (*B. terrestris*) bites through the spur and steals the honey without benefit to the plant. I have watched one thrust his proboscis into several flowers in vain, as his proboscis was too short, and then crawl round to the back, and finally bite through the spur. In default of cross-fertilisation, self-fertilisation can take place, as the anthers are still ripe when the stigmas open. The Larkspur (*Delphinium elatum*) is the first instance we have come across of a plant which is so habitually cross-fertilised that self-fertilisation has become impossible. Its striking appearance and blue colour mark it as an object for the visits of many bees. The crumpled texture of the sepal walls prevents the plunder which occurs in *Aquilegia.* The upper petals unite to form a spur containing the honey, and the lower ones make a platform for the bee, and also bear yellow hairs which serve as path finders, and leave the bee no choice but to thrust his proboscis into the right place. The stamens and carpels are endowed with a curious power of movement. In the unripe condition they hang down, and as they debisce they stand up in turn in the path of the bee's head, and when they are withered sink completely down again. When they have all had their turn, the carpels follow suit, and cross-fertilisation cannot fail to take place if a bee goes from a young to an older flower.

In the *Ranunculaceæ*, then, we see that separate divisions have developed very distinct advantageous modifications. Conspicuousness is ensured in *Ranunculus* by the petals, in Anemone and *Caltha* by the sepals, by both in *Aquilegia* and *Delphinium*, and by the stamens in *Thalictrum* Honey is wanting in Anemone and *Thalictrum*: it is secreted by the petals in *Ranunculus* and *Delphinium*, and by the carpels in *Caltha*. In some species it lies patent, and in others it is deeply hidden. Easily accessible honey has the advantage of securing abundant insect visits, but the objection that the insects creep about in various ways, and also waste honey and pollen without fertilising the flower. Honey deeply placed shuts off the multitude of short-lipped insects, which is a disadvantage unless it attracts enough bees, etc., with their long proboscises, which move in a particular way, and ensure cross-fertilisation. And here we may opportunely note the other advantages that the visits of bees bring to a flower. The chief one is certainly that extreme diligence which struck Dr. Watts. Most of the flies waste a lot of time, and I have noticed even the highly developed drone flies hovering for some two minutes over a flower before alighting, whereas the bees always work steadily. Another thing is that the bees will only visit a single species on a single journey. I have watched them on a plot of seedlings, and noticed a line of flax entirely visited by one species of *Bombus*, and the next line of *Clarkia* by another, while the hive bees visited all alike, but no individual crossed from one line to another. This of course means a great saving of pollen, and the plant is not liable to be injured by extraneous pollen.

We must not leave this order without noticing one fact which militates against the absolute superiority of cross-fertilisation. The cross-fertilised species are not necessarily the most abundant. The buttercup and celandine, in spite of frequent self-fertilisation, are far commoner than the columbine or larkspur. And we shall find this to be the case in most orders. It is only where nearly allied species come into close conflict that the self fertilised one goes to the wall. The very fact of a species existing in spite of self-fertilisation probably indicates a hardy stock, or it may have other means for securing a change of condition, such as dispersion of seeds by wind or birds. The time of development of plants has been enormously long, and the complexity of some seems to indicate that they have gone through several periods of cross and self-fertilisation, according as the increase of vigour or the certainty of offspring was of greater importance.

Another order that shews some of the primitive characteristics is that of *Rosaceæ*, but here we find a general advance in devices for disposal of seed (*e.g.* rose, strawberry, apple). It is remarkable in furnishing many examples of proterogyny (*i.e.*, the stigma maturing first). *Potentilla* is the simplest genus : it contains Tormentil, barren strawberry, and silverweed. The flowers are generally yellow, and the stamens and pistils ripen together, but as the honey lies in a ring somewhat out beyond the stamens, cross-fertilisation is sometimes effected by an insect alighting on the petals and getting dusted with pollen, and then flying to the carpels of another flower. In wet weather the flowers scarcely open, and self-fertilisation must take place. The plants easily spread by means of runners. *Frogaria vesca* (the true strawberry) is white, and attracts many flies. It is considerably proterogynous. This makes cross-fertili sation more probable than in *Potentilla*, and of course the succulent fruit is often devoured by birds, and so the plant is spread by their agency. *Potentilla comarum* (marsh cinquefoil) is very remarkable. It grows on open bogs, and both petals and sepals contribute to its rich crimson colour. I have seen beds of it on the Yorkshire moors literally crowded with bees, and the honey is so plentiful that one can collect it on his fingers. My impression is that it is distinctly proterogynous, and so being would ensure cross-fertilisation, but I have been unable to find notice of it in any books. This development of a crimson colour in a simple genus in order to attract bees is curious. Perhaps flies are afraid of the water.

We may notice an advance of colour among the *Rosaceæ* from yellow to white and pink. Among the *Rubus* genus the Raspberry has inconspicuous white flowers with the stamens crowded round the pistil in a narrow tube, and insects which seek the deeply-seated honey must generally effect self-fertilisation, but no doubt an occasional cross occurs. In the Blackberry, the outermost stamens and pistil, which are very far apart, mature first, so cross-fertilisation must often occur, as in *Ranunculus*. The crimson tips to the petals no doubt attract the great quantity of bees which visit it, in spite of the fact that there is no honey. The Water Avens (*Geum rivale*) flowers early, and has a pink flush, with distinct honey guides, so it attracts many species of Bombus and Apis. It is proterogynous, and the stigmas project far beyond the still closed anthers, so at first cross-fertilisation is assured. Unfortunately, there is a slight gap between successive petals, and that pirate *Bombus terrestris* thrusts his proboscis through, and steals the honey from the yet unopened flowers. In the true roses the parts mature together, but cross-fertilisation must often occur owing to their great distance apart. I have no time to speak of the little self-fertilised Agrimony, or the very interesting Burnets, but here as in the Ranunculacæ, we do not find that cross-fertilisation necessarily means abundance. This is partly accounted for by the prevalence of succulent fruits, which are dispersed by birds, and runners which ensure change of ground and surroundings.

Another order that I cannot pass over is *Geranaceæ.* It possesses the peculiar interest of containing the first flower that Springel observed, but apart from this it illustrates exceedingly well the law that a cross-fertilised flower will be more conspicuous than a nearly allied self-fertilised one. In *Geranium pratense* cross-fertilisation is brought about in this way.—The ten stamens stand round the unopened pistil, and form a convenient alighting place for an insect seeking honey. First five of them dehisce, and when they have shed their pollen, wither and fall down; then the other five dehisce, and after they are gone the stigma comes to maturity. Thus self-fertilisation is impossible, but a bee going from flower to flower is certain to effect cross-fertilisation. In *G. pyrenaicum* the pistil comes to maturity before the second lot of stamens have withered, and so will be fertilised by their pollen, if insects have not previously removed it. In *G. molle* five stamens mature, and then the stigma before the other five, so self-fertilisation is much more probable than in the last case. In *G. pusillum* the stamens are reduced to five, and the stigma matures before them. There are in all four stages: the flower is female at first, then hermaphrodite for a time, then as the stamens overtop and cover the stigma it is male, and lastly when they have withered, it is once more female. Few insects visit the plant, so self-fertilisation generally occurs in the second stage. Here we can clearly observe the effect of cross-fertilisation. *G. pratense* is more than one inch in diameter, and bright blue, and the other species show every degree of degradation, to the tiny *G. pussilum* with its faint pink petals a quarter of an inch across. But for all this, the Dovesfoot cranesbill (*G. Molle*) is much more abundant than its brighter brethren. The Storksbill (*Erodium*) is fertilised much like *G. Molle*, but it has honey guides. H. Müller noticed a curious case of want of adaptation in an insect visiting it. A ladybird bent on securing honey, perched on a petal and made a grab, but in the effort it broke off the petal, and was left hanging to the next; here it repeated the process, and so continued until it fell to the ground with the last petal, only to make a futile attack on another flower.

In *Compositæ* we have a family in which there is a combination of all the characteristics most favourable to cross-fertilisation by small insects and bees alike, viz. (1) the close association of many flowers in heads; (2) the accessibility of the honey, as well as its abundance, and its protection from rain; (3) a pollen mechanism. At the same time most of the species are adapted for self-fertilisation when insect visits fail. These facts account for the great abundance of genera and species in the order. For the sake of non-botanists I may mention that each little tube of the head (*e.g.* in the Daisy) constitutes a perfect flower. The anthers cohere to form a hollow cylinder, and dehisce inwards, filling this cylinder with pollen, before the flower opens. The style is furnished with a brush of hairs, which forces out the pollen gradually, so that an insect crawling over the head is dusted with pollen underneath. When the style has forced all the pollen out, it splits down the centre exposing the stigmatic surfaces. If insect visits have been few, some pollen will be still adhering to the style, and will cause self-fertilisation; whereas if they are plentiful, an insect coming from a younger flower will effect cross-fertilisation. Further, the development of the florets progresses from the margin towards the centre, so an insect alighting on the outer ray will touch the oldest (*i.e.* the female) part first. And here we may notice a little piece of economy on the part of Nature. The pollen on the outer florets would generally be shed before any stigmas were ripe, and would be wasted, so it is entirely dispensed with; and not only this but the brush apparatus on the style of these outer florets is wanting in many species. The honey is secreted at the bottom of the corolla tube, which is often 10 or 12 m.m. long, but the tube is so narrow at the bottom that the honey rises into the broader throat, where it is accessible to short-lipped insects. This causes no injury, as it would in the case of flowers specialised for bees, for an insect effects cross-fertilisation by simply crawling over the flower, and no intelligence is required for this. We may also notice that the *Compositæ* have light seeds in which the calyx has become specialised into a sort of parachute, which enables them continually to change their ground. In *Cardnus Arvensis*, the commonest of our thistles, the brush apparatus is still more complete. It is terminated by a ring of longer hairs, and the pollen grains are sticky enough to adhere to it. The style then grows out several m.m. beyond the corolla tube, and if sufficient insects come (which will always be the case in fine weather), the pollen is soon removed. The style then opens and exposes the stigmatic surfaces. In *Centaurea nigra* (Knapweed) there is a very remarkable mechanism. The style protrudes so far that self-fertilisation cannot take place without the aid of insects, but bees visit it in great numbers. The corolla throat is long enough to exclude short-lipped insects. When the pollen is shed, and has been swept by the style into the upper part of the anther cylinder, a slight touch is sufficient to cause the filaments to contract sharply, and this forces out a large quantity of pollen. Afterwards the style grows far out and exposes its stigmatic surfaces. But it is the wicked that flourish like the green bay tree, and the dirty little self-fertilised groundsel is after all the most vigorous and persistent foe of every gardener.

I have only mentioned four orders, and there are others of equal or greater interest. I must commend to your notice *Lythrum* with its threefold array of stamens and styles, the Gentians with their blue bell developed to attract bees, and then narrowed down to suit the long proboscises of the upland Lepidoptera, or the orchids with their fascinating multiplicity of devices ; I will now describe the mechanism of one or two highly specialised individuals. *Lotus corinculatus* (the yellow trefoil) uses two of its petals to form a "keel," which encloses the stamens and style. Two others form "wings" on either side of the "keel," which are notched into it in such a way as to communicate to it any motion they may receive. The fifth forms the vexillum, which serves to make the flower conspicuous from every point of view. Of the ten stamens, nine are united to form a tube round the style, and the tenth forms a guide to the honey, which is secreted at its base. The anthers dehisce before the flower opens, and the filaments of the stamens expand sufficiently to enclose the pollen in the cone-shaped end of the "keel." The "keel" now grows rapidly, and five of the stamens expand enormously, forming a pistil which completely blocks the cone. When a bee alights on the "wings" they are depressed, and communicate their motion to the "keel," and the stamens are consequently forced up the cone, and cause a ribbon of pollen to issue forth on to the ventral surface of the bee. In an older flower the pistil will also protrude, and cross-fertilisation will occur unless the stigma has already been affected by the pollen of its own flower. It seems likely, however, that this is not the case, as Delphino concluded that the stigmatic surface was not sensitive until it had been slightly rubbed, and this would not happen until all the pollen had been worn off.

In Mimulus and the Musks self-fertilisation is prevented by a beautiful device. The stigma is hollow, and the stigmatic surface is inside. It stands in the way of a bee seeking for honey, and the bee will very probably thrust his proboscis into the cup, but should he fail to do so, he will touch the outside of the stigma, which causes it to shut with a snap, and so prevents it from being touched by pollen from its own flower.

Salvia (Sage) is chiefly remarkable for the enormous extent to which the connectives of the two anthers of each stamen have been developed. In *S. pratensis* the stamen is quite short and the lower anther is abortive, and forms a round knob; the connective is so long that the upper anther lies in the front part of the hood, and if a bee strikes the knob, a shower-bath of pollen falls down on its back. In an older flower the style opens in such a position as to come into contact with the same part of the bee. In *S. officinalis*, a simpler mechanism produces the same result.

The Germander Speedwell (*Veronica Chamædrys*), another of the *Scrophulariaceæ*, is mostly fertilised by flies, an unusual occurrence in blue flowers. A fly alights on the corolla, and seizing the widely diverging stamens as a support, draws them under its body, which is dusted with pollen in such a way as to cause cross-fertilisation when it visits an older flower.

These few examples must suffice, and now a few words in conclusion. Firstly, the evidence we have accumulated is very contradictory. We find that plants like columbine or sage, which have developed very elaborate mechanisms to ensure cross-fertilisation, and which have been rewarded by the possession of a graceful form and bright colours, are far less abundant than the buttercup or dovesfoot cranesbill, which depend mainly on self-fertilisation. The true aim of an organism then is neither cross- nor self-fertilisation, but the greatest possible increase in the number of its individuals. To this end self-fertilisation, which is simple and certain, would seem to be the most direct means, but an occasional disturbance of its equilibrium seems necessary to keep up the vigour of every organism. This may be obtained by the crossing of individuals which differ slightly from one another, or by a change of surroundings. When insects are plentiful the first method would be pursued, but should they fail, the flower will have to fall back on self-fertilisation (as has been the case with bee orchid and groundsel), and the plant will only continue to flourish if it finds new ways of changing its conditions, such as disposal of its seeds by birds or wind, or transplantation by means of runners, or finally, a development of new features which may prove attractive to othet insects. and so secure cross-fertilisation once more. And (to quote Wallace) "we should expect that those groups of plants which are adapted for both cross- and self-fertilisation, which have showy flowers and possess great powers of seed-dispersal, would be the most abundant and the most widely distributed; and this we find to be the case, the *Compositæ* possessing all these characteristics in the highest degree," being the most generally abundant group of plants with conspicuous flowers in all parts of the world.

Next, as to the possibilities of *practical observation*; and here I must warn you that it is one thing to examine flowers, find out the mechanisms they possess, which must certainly be arranged to suit the visits of insects, and quite another to find the insects at their work. In the first place, the number of days in an ordinary English summer, when insects are thoroughly hard at work, is few; and then insects have an unpleasant habit of flying away just at the critical moment of an observation. But much can be done by observing considerable patches of plants. I have already referred to the study of rows of seedlings, which are just beginning to flower, before they have been removed to their destination by the gardener, and a hayfield on rough ground offers great opportunities: in this way I have studied the geraniums and clovers. But of course one must not expect to see too much. One of the most beautiful contrivances described in Darwin's *Fertilisation of Orchids*, is that by which the pollinia of the Pyramidal Orchid are detached from the flower and fixed to the proboscides of bees or moths; but although he had taken moths with as many as seven pollinia attaceed, in the course of twenty years he had never been fortunate enough to catch an insect in the act of detaching one.

Lastly, what a wonderful evolution of flower and insect we have! Flowers in their efforts to ensure economical fertilisation began to develop hairs to keep off the rain: this protected the honey as well as the pollen, and consequently insect visits became more numerous. But small insects by crawling indiscriminately about, wasted pollen, and so some flowers began to develop tubes too long for their short lips. But the bees with their tendency to variation, and consequently developing powers, developed longer and longer tongues as the flowers advanced. Again, the bees noticed that the flowers of a bluish colour generally had the most honey, and so began to prefer blue; the flower became more blue, and altered his arrangements to suit the bee, setting up guides and resting places, so the bee's tongue got even sharper and longer, and the flower more tubular and bluer, till at last the perfect hive bee and gentian were formed. Of course, the principle of

Natural Selection tells that the bee and flower knew nothing of this destination—they only possessed the power of variation, and nature did the rest. The flower with the bluer throat or the bee with the longer tongue survived in the battle of life, and transmitted their peculiarity to their descendants. Nature is indeed making new creatures out of old, or in Mother Carey's grand old words, she sits there and makes them make themselves. Let us remember for a moment the Great Author of nature, who, endowing His creatures with this mysterious power of variation, has clothed our earth as a garden. Surely we may say with fuller realisation than of old, "Such knowledge is too wonderful for me, I cannot attain to it."

"THE PLANET MARS, DO PEOPLE LIVE ON IT?"

Abstract of Lecture by F. A. L. Kitchin, Esq.

The idea of other worlds than ours is essentially modern. Our ancestors believed that the earth was the centre of the universe, immovably fixed in space, and that the stars, sun and planets revolved round it, and were created solely for the earth's use or pleasure. Pythagoras held that the sun was the centre, about B.C. 500. The idea was not revived until about 2,000 years later, namely by Copernicus in the XVI. Century.

Soon after came Galileo with the first telescope and the old order changed. We know now that the earth is only one of several planets moving round the sun, insignificant even in the solar system. Our system is only one of countless others. In the universe we are nowhere. We are "ploughed with ignominy and contempt." The only consolation we have is the magnificence of ideas the new astronomy brings us. One of the first and most obvious is the possibility of "other worlds." At one time men were ready to people with intelligent beings all the planets, the moon and all the stars. For instance Swedenborg, a Swedish visionary and dreamer who lived in the last century, has written much of his intercourse with spirits from other planets. At the present time a lady novelist has even described the wonderful beauty of a harvest home sung by the people of Mars.

But it is necessary to consider the question under the dry light of science. It is almost certain that long ages ago the sun and the planets formed one huge glowing mass, which we call a nebula. This huge nebula, our primeval solar system, revolved about its centre, and gradually cooled and shrank. As it did so, pieces broke off, and formed the planets. The planets in turn threw off pieces forming moons. The central portion, the sun, being so large, remained hot, while the other smaller pieces cooled quicker. In this way the earth and moon were formed.

As time went on the nebulous earth cooled, became liquid, and finally solid at the surface and life was possible. If the earth cooled, became fit for life, and life began, we are bound to say that as soon as the other planets are fit for life, life will begin there too.

In reviewing the moon and planets we find that the moon is merely a vast extinct volcanoe, without air or water.

Mercury is too close to the sun to be seen with advantage.

Venus when most favourably placed appears to us like the new moon.

Jupiter is merely a mass of clouds, and is white hot.

Saturn is like Jupiter still in its infancy.

The other two, Uranus and Neptune, are smaller, cold and sunless.

We find the enquiry profitable only in the case of Mars.

This year, in August especially, much has been written about Mars and his probable inhabitants. Something must be found to fill the newspapers, the great sea serpent is often used for that purpose.

But Mars drove him out in August, for Mars was nearer to the earth then than he had been since 1877. When Mars and the earth are on the same side of the sun and in a straight line, we have what is called an opposition of Mars.

In 1877, the opposition occured on September 5th, this year on August 4th. The best would fall on August 26th. The former year was famous for the discovery that Mars had minute moons which circle round in 7 hours and 30 hours respectively.

An American was the lucky finder but he was not the first. The Laputans were before him. We learn this from 'Gulliver's Travels.' The inhabitants of the Flying Island of Laputa were great astronomers. They told Gulliver that they had discovered two moons of Mars, and that one revolved round him in 10 hours and the other in 30. Such a curiously exact guess is probably unique in literature.

The surface of Mars is well seen in the telescope. A map of Mars has been made by Proctor from a study of a large number of photographs. The white caps at the Poles and the dark and light parts have been divided into ice, sea and land. The names given to the different parts are those of men who have devoted their lives to the study of the Heavens.

Astronomers tell us that the width of Mars' globe is only 4,200 miles, so that its size is but the 17th part of the earth. But it would take nearly 10 globes as heavy as Mars to equal the weight of the earth. Therefore a man of 12 stone on the earth would weigh but 5, if removed to Mars. A football match removed from Cheltenham to Mars would be an astonishing sight. We should see the half-backs jumping over the scrimmage. Collaring low would be a vain cry when the man running with the ball could, if he chose leap nearly over the cross-bar.

The day of Mars is about half-an-hour longer than our day, but his year is nearly 700 days. His seasons are similar to those of the earth, but instead of three months summer he gets about six. Also of course six winter months.

In 1877, Professor Schiaparelli, of Milan, made a remarkable discovery which justifies us in calling the dark parts oceans. He noticed that the continents of Mars were traversed by many dark marks stretching from sea to sea, which he called canals or channels They are of immense length and show according to the Journalists that the Martians are much cleverer than we are. We make little things like the Suez Canal, a poor 100 miles long, while the Martians make theirs a thousand or more. The idea that these canals are artificial is of course absurd, considering their size. It is supposed that they are great floods, huge extensions of the oceans into the continents. Clouds have been observed on Mars and the white polar caps shrink in his summer However it seems quite impossible to believe that water exists on Mars in a liquid form, or as clouds, for owing to his diatance from the sun he receives half as much heat as the earth, as his temperature is, by a simple sum in proportion, about 240° below Zero Fahrenheit at the latitude of London, any water must be permanently frozen. This climate would suit only the people whom Dante saw punished by cold in the Inferno. He says of them :

> " And when to me their faces they had lifted
> Their eyes, which first were only moist within,
> Gushed o'er their eyelids, and the frost congealed
> The tears between and locked them up again."

But if these oceans are not water, they, perhaps, are liquid carbonic acid. This gas can be liquified by cold, and it can also be frozen solid and then appears as a snow-white mass. In a very cold climate it would behave like water on the earth. However this great cold and the absence of water on Mars is a disputed point, Dr. Huggins, who has done marvels with the spectroscope assures us that water vapour exists in the atmosphere of Mars. Mr. Maunder of the Royal Observatory, Greenwich, is also of his opinion. But the Editor of 'Knowledge' writes in October " I am quite prepared to believe that the white polar caps of Mars are due to the snow-white crystals of carbonic acid gas."

This disputed point is important, for the possibility of life on Mars depends upon it.

The only way to decide this knotty point is to ask the Martians themselves " Are you there ? "

The idea sounds absurd, but the lady who left the following will is not of that opinion :—

"I bequeath a prize of 100,000 francs to the Institution of France for the person, no matter of what nationality, who shall discover, within 10 years from the present time, a means of communicating with a star, planet, or otherwise and of receiving a reply. 'I have especially in view the planet Mars.'"

One way to set about the communication is this.

In some vast open plain we must draw the figure of Euclid's Prop. 47, Book I., so big that the Martians could see it. If they saw it they would at once recognise the presence of intelligent beings on the earth, and would reply in some similar way, perhaps by a figure of a better proof of the same important proposition. Of course there is no Euclid on Mars, but there must be right angled triangles. Every house builder consciously or unconsciously uses this proposition. If they build houses on Mars they must use it too.

It is a glorious scheme in theory. The difficulties are these :

Firstly as to the size of such a figure. The sides must be at least 60 miles thick—hardly length *without* breadth—and thousands of miles long. Our blackboard must be as big as Europe. If we could find a piece of level ground big enough who would pay for such an enormous work? Even if we made it the Martians could not see it for our skies are nearly always cloudy, and what is absolutely fatal, at the time when we see him best we appear to him but as the new moon does to us.

It is hopeless; the lady's 100,000 francs will remain for ever unclaimed. Mars may be able to speak to us, but we shall probably never be able to reply.

"SOME ANCIENT BURIAL CUSTOMS,"

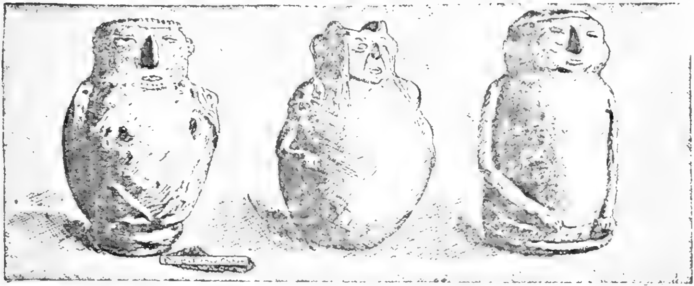
BY W. H. D. ROUSE, ESQ.

NOT long since, a man was buried in Devonshire along with a candle, a penny, and a bottle of wine. The candle was to give him light, and the wine to sustain him on his journey, the penny to pay his fare across the river of death. In this very town of Cheltenham, a pipe of tobacco and pouch are sometimes put in a man's coffin. Are these simply practical jokes, or is there any sense underlying them? To answer this question we must take a glance at a great many different peoples, places, and times.

Ancient Egypt.—Everybody knows how careful the Egyptians were to mummify their dead. But how much more elaborate was the funeral than anything we see now! When the body had been embalmed, with all sorts of uncouth rites, it was put to soak for 20 days in a bath of natron. Meanwhile there was a busy scene. Sculptors were making large images, and statuettes of the deceased by the dozen, sitting, standing, lying, and in every conceivable attitude. Goldsmiths were beating out gold rings and collars. The Watts of the day was making wigs galore of every kind, high and low, curled and uncurled, black and blue. Carpenters were knocking together chairs and tables, stools and beds, coffers to keep the mummy's clothes in; wheelwrights were making chariots for him; boats were not forgotten, in case he wished to go a-sailing; he had store of all manner of weapons; and games, such as draughts, for his leisure hours. There were the implements of his trade,—palette, pen and ink for the scribe; and a library of poetry, travels, and religious works. When all was ready and the mummy had soaked long enough, the funeral procession was formed, which was to lead the dead to "reunite himself with the earth." A long procession carried plenteous stores of food and drink, jars and ornaments of gold, live calves for sacrifice at the tomb, arms and images; hawks for the ghost to hunt with, and chariots and horses to carry him forth. Then came the mourners in a melancholy string, with a priest sprinkling water, and the coffin on a boat-shaped sledge. Arrived at the river they embark in grand barges, which make for the sacred road on the farther side. Then the party mount into the hills, to a platform whereon opens a suite of chambers hewn out of the solid rock. Here they at length lay the body. In the room are painted all the scenes of his life, which the double of the dead man can live over by looking at them. Here he sees the farmer ploughing, the huntsman and fisherman at the sport, the tradesman at his shop, the warrior in the fight. The double is content so long as he has food. When the stores brought are exhausted, all he has to do, is to pick out some fine fat heifer in the fields, follow it through all the stages of its life, till he arrives at the butcher's, sees it killed, cooked and set on table, and as the picture on the wall stretches out his hand to take a slice and eat, the double who looks on feels his pangs of hunger satisfied.

This account has been given at length, because it is the key to nearly all burial customs which we see elsewhere. The idea is that the double or ghost has a life like the man's. The primitive custom was to bury the dead in his own house, with all his belongings, to shut it up and leave him. This was done in Peru under the Inca rule, and is still done in Dahomey (where however, only one room is shut up). In California the house is burnt. Sometimes the canoes are staved in, and his other goods destroyed ; the idea being, that as the man has died, so his property must be killed to go with him. Wives and slaves are often sacrificed for the same purpose. The next stage is to build him a little hut *near* his house, or over the grave. Last year I saw in a little village in Greece a Cemetery ; over every grave was a little wooden hutch, where yearly a light is burned on the anniversary of the death. The third stage is to make a coffin in the shape of a house. Thus Egyptian mummy cases often take the shape of a house or a pyramid. Urns in the shape of primitive huts have been found in Italy ; and two fine ones are now in the British Museum. Sometimes the urn is made in rudimentary human shape. Two such urns, drawn in the Museum at Turin, you see at the side above. Of the three queer squat figures on the next page, which belong to me, (1) and (3) come from Italy, and (2) from Peru. It is remarkable how much they are alike. All this trouble is taken to make the ghost happy, and keep him from haunting the living.

(1) (2) (3)



But it sometimes happens that in spite of all this the ghost returns. Music is played to lull him to sleep. Appeals are made to his good feelings. He is honoured with periodical feasts, in which he is invited to share. The North Americans smoke pipes all over the house till they find his shadow, which they then eject. In Bohemia they pelt the ghost with sticks and stones. He is taken out of the door feet first, lest he should be able to see his way back. Even to-day, in Cheltenham, people are most careful to do this, and to sprinkle water after him ; for over water the ghost cannot come. You will recollect the same thing in the Egyptian custom. He is often blindfolded ; and this too is the reason his eyes are closed. By many tribes the dead name is never uttered ; and in some of the Polynesian islands, where personal names are the names of ordinary things, such as *palmtree*, *dog*, *fish*, languages change completely in a few generations ; when Mr. Fish dies, Fish has to be called by a new name. Or you may nail the corpse to the coffin ; so, in England, suicides used to be buried with a stake through them, as they are particularly restless. The dead man can only return by the way he went out ; hence sometimes a hole is made in the wall and afterwards bricked up. Another way of barring the ghost's return is to pass over a fire on the way. But the number of devices to outwit the poor ghost are so great, that if the whole were told, the College Library would hardly contain the books that should be written.

You will see anyhow from this sketch, that the customs which strike you as simply odd have always some reason underlying them, if it could be got at. May I appeal to readers of this to bring me a note of any superstitions they may come across themselves ? We may thus save from oblivion some of the curious practices which we have inherited from the time when our forefathers were savages.

"COLOUR,"

BY A. S. DAVIS, ESQ.

On March 29th, Mr. Davis gave an interesting experimental lecture "Colour." The Lecturer in leading up to his subject demonstrated that white light consisted of seven colours, a ray of white light being split up on passing through a prism. In the same way these seven primary colours were shown to re-unite and form white light. The seven colours of the spectrum possess entirely different properties, for instance the extreme end of the red—or ultra-red rays—produces calorific or heat effects, while the deep blue or ultra-violet end has chemical properties, and turns the well-known silver chloride of photography a deep purple. In connection with the recombination of the primary colours into white light by means of a revolving mirror, some interesting points were shown in explanation of the "persistence of impressions." The phenomena of complementary colours, although opening a wide field of scientific knowledge was readily explained by means of the well-known *Pears' Soap* advertisement projected on the screen. A disc of red light or a star having been focussed on the screen, we were directed to look intently at it for a few seconds, it was then rapidly obliterated and in its stead a white disc was flashed on. To our untutored eye it seemed of a green disc upon a red foreground. This experiment was repeated in various forms, and many of the audience could not for the moment but believe that the complementary colours were an optical illusion. It is not often that one sees a rainbow on the lecture table, but by a novel method of analysing a beam of white light by projecting it through a bulb filled with distilled water, a perfect rainbow was projected on the white screen. The colour of various bodies by their properties of reflecting only certain light was extremely amusing, the bright red geranium appeared dead black in any other than red light, while a similar experiment of illuminating in two phases of colour a hand shadow on the screen produced only half a hand. The ghastly effects of illuminating the audience by the yellow rays of spirit saturated with common salt, brought a highly interesting lecture to a close, followed by the usual vote of thanks to the Lecturer.

EXPEDITIONS.

Expedition to Stratford-on-Avon.

THE MEMBERS of the Natural History Society made an expedition to Stratford-on-Avon, the native town of Shakespeare. On arriving there, we first visited the poet's birthplace, purchased by his father in 1574. The rooms on the ground floor, and that above known as the birth-room, have undergone little if any change since Shakespeare's time, and in the museum and library are to be seen many relics and works connected with the poet, together with the letter from Quincy to Shakespeare, and an interesting painting of the latter. Leaving the house we made our way to New Place, the residence of Shakespeare, but, unfortunately, the house was demolished in 1759, so that now nothing but the foundations remain; the garden also is carefully preserved. The next object of interest was the Grammar School and Guildhall: the School is celebrated for having given Shakespeare his early education, while the Guildhall occupies the ground floor next the street, and in which plays were acted in Shakespeare's time. A pleasant walk through the town brought us to the Church where Shakespeare lies buried. This church formerly (till the time of Henry VIII.) was a collegiate one, it is in the form of a cross with a massive Norman Gothic tower, surmounted by a spire at the intersection of nave and transepts. In the chancel, which is a decided feature of the church, and on the north wall, is the famous monument of the poet, erected shortly after his death; the bust is supposed to be taken from a cast of Shakespeare's face. On the slab over the grave are the words

> "Good friend, for Jesu's sake, forbear
> To dig the dust enclosed here:
> Blessed be the man that spares these stones,
> But cursed be he who moves my bones."

Near the grave is the font in which the poet was baptized, and before leaving the church one may see the register of his baptism and burial. The Shakespeare Memorial, founded in 1877, by the generous brewer of the town, Mr. C. E. Flower, was next visited. It comprises a theatre, in which performances are given on the poet's birthday, also a library and picture gallery, and there is a lofty tower from which a good view of the county is obtained. Anne Hathaway's cottage, situated a little distance from the town, was also visited: it has just been purchased for the nation at a cost of £5,000. We then partook of a repast at the sign of the "Red Horse," after which we wandered down by the river and looked upon the remnants of the Swans of Avon. Having had a most enjoyable day we returned home.

A.T.C.

CHELTENHAM COLLEGE

Natural History Society.

REPORT

OF THE PROCEEDINGS OF THE SOCIETY FOR THE YEARS

1893 & 1894.

Sumptibus Editorum Cheltoniensium.

CHELTENHAM
DARTER'S COLLEGE BOOK AND STATIONERY DEPOT,
1895.

CONTENTS.

The Council, 1893-94.

President	The Principal.
Vice-President	Rev. J. Mugliston.
Treasurer	W. M. Baker, Esq.
Secretaries	J. H. Hichens, Esq. W. H. D. Rouse, Esq.
President of Archaeological Section...	W. H. D. Rouse, Esq.
President of Art Section ...	S. P. Nesbit, Esq.
President of Botanical Section ...	J. R. Wynne-Edwards, Esq.
Secretary	E. W. Sparrow.
President of Entomological Section ...	W. Griffin, Esq.
President of Geological Section ...	J. H. Hichens, Esq.
President of Ornithological Section ..	M. Tanner, Esq.
Secretary	L. Braddell.
President of Photographic Section ...	A. H. MacDonald, Esq.
President of Junior School ...	C. J. Cade, Esq.

BALANCE SHEET FOR 1893.

Receipts.

	£	s.	d.
Balance in hand	18	0	1
Per G. G. P., 8 Hon. Members	2	0	0
157 Ordinary "	7	17	0
21 Subs. to Dark Room	5	5	0
6 " Hon. Members	1	10	0
135 " Ordinary "	6	15	0
32 " to Dark Room (3½ terms) ...	7	12	6
17 " to Dark Room	4	5	0
152 " Ordinary Members	7	12	0
1 " Hon. Member	0	5	0
	£61	1	7

Audited and found correct, March 1st, 1894,

A. A. Bourne.

Expenditure.

	£	s.	d.
Birds' Egg Cabinet	5	0	6
Per G. G. P., Expenses of Lectures ...	1	0	0
King (Dr. Ferguson's Lecture)	0	2	6
King, Dark Room Superintendence ...	3	9	0
Carriage of Egg Cabinet	2	0	0
Grant for Oxford Expedition per G. G. P.	13	1	9
Grant for Chedworth " " W.H.D.R.	1	5	0
King, Dark Room Superintendence ...	4	9	3
Carriage of Photos	0	2	6
King, Lectures	0	12	6
King, Dark Room Superintendence ...	4	2	10
Slides for Lectures per J. H. H. ...	1	6	6
Balance in hand	26	7	3
	£61	1	7

W. M. Baker,

Hon. Treasurer.

BALANCE SHEET FOR 1894.

Receipts.

	£	s.	d.
Balance in Hand	26	7	3
Subscriptions for Lent Term	6	11	0
Dark Room Subscriptions, ditto... ...	3	2	6
Subscriptions for Summer Term... ...	5	11	0
Dark Room Subscriptions, ditto	7	2	6
Subscriptions for Christmas Term ...	6	1	0
Dark Room Subscriptions, ditto... ...	3	15	0
	£58	10	3

Expenditure.

	£	s.	d.
Mr. Shenston's Lecture (Attendants) ...	0	9	6
King, Dark Room, Lent Term, Hypo., &c.	3	9	3
Ditto for Lectures	0	5	0
Ditto for Mr. Shenstone's Lecture ...	0	10	6
Grant, Tintern Expedition	11	3	9
„ Berkeley ditto	5	1	6
„ Sudeley ditto	0	14	0
„ Birdlip ditto	0	6	0
King, Dark Room, &c., for Summer Term	4	8	0
Grant, Chedworth Expedition	1	3	0
Printing	0	10	6
Carriage, &c.	0	8	9
King, Dark Room, Christmas Term ...	4	1	0
Ditto, Lantern at Lectures	0	12	6
Balance in hand	25	7	0
	£58	10	3

Audited and found correct,

A. A. BOURNE.

W. M. BAKER,

Hon. Treasurer.

RULES.

1.—That this Society be called the Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That Ordinary Meetings of this Society be held on Fridays once in three weeks at 5.30 p.m., or at such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

3.—That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4.—That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5.—That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-, and that all Members who have paid 5 consecutive terminal Subscriptions, be exempt from any further payment.

6.—That any Member whose subscription shall be a whole term in arrears shall cease to be a Member of the Society.

7.—That Members be encouraged to join sections for the more accurate study of the different branches of Natural History: that the formation of these be arranged, and the work settled at the first Meeting of each term: that each section be under a President, who is responsible for its Meetings and organisation, and that a Secretary be appointed by each section to keep minutes of its proceedings, of which a summary shall appear in the Report.

8.—That the Society issue a Report as often as the Council think fit.

9.—That the Officers of this Society consist of a President, Vice-President, a Secretary and Treasurer, who, with the Presidents

and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10.—That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11.—That in the absence of the President, the Vice-President, or, in his absence, a Member of the Council, shall preside.

12.—That the duties of the Secretary shall be to give notice of Meetings of the Society and the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13.—That the Treasurer's accounts, after the approval and signature of the two Auditors, to be appointed at the last Meeting of each year, be laid on the table at the first Meeting of the succeeding year.

14.—That the Officers constitute for the time being the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15.—That the Secretary have power by a vote of the majority of Members present, at a Special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct should be adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of an ex-Member to be permitted during the next term.

16.—That the Members of the Society on leaving the College become corresponding Members.

17.—That no alteration be made in these rules except at a General Meeting at which 21 Members at least are present, and then only provided it is carried by a majority of two-thirds of those present.

Reports from Sections.

ARCHAEOLOGICAL SECTION.

President - - W. H. D. Rouse, Esq.

In the long time which has elapsed since the last Report, a number of Expeditions have been made and Lectures delivered, but a detailed account of all is not necessary now. Some of the Lectures are reported below. Before the trip to Deerhurst and that to Tintern, a Lecture was given illustrating the history of Architecture, Roman, Briton, Saxon, and Gothic of all periods. As for the Expeditions, they are these :—

An Expedition to Chedworth

Took place on July 6th, 1893. Twenty-one fellows started at 1.15 from the College gate in a large four-horse break, and had a capital drive to Chedworth. There we inspected the little museum, with its curious odds and ends of Roman remains—spoons, knives, buckles, coins, carved stones, heating flues, and bones; and went round the Villa, examining its walls, tiles, steps, mosaic floors, bath-rooms, kitchen and out-houses. Some of the party amused themselves by catching butterflies. We admired the good taste of the Romans in scenery, and looked for specimens of their good appetite in the shape of snails, and then drove to Foss Bridge. Here stands an inn, which in the coaching days must have been a place not unfrequented ;

we wandered in its pretty grounds, gathering forget-me-nots till tea-time; and after our meal drove home again, arriving just after 7 p.m.

This Expedition was repeated on August 28th, 1894.

Expedition to Deerhurst.

A dozen or more fellows, some with cameras, took train to Tewkesbury, where they viewed the Abbey and the battle-field, and then walked to Deerhurst. At Deerhurst are some very interesting antiquities. The Church, began in Saxon times, contains a Saxon tower with a window of unique form, some Norman work and Gothic of various periods. It also has several interesting brasses (of which we took rubbings), and until lately had the distinction of being one of the few churches which still keep the communion table in the position which it held before the Reformation, namely, standing out from the wall, while the communicants sat all round it. This most interesting feature has lately been altered, destroying the continuity of the tradition and without any gain on the other side. Close by is a Saxon Chapel, about a thousand years old, which formed part of an old farm-house. The original structure has now been laid bare, and it is kept as a place of show. It consists of a nave and chancel, separated by a massive round arch.

Expedition to Gloucester,

March 28th, 1894, by the courtesy of the Dean, we were shown over the Deanery, part of which, the library to wit, is Norman, and has been continuously inhabited ever since it was built; this is one of the oldest dwelling houses in England, and is thus almost as old as the English nation. We visited the Cathedral, and finally spent a very interesting hour in Mr. John Bellows' Printing Offices. Here is to be seen a portion of the Roman Wall of Gloucester, unearthed by Mr. Bellows himself; and the foreman was kind enough to explain to us all the processes of printing, from founding the type to the binding of the finished book.

Expedition to Berkeley Castle.

On July 5th, 1894, some 120 boys and masters started for Berkeley about mid-day. On arriving, we visited the quaint old

Church, and some photographs were taken of it. We were then shewn over the Castle, which consists of blocks of buildings like a college quad. This is the place where King Edward III. was imprisoned and finally murdered. The chief show places are a horrible pit in which the King was kept in misery, and the room where he was murdered : the last retains its original furniture and fittings. The keep, dismantled in the days of Cromwell, must once have been a strong fortress. The rest of the day was spent in walking about the fields or in visiting the Castle stables, where splendid horses are kept.

BOTANICAL SECTION.

President - - - J. R. Wynne-Edwards, Esq.

Secretary - - - E. W. Sparrow.

A couple of meetings held during the Lent term in common with the Ornithological Section were well attended. They were devoted to the examination of a few common flowers which were out at the time, and the explanation of the simpler Botanical facts.

We were also indebted to Miss Laurie for an interesting and instructive lecture on some of the Natural Orders. It was profusely illustrated by specimens and by tables of the leading characteristics of the common orders. During the term Sparrow and Hill have been collecting for the Botany prize. Next year we hope to see some more of the fellows who did good work on the Botanical excursion enter for the prize.

Excursion to Birdlip.

This was a joint excursion by several sections on June 30th, the day after Speech Day. We append a list of the species found during the walk of three miles, 123 in all ;—

Veronica Officinalis (Speedwell)
,, Beccabunga (Brooklime)
,, Chamaedrys (Germander Speedwell)
,, Serpyllifolia (Thyme-leaved, Speedwell)
,, Polita (Field, Speedwell)
Geranium Robertianum (Herb Robert)
,, Molle (Dove's Foot, Cranes-bill)
,, Dissectum (Jagged ,,)
,, Pratense (Meadow ,,)
Hieracium Pilosella (Hawkweed)
,, Sylvatica (,,)
Scrophularia Nodosa (Figwort)
Lapsana Communis (Nipplewort)
Lysimachia Nemorum (Moneywort)
,, Nummularia (Creeping Jenny)
Thymus Serpyllum (Thyme)
Viola Canina (Dog Violet)
,, Tricolor (Pansy)
Galium Aparine (Robin-run-in-hedge)
,, Mollugo (Bedstraw)
,, Cruciatum (Mugwort)
,, Boreale (Bedstraw)
Sherardia Arvensis (Madder)
Asperula Odorata (Woodruff)

Heracleum Spondylium (Cow Parsnip)
Sambucus Nigra (Elder)
Orchis Maculata (Spotted Orchid)
,, Pyramidalis (Pyramidal Orchid)
Habenaria Bifolia (Butterfly Orchid)
,, Apifera (Bee Orchid)
Listera Ovata (Tway Blade)
Cephalanthera Grandiflora (Helleborine)
Stellaria Holostea (Stitchwort)
,, Graminea (,,)
,, Media (Chickweed)
Cerastium Trivials
,, Arvense
Campanula Glomerata
,, Trachelium (Nettle leaved)
Atropa Bella-donna (Deadly Nightshade)
Solanum Dulcamara (Woody Nightshade)
Circaea Lutetiana (Enchanter's Nightshade)
Epilobium Augustifolium (Rose Bay Willow Herb)
,, Parviflorum (Willow ,,
Monotropa Hypopitys (Bird's-nest)
Cornus Sanguinea (Dog Wood)
Sambucus Nigra (Elder)
Lonicera Periclymenum (Honeysuckle)
Bryonia Dioica (Bryony)
Tamus Communis (Black Bryony)
Helianthemum Vulgare (Rock Rose)
Hypericum Quadrangulum (St. John's wort)
,, Hirsutum (,,)
Centaurea Scabiosa (Gt. Knapweed)
Carduus Lanceolatus (Thistle)
Tragopodon Pratense (Goat's Beard)
Taraxacum Officinale (Dandelion)
Bellis Perennis (Daisy)
Chrysanthemum Leucanthemum (Dog Daisy)
Rosa Canina (Dog Rose)
,, Arvensis (Trailing Dog Rose)
Lamium Purpureum (Dead Nettle)
,, Album (White ,,)
Stachys Sylvatica (Woundwort)
Ajuga Reptaus (Bugle)
Nepeta Glechoma (Ground Ivy)
Sanicula Europaea (Wood Sanicle)
Urtica (Nettle)
Rhinanthus Cristigalli (Yellow Rattle)
Spiraea Ulmaria (Meadow Sweet)
Bunium Flexuosum (Earth Nut)
Capsella B-pastoris (Shepherd's Purse)
Polygala Vulgaris (Milkwort)
Cardamine Hirsuta (Bitter Cress)
Arabis Hirsuta (Hairy Rock Cress)
Sisymbrium Alliaria (Hedge Garlic)
Sinapis Arvensis (Charlock)
,, Nigra (Mustard)
Lychnis floscuculi (Ragged Robin)
,, vespertina (White Campion)
Sonchus Olereacus (Sow Thistle)
Sedum Acre (Stone Crop)
Alopecurus Pratense (Fox-tail Grass)
Briza Media (Quaking Grass)
Dactylis Glomerata (Cock's Foot Grass)
Cynosurus Cristatus (Dog's Tail Grass)
Poa Annua (Grass)
Plantago Media (Great Plantain)
,, Lanceolata (Lesser Plantain)
,, Major (Hoary Plantain)
Vicia Sepium (Bush Vetch)
Lathyrus Pratense (Yellow Vetch)
Vicia Cracca (Tufted Vetch)
Lotus Major (Bird's Foot Trefoil)
Trifolium Repens (Dutch Clover)
,, Pratense (Purple Clover)
,, Minus (Lesser Clover)
Onobrychis (Sainfoin)
Rubus Corylifolius (Bramble)
Genun Urbanum (Herb Bennett)
Senecio Jacobaea (Ragwort)
,, Vulgaris (Grounsel)
Anthryscus Sylvestris (Parsley)
Potentilla Auserina (Silver Weed)
,, Tormentilla (Tormentil)
,, Repens (Cinquefoil)
Fragaria Vesca (Strawberry)
Picris (Hawkbit)
Rumex Obtusifolius (Dock)
Papaver Rhoeas (Poppy)
Ranunculus Acris (Buttercup)
,, Hirsutum (Hairy Buttercup)
Vicia Hirsuta (Hairy Tare)
Crataegus Oxycantha (Hawthorn)

Prunella Vulgaris (Self-heal)
Myosotis Sylvatica (Forget-me-not)
Cynoglossum Officinale (Hound's Tongue)
Echium Vulgare (Viper's Bugloss)
Reseda Luteola (Mignonette)
Silene Inflata (Bladder Campion)
Poterium Sanguisorba (Salad Burnet)
Linaria Cymballaria (Toad Flax)
Ligustrum Vulgare (Privet)

GEOLOGICAL SECTION.

President - - - J. H. HICHENS, ESQ.

SEVERAL meetings have been held and a series of short lectures have been given on the rocks found in the neighbourhood of Cheltenham, and their organic remains. The characteristic fossils such as the Ichthysaurus, the Plesiosaurus, the Ammonite, the Belemnite, etc., were studied in detail, the chief points about them being illustrated from our well-stocked Museum, and by lantern slides.

ORNITHOLOGICAL SECTION.

President - - - - M. TANNER, ESQ.

Secretary - - - - L. BRADDELL.

A SECTIONAL MEETING was held in October, 1893, at Thirlestaine Villa at which a paper was read by A. G. Gamgee on the "Habits of some British Birds." There were present Mr. Tanner, Mr. Cade, Mr. Scot-Skirving, Mr. Griffen and about thirty other members.

ON Saturday, October 27th, 1894, a Meeting was held at Thirlestaine Villa, at which a paper on "Birds of Gloucestershire" was read by W. L. Mellersh, Esq., O.C. In explaining the utility of many classes of birds he pointed out one instance in particular, that of the goldfinches, which, through being almost exterminated by bird-catchers, as many as 120 being caught in one day, are now unable to fulfil their intended work, which is to destroy the thistles by eating the seed. These birds used once to be very plentiful on Leckhampton hill, now very few, if any, can be seen. The lecturer advised us to visit the museum at Bournemouth if we ever visited that place, as they have a very good collection of hawkes there, which are alone worth seeing. He told us that the Golden Oriole has visited this county, but owing to its destruction by collectors, this interesting bird has not been known to breed. Many birds, such as the jay, magpie, crow, sparrow, and kestrel hawks were mentioned. After the paper a proposal was made by Mr. Tanner that the College collection of eggs should be overhauled and renewed, which was met by Mr. Mellersh, Mr. Tanner then promising to give his own collection to the Museum. Besides Mr. Tanner, Mr. Cade, Mr. MacDonald, there were about 35 members present.

NOTICES IN 1893.

DATE.	NAME OF EGG.	LOCALITY.	TAKEN BY.
March 25th ..	Blackbird	.. Pittville	.. L. O. T Baines.
April 2nd ..	Redstart	.. Battledown	.. L Braddell.

DATE		NAME OF EGG.	LOCALITY.	TAKEN BY.
April	5th	Rook	During Vacation	L. O. T. Baines.
,,	5th	Thrush	,,	,,
,,	7th	Missel Thrush	,,	,,
,,	9th	Moorhen	,,	,,
,,	13th	Chaffinch	,,	,,
,,	19th	Hedge Sparrow	,,	,,
,,	23rd	Tree Creeper	Charlton Park	L. Braddell.
,,	30th	Great Tit	Sandy Lane	L. O. T. Baines.
May	1st	House Sparrow	Battledown	L. Braddell.
,,	2nd	Blackcap	Charlton Park	L. O. T. Baines.
,,	4th	Green Finch	Battledown	L. Braddell.
,,	6th	Skylark	Puckham	,,
,,	6th	Lapwing	,,	,,
,,	8th	Whitethroat	Ham Hill	,,
,,	8th	Dove	Charlton	,,
,,	8th	Starling	,,	,,
,,	12th	Cuckoo	Robin's Nest	S. Dennis.
,,	13th	Tree Pipit	Hewlets	L. Braddell.
,,	13th	Bullfinch	Puckham	,,
,,	14th	Nightingale	Leckhampton	A. F. Wilson.
,,	14th	Swallow	Ham Hill	L. Braddell.
,,	14th	Garden Warbler	Battledown	,,
,,	14th	Yellow Hammer	,,	,,
,,	16th	Meadow Pipit	,,	,,
,,	16th	Bunting	,,	,,
,,	16th	Robin	Ham Hill	,,
,,	17th	Sparrow Hawk	Puckham	,,
,,	18th	Wren	Charlton Park	,,
,,	19th	Wood Wren	,,	L. O. T. Baines.
,,	21st	Redstart	,,	L. Braddell.
,,	21st	Tree Sparrow	Puckham	,,
,,	21st	Grassh'per Warbler	Sandy Lane	L. O. T. Baines.
,,	23rd	Golden-cr'ted Wren	Charlton	W. R. Elliott.
,,	23rd	Yellow Wagtail	Dowdeswell	S. Dennis.
,,	27th	Sand Martin	Charlton	L. O. T. Baines.
,,	27th	Stock Dove	Dowdeswell	,,
June	2nd	Spotted Flycatcher	Charlton	,,
July	5th	Chiffchaff	Hewletts	L. Braddell.

Observations in 1893.

Feb.	5th	Thrush, Blackbird, Hedge Sparrow and Robin in full song	F. J. Cade, Esq.
March	21st	Yellow Hammer in full song	,,
,,	27th	Lesser Spotted Woodpecker observed tapping at top of Playground	,,
,,	29th	Three Ring Ousels and several Wheatears at Leckhampton	,,

March 29th	..	Willow Wren seen	F. J. Cade, Esq.
,, 29th	..	Redstart (cock) seen. (A singularly early record).	,,
May 9th	..	Two pairs of yellow Wagtails seen at Shurdington	,,
,, 23rd	..	Blackbird sitting second time.. ..	,,
March 29th	..	Young Cole Tits	W. J. W. Kerr.
May 13th	..	Golden-crested Wren with young ..	,,
,, 24th	..	Carrion Crow with young	Glenny.
June 3rd	..	Tree Creeper with young	,,
Oct. 13th	..	Marsh Tit still singing	F. J. Cade, Esq.
Nov. 2nd	..	Nuthatch on College Field	L. Braddell.

The Sectional Prize was won by L. Braddell.

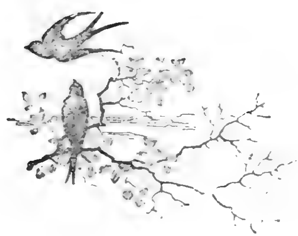
Notices in 1894.

DATE.		NAME OF EGG.		LOCALITY.		TAKEN BY.
March 18th	..	Song Thrush	..	Pegglesworth	..	S. Dennis.
,, 24th	..	Rook	..	Charlton Park	..	,,
,, 28th	..	Chiffchaff	..	Crippets	..	Arrival by ditto.
April 3rd	..	Long-eared Owl	..	,,	..	A. E. Cresswell.
,, 5th	..	Rock Dove	..	Leckhampton	..	,,
,, 9th	..	Missel Thrush	..	During Vacation	..	S. Dennis.
,, 9th	..	Brown Linnet	..	,,	..	A. E. Cresswell.
,, 9th	..	Green Linnet	..	,,	..	,,
,, 13th	..	Tree Sparrow	..	,,	..	,,
,, 14th	..	Plover	..	,,	..	S. Dennis.
,, 16th	..	Swallow	..	,,	..	Arrival by ditto.
,, 17th	..	Redshank	..	,,	..	S. Dennis.
,, 17th	..	Snipe	..	,,	..	,,
,, 19th	..	Wood Pigeon	..	,,	..	H. Thompson.
,, 19th	..	Great Tit	..	,,	..	,,
,, 19th	..	Moor Hen	..	,,	..	A. E. Cresswell.
,, 19th	..	Carrion Crow	..	,,	..	,,
,, 20th	..	Chaffinch	..	,,	..	S. Dennis.
,, 22nd	..	House Sparrow	..	,,	..	,,
,, 24th	..	Starling	..	,,	..	,,
,, 27th	..	Jay	..	,,	..	A. E. Cresswell.
,, 28th	..	Bullfinch	..	Crippets	..	S. Dennis.
,, 29th	..	Chiffchaff	..	,,	..	,,
,, 29th	..	Yellow Hammer	..	,,	..	,,
,, 29th	..	Marsh Tit	..	,,	..	A. E. Cresswell.
,, 29th	..	Jackdaw	..	,,	..	,,
,, 29th	..	Tree Creeper	..	Pittville	..	H. Thompson.
May 5th	..	Lesser Whitethroat	..	Prestbury	..	,,
,, 6th	..	Blackcap	..	Charlton	..	S. Dennis.
,, 6th	..	Willow Wren	..	,,	..	,,
,, 6th	..	Common Wren	..	Crippets	..	,,

DATE.		NAME OF EGG.	LOCALITY.	TAKEN BY.
May	6th	Blue Tit	Crippets	A. E. Cresswell.
,,	6th	Redstart	,,	,,
,,	6th	Robin	,,	,,
,,	6th	Hedge Sparrow	,,	,,
,,	12th	Whitethroat	,,	S. Dennis.
,,	17th	Bl'k-h'ded Bunting	Tewkesbury	,,
,,	19th	Common Bunting	Charlton	,,
,,	20th	Cuckoo	Dowdeswell	,,
,,	20th	Turtle Dove	Charlton	,,
,,	22nd	Sedge Warbler	Tewkesbury	,,
,,	24th	Whinchat	Charlton	,,
,,	24th	Sand Martin	Sandy Lane	,,
June	2nd	Swallow	Charlton	,,
,,	7th	Red backed Shrike	Crippets	,,
,,	8th	House Martin	Charlton	,,
,,	11th	Kingfisher	,,	,,
August	12th	Shotted Flycatcher	During Vacation	,,

Observation in 1894.

Oct. 10th .. A pair of Marsh Tits seen in a tree near Junior entrance .. .. F. J. Cade, Esq.



PHOTOGRAPHIC SECTION.

President - - - A. H. MacDonald. Esq.

The work of this section during the last year has been on the whole very successful; the greater part of it has of course been done in the Summer, but during the Xmas Term a large number of lantern slides were made from negatives taken in the Summer holidays. At the Annual Lantern Exhibition in the Big Classical, a considerable number of good pictures were shown, though some of the work was evidently that of beginners. During the Easter Term, owing to the long continued frost, very little work was done. The dark room has all this term been in constant use, as there are at present 36 members. Much successful work has been done, some of the results obtained with hand-cameras being especially noticeable. Photographs have been taken at several of the Natural History Expeditions, some of the best views being got at Colesbourne. It is a pity that more members did not send up the results of their work to the Photographic Exhibitions at Dulwich, Glenalmond, and Manchester Grammar School; and it is to be hoped that some of the holiday-work will be good enough for exhibition next year.

JUNIOR SCHOOL.

President - - - - F. J. CADE, ESQ.

IN 1893, in the Junior Department a very good collection of flowers was made by L. Braddell, who obtained 121 specimens. T. Hodson and C. Noel also did good work. Among noticeable or rare flowers were Galanthus Nivalis, Convallaria Majalis, Polygonatum Officinale, Atropa Belladonna, Neottia Nidus-avis, Nuphar Lutea, Sagittaria Sagittifolia.

In 1894 the records were not so good as in the preceding year, but this was due to the absence until the end of May of the 'recorder.' T. Hodson was first with 87 records, and L. Braddell and C. Noel were second and third. Hyoscyamus Niger, Orobanche Minor, Borago Officinalis, Gymnadenia Odoratissima and Herminium Monorchis were among flowers found. The last named rare Orchid is fairly abundant on Leckhampton.

In 1893 H. Glenny obtained the prize for a record of 25 species of birds' eggs, including those of the lesser-spotted woodpecker, nuthatch, creeper, and goldfinch. The last is now very rare in the neighbourhood of Cheltenham.

C. G. Seymour obtained the prize in 1894 with 22 specimens, and L. Fort was second with 17. The chief event was the finding of a kingfisher's nest at Charlton Kings by the above-mentioned members.

LECTURES.

"COLLECTING OF BUTTERFLIES AND MOTHS,"

BY W. R. BUCKELL, ESQ.

On November 10th, 1893, Mr. W. R. Buckell, F.R.C S., lectured to the N.H.S. on the Collecting of Butterflies and Moths. After being introduced by Mr. Hichens, he began by saying that the subject of Entomology was a very wide one, and he would not keep strictly to the title of his lecture. He would give some account of the whole science for the benefit of those who were not collectors, and at the same time advised everyone to begin at once to collect, saying that the sporting element was the one that appealed first to the entomologist, and then that of collecting, which was natural to every boy and often to men. He then explained that the difference between butterflies and moths, often supposed to be a wide one, was in reality not greater than that between different families of moths. He next referred to the construction of the head, pointing out especially the difference between the mouth of the perfect insect and that of the caterpillar, and mentioned as an interesting fact that the eye of a butterfly consisted of 16,000 to 17,000 facets. He then described the wings and showed the way in which the scales were fixed to the membrane beneath, and also gave an amusing account of his attempts to get the scales off a wing. The lecturer next explained the construction of the legs, the abdomen, with the spiracles, and then turned to the earlier stages of an insect's life history, describing the eggs, the caterpillar and the chrysalis, and some of the habits of the caterpillar. Then turning to the actual collecting he produced examples of the apparatus necessary for the work, and created some astonishment by producing from his pocket and joining together a folding net, specially pointing out that the necessary outlay was very cheap and need not cost more than a few shillings, expressing a hope that the number of collectors in the College would be greatly increased.

Mr. Owen in an amusing speech thanked Mr. Buckell on behalf of the meeting for his clear and concise lecture, and heartily endorsed Mr. Buckell's remarks as to everyone becoming collectors, adding that there was nothing cruel in the science, the killing being performed in a perfectly harmless manner.

The lecture was illustrated by large clear diagrams, and at the end Mr. Buckell exhibited some specimens of what he called beauty and fashion, taken from his own large and well-arranged collection.

"THE GERMS OF DISEASE,"

BY W. A. SHENSTONE, ESQ.

On Saturday, February 17th, 1894, a most interesting lecture was given to the Natural History Society by Mr. W. A. Shenstone, Senior Science Master of Clifton College, on "the germs of disease," illustrated by the lantern and actual specimens.

The lecturer commenced by saying that though we usually connected microbes and germs with the idea of something hurtful and deadly, it was really the case that on the whole they were more our friends than our enemies. In proof of this he told us how the vegetable world, from which we derive our food and the oxygen we breathe, could not be alive if it were not for microbes which manufacture the nitric acid necessary for its existence; and further instanced the important discovery, which has lately been made, of the power of the pea-flower tube (peas, beans, clover, &c.) to absorb the nitrogen of the air into their roots, telling us that this power, which adds enormously to the productiveness of the soil, is due also to the presence and action of certain microbes.

Introducing us to a picture of M. Pasteur, he explained the methods by which the great savant succeeded in cultivating and propagating microbes such as those which cause anthrase, the fatal disease in cattle which M. Pasteur's discoveries have done so much to diminish. He also showed us actual specimens of "bleeding bread" which has been more than usually common during the last year, and is caused by a microbe so small that two hundred million of them could lie on a postage stamp without being inconveniently crowded. This is the curious growth, which by its occurence on the sacred wafer in Roman Catholic countries has often caused superstitious alarms. We were then shown in succession the bacilla of many deadly diseases such as erysipelas, tuberculosis, tetanus or lock-jaw, typhoid-fever, and the comma shaped bacillus of Cholera discovered by Dr. Koch. Of these the bacillus of typhoid-fever with its numerous twisting legs gave the most disagreeable animated appearance, and it was not pleasant to hear that the germs of tetanus are so plentifully to be found in haystacks, or in the cobwebs with which the unwary sometimes poison the wounds which they try to stanch. Finally the lecturer gave some explanation of the process by which these deadly microbes kill us or are defeated in their attempt, and mentioned a theory which is now attracting some attention, though it cannot yet be said to be proved. This is, that of the two kinds of corpuscules red and white, of which our blood is composed, the red is that on which the microbe preys, while the white is our defender, ever ready to enclose and kill and cast away the deadly enemy which attacks the frame, and that like any other soldier it may be drilled and disciplined by proper training to higher efficiency in coping with its foe. At the conclusion of the lecture the Principal thanked Mr. Shenstone for one of the most interesting lectures ever given to the Society, and in this feeling we are sure that all who heard it will cordially agree.

"BIRDS AND THEIR HABITS,"

BY MISS REID.

On November 2nd, 1894, Miss Reid, of the Ladies' College, gave a most interesting lecture on "Birds and their Habits," which was much appreciated by a large audience. The following is a resumé of it:—

Do you know what is the right thing to say to the members of a field club when one is asked to address them. It is this—Collect Facts. This custom has been followed by so many great men that I should not like altogether to depart from the precedent. But perhaps you will consider that I have done my duty in saying this and allow me to go on at once to the subject about which I have to speak, and that is—What are we to do with facts after we have collected them? If we do nothing we might just as well collect penny stamps, or buttons. What have these men who advise us to collect facts themselves done with them? Well, first they arrange and classify them, and then they try to find a reason why things are as they are and not otherwise. To these reasons we give the name of theories, and a theory must not only account for all the facts that we have collected, but must also give us the power of foretelling facts not yet observed, and if it fail in either of these requisites the theory must be abandoned. Now we see the benefit of having collected our facts carefully.

The story is told of a meeting of the Royal Society in its early days. The subject under debate was "Why does a dead fish sink?" After several reasons had been adduced and discussed someone suggested "But a dead fish does not sink, it floats." A fish and some water were immediately sent for, the experiment was made and—the fish floated!

Or, to take a similar example from our own subject, you will find it stated in many books that the legs of a flamigo are long and that her nest is raised on a mound some inches above the level of the water, and that (here comes the false theory) the reason of the raised position of the nest was that the sitting flamigo might be able comfortably to hang her legs. Further observations shewed that the flamigo does not hang her legs but sits with them doubled beneath her, and the theory held now is that the position of the nest is to allow for inundations.

Now all the theories of which I wish to speak to-day are concerned with the life-history of birds and will principally have to do with colouring and the so-called instincts.

With regard to colour, the most obvious thing when one is "collecting facts" is the difference in colour between cock and hen birds of the same species. I have here a cock and a hen bullfinch, and you will see that the colours of the cock are much brighter than those of the hen. Now bright colouring appears always to accompany strong vitality, so the difficulty is not to account for the bright colours of the cock, but for the duller tints of the hen. For an explanation we must look to the difference in their manner of life. The greatest difference is obviously that the hen sits on the eggs. Should an enemy approach and see her she can only save herself by deserting her nestlings, and every sitting hen would, if she were brightly coloured, be a sure mark for such an enemy. The mother being killed, the young who, probably would have resembled her in their bright plumage, die. On the other hand a hen whose plumage was not so bright, would not only run a better chance of escaping notice herself, but would have her life spared to bring up her nestlings, who would, of course, tend to resemble her. This happening through many generatians would always preserve alive the more sober-coloured hens.

But here I have a kingfisher and she appears to upset our theory, for, though not exactly like the cock, she too is brightly coloured. But if we follow her to the nest we find she has no need for protective colouring, since she lays her eggs on a few fish bones in a hole in a bank and cannot be seen when she is sitting. The same applies to parrots who lay their eggs in holes in trees.

Again, at one time it seemed as if the theory was flatly contradicted by the dotterel and other wading-birds as the cock is not so bright as the hen, till it was found that in this case it was the cock and not the hen who hatches the eggs. So that instead of contradicting the theory of protective colouring this case actually lends support to it.

I am afraid that I may have given the impression that the brighter colouring was the original one for both sexes and that the female has gradually become duller. Now we know that this is not so, but that the hen, for purposes of protection, has retained the more sober tints, while the cock has been more free to vary. What proofs have we that the duller colour was the original one? Well, we know the life of every young animal is, as it were, an epitome of the history of the class to which it belongs, that in its early youth it resembles its more remote ancestors, and as it grows older develops the characters of the more immediate ones. For instance, young rooks have, like other birds of the family of the *Corvidæ*, feathers at the base of the beak, but after the first moult they lose these feathers and have a bare patch, which fits them for the peculiar life of rooks, that is, for digging in the moist soil for grubs, etc.

Now we find that the plumage of young birds generally approximates to that of the hens, whereas, later the young cocks get their brighter feathers, and in this way we get a peep at the ancestral plumage. Whilst speaking of this theory that colouring in birds is often protective, let us see how far the theory is borne out in the case of eggs.

First let us notice a law that is of equally wide application, which is, that the eggs of closely allied birds, that is, of birds who are descended from a common ancestor, are, as we should expect, somewhat similar. For instance, here I have examples of eggs of different gulls, which you see are very much alike; here, examples of the family *Corvidæ*—the rook, the carrion crow, the jackdaw, the magpie, and the jay—and they again are similar, and here you have the same thing in some of the finch family. But as well as the fact of the similarity of the eggs of allied birds, we do get a great number of instances of protective colouring. For instance, eggs laid on the ground or on slight nests on the ground are commonly mottled browns or light olive browns, as the lapwing and the pheasant; when among stones the colour is buff or stone-coloured, as in the eggs of gulls or terns. When the eggs are laid in trees or bushes the ground colour of the egg is commonly blue or green, so that they are not very obvious among the surrounding foliage. If, like the blackbird's, the nest is in an evergreen or in a very thick bush where little light penetrates the eggs are duller in colouring. The chaffinch's eggs are not very conspicuous, for the hen lines the nest with lichen and moss very like them in colour.

But how are we to account for the existence of white eggs,—these may be laid under several conditions, by birds that lay their eggs in holes, in banks, or trees, as the sand-martin, and the wood-owl. We find white eggs laid by birds who make dome-shaped nests, as the wrens and chiff-chaff, or they may be white in those cases in which the hen sits very close and only leaves the nest after dark. Again, chalky white eggs are often laid on nests made of seaweed, and the decaying nest material itself stains them. One case I might mention where the parent seems to make a special arrangement for the safety of the eggs and where the colouring cannot therefore be said to be protective. This is the dabchick, who, when she leaves her nest, pulls some of the nest material over the eggs. But, perhaps the most interesting case of protective colouring is that of the cuckoo, who lays her eggs on the ground, afterwards depositing them in the nest of some other bird. The nest may be that of a hedge-sparrow, a meadow pipit, a wagtail, or a robin. Now often, though not always, the eggs are similar to those of the foster-parent. How can such a modification as this take place. In the first place, we must imagine that such cuckoo's eggs as were at all like those of the foster-parent ran the best chance of being undisturbed and that any egg varying in this direction would be hatched. When the young bird, supposing it to be a hen, has grown up and is looking round for a nest for her own egg, what can be more likely than that she should look upon a nest similar to the one in which she was herself brought up as the most desirable. If she had been brought up in a hedge-sparrow's nest she would deposit her egg, which would be the same colour as the egg she was herself hatched from, in a hedge-sparrow's nest.

While on the subject of eggs let me say a few words of their form and size. Birds which have conical eggs, as the lapwing, generally lay four, and they lie in the nest with their pointed ends towards the centre. This seems a convenient form for packing when there are several eggs. If the eggs are very round, as those of the wood-owl, there are not more than two.

I think the egg which I hold in my hand is the most interesting form that I know. It is the egg of the guillemot, and is, as you see, very pointed. The guillemot only lays one egg, and that one she lays on ledges of cliffs, and when she is sitting on her egg she holds it tightly pressed to her body. When she rises from the egg a very slight kick would be sufficient if it was round to send it over the edge, but being pointed you see it simply describes a circle about its point and remains on the ledge.

If the eggs of birds are large in proportion to the size of the parent bird, and the young have had plently of room to develop they are precocious, that is to say, they are able to run about and get food for themselves at once, but birds who for the first few days or weeks are helpless and dependent on the old birds generally hatch from comparatively smaller eggs.

In all the theories which we have dealt with so far the bird's own individuality may be almost neglected, Nature causing variations without any consciousness on the part of the bird. Now, I wish to speak of some theories regarding birds where the individuality is allowed some play. These theories will deal with song, nest-making, so-called instinctive fear, and migration. One of two theories used to be held with regard to these points. The one was that birds in these respects had always acted exactly as they do at present, and that they inherited a tendency to act only in these ways. A second theory was that though the peculiarities might have been acquired by some particular ancestor, yet that by their descendants these fixed habits were inherited as instincts and that the individual had very little power of varying. The theory held at the present day is that these so-called instincts are to a certain extent hereditary habits, but that they also depend upon traditions handed down from one generation to another, that, in fact, most of the acts are at any rate in some degree the result of imitation.

Let us first take the case of song.—If eggs be taken early from the nest of the parent and placed in the nest of some other bird, the young when they are hatched very rarely attain to perfection in their own song, though, of course, there may be circumstances which prevent their imitating the song of their foster-parent, as a different form of vocal organs, which may make a very limited range of notes possible. As we might expect when it is absolutely necessary that the young bird should recognise a sound, as in the case of the warning cry, it seems to be hatched with the instinctive recognition of it perfect. In some cases it seems perfect whilst the young is still in the egg, for if it is tapping at the shell, and the hen utters the warning cry it will at once stop. After two days, the young if taken away from the parents will, when their time to sing comes, produce some of the song-notes of the species.

I think one may notice that in the case of those birds who have a very varied song the young are hatched helpless and are dependent on the parents for some time, and so have opportunities of learning a song, whereas when they are precocious their utterance is limited to a cry, as the cry of our domestic birds and of game.

Nest building gives another example of an instinct which has to be supplemented by imitation. If an egg be taken and hatched artificially the bird will make the characteristic nest of the species very imperfectly,—if thrown into the company of birds of a different species it will modify its nest and make one approximating to those of its companions. But the imitation of the nest of another species is never perfect, but is suited to the structure of the bird building it. Pigeons which have weak feet and clumsy bill could never do more than lay twigs on the top of one another, and a parrot which uses both feet and beak for every movement is incapable of making a nest and lays her eggs in a hole. That the instinct is capable of considerable modification we see from the nests of chimney martins and jackdaws, who now often build in church towers. What did these birds do formerly? The very earliest chimneys in this country being built in the 12th Century and church towers also being a comparatively late introduction in the history of the world.

Song and nest building are then, at any rate in some degree, imitative; what about fear of natural enemies. Here at least we might expect a pure instinct, since escape from enemies is necessary for the preservation of life, but again we find an acquired fear passes by tradition from one generation to another. I will do no more here than just give the results of some of Mr. Hudson's observations in La Plata. He tells us that the rhea, the American ostrich, was till quite lately hunted by Spaniards on horseback, and that in the two hundred years the Europeans had inhabited the continent they had acquired a fear of mounted man, but showed no anxiety at the sight of a pedestrian. During the last twenty years they have become accustomed to give cries and will no longer allow man to approach. The same observer experimenting with young birds of his own rearing, used at times to imitates the snorting alarm call of the old bird, immediately they rushed to him and tried to hide themselves by pushing their heads and necks into his trouser leg. And if he always made this call at the approach of a person dressed in white they soon acquired a habit of avoiding anyone so clothed.

There is a curious instance given of the cowbird, which like our cuckoo is a parasite, that is, the eggs are placed in the nest of another bird. The rightful occupants of the nest crouch with terror when they hear the warning note uttered by the parent on the approach of man, but the cow-bird not understanding the cry shows no terror and will even take worms from his hand. On the contrary directly the cow-bird associates with his own species he becomes imbued with class-prejudice and shuns the approach of his former benefactor. No observations have been made along these lines with regard to our own cuckoo.—Here is the opportunity for the Collection of Facts.

I should like to employ the time I have at my disposal with a few remarks on a part of the subject that is very interesting to me. —The migratory habits of birds.

Formerly believing that such birds as swallows flew due North and South, some theorists tried to account for it by supposing the bird to be in some way influenced by the magnetism of the earth. Even now some still hold a modification of this theory. Many other theories have been suggested, which on a careful examination have proved untenable, and even now our facts are not sufficient to warrant a definite conclusion. The facts are these.—Very few birds remain in the same country all the year round. They migrate on the approach of cold. Some, as the swallow and nightingale spend the Summer in England, but Winter in the South of Europe or North Africa. Other birds nest in colder regions and come to us as Winter visitors, as the fieldfare from Finland, Scandinavia, and North Russia. The third class, the true birds of passage, only rest in England in their journeys North and South. All birds lay their eggs and bring up their young in the coldest country to which they migrate. Change or failure of food supply or change of climate seem to be the causes which impel migration, though the migration takes place in advance of such change.

Wallace's theory of the origin of the habit is now generally accepted. It is this.—Thousands of years ago in the Period which we call the Pliocene the climate of Northern Europe was not only much warmer than at present, but it was also more equable, that is there was no great difference between Summer and Winter temperature. Under these conditions there would be no need for birds to travel in search of food. As the climate changed and Summer and Winter temperature became more unlike so birds would have to follow their food supply further and further South, at first over shorter distances, and as the difference between the Summer and Winter temperature became greater over longer and longer distances. During a part of the Pliocene period we have proofs that the level of the land in parts of Europe was higher than at present and that the North Sea and the Mediterranean, if they existed at all, were much smaller than at present. It was during this Period that the birds acquired the habit of travelling greater and greater distances, and when the level of the land subsided the route was still continued.

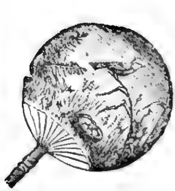
As a support for this theory we find that birds do actually cross these seas over shallower regions and where there are islands as from Italy to Sicily and Malta to Africa or from Greece by Crete. Apart from the idea that the shallow water covers what was in former times land there would be no advantage to the flying bird in crossing it rather than deeper seas as if its strength failed death by drowning must ensue in either case. There is a great difficulty in tracing these routes, for though special birds may be marked for recognition, so great is the mortality among them that any given one has only a chance of fully completing the journey, also it is inevitable that it must be shot to be recognised, and once having the bird, it is impossible to say what would have happened if it had been allowed to live. One very well-marked route we do know, however, which is, from North Russia through Lapland and Scandinavia to Britain. This route is not in a Southerly direction, but it is to a warmer climate. This question of routes is now receiving attention from a commission appointed to inquire into the matter.

So far then, we have accounted for the original route, now we should find some reason why this route is persisted in. As in the case of the nest-making and singing and fear of enemies, we have done away with the old theory of instinct,—have suggested that tradition and imitation play an important part. These same forces act in the same manner on the migratory instinct. Birds usually migrate in large numbers, and though the young may precede their parents by a few days they are soon overtaken, also the young fly nearer the ground and will cross the sea by the shortest passage, where they can see land on the other side, skirting round the South coast to the Straits of Dover, whereas the parents who have been the return journey, at any rate with experienced travellers, go by a shorter route, though this necessitates crossing the sea at a wider part.

We can to a certain extent see the migratory habit growing, as during the last 100 years very many plantations of trees have been made in Scotland further North than any such plantations before existed, and we find that this is accompanied by a further migration North in the case of some birds.

That routes can be considerably modified, and that the instinct does not descend in the unvarying form which was supposed, is shewn by the fact that some species have within the last few years been seen for the first time in the Faroe Isles and others in the Cape Verde Islands. It can only be supposed that some birds have joined another party and then guided other birds of the same class.

One last remark and I have done. A few American birds are seen in England but very rarely on the Continent, and they are more common in this country than formerly, it is thought that they have been blown out to sea by Westerly Winds, and that taking advantage of the greater traffic between North America and England they have crossed on the rigging of some steamboat. The rigging of steamboats not requiring the same adjustment as that of sailing vessels they run a better chance of not being seen and killed by sailors, and every twenty four hours carries them 300 miles nearer Europe. I do not mean to say that all these birds catch the boat to England, many are drowned, and some no doubt rest on a boat going back to their own shores. But being among birds of their own species they do not enjoy the notoriety which falls to the lot of those who have crossed the ocean. This theory and all the others I have mentioned can only be substantiated or denied by the Collection of Facts, but they do in any case point to lines along which more work is needed.



"MIMICRY AMONG ANIMALS."

I DON'T think I can introduce my subject to you better than by a quotation from the book in which Professor Drummond so graphically describes his experiences in Tropical Africa.

"Mimicry," he says, "is imposture in Nature. Thos. Carlyle in his blackest vision of shams and humbugs never saw anything so finished in hypocrisy, as may be found in every Tropical Forest. There are to be seen creatures, not singly but in tens of thousands, whose appearance down to the minutest spot and wrinkle is an imposture, whose every attitude is a sustained lie. Before these masterpieces of deception the most ingenious of human impositions are vulgar and transparent. Fraud is not only the great rule of life in a tropical forest, but the one condition of it."

I think, when we know the facts, we shall be ready to endorse his opinion. Let me tell you what first called my attention to this subject. When I was at school up in Yorkshire, I was out with a friend one day, hunting for orchids in a bit of swampy undergrowth on the edge of a moor, when I was surprised to see a large hornet buzz past me and settle on a willow tree a little way off. We cautiously advanced to within reach, and made for him with a stick, in some trepidation lest we should miss him, and he should turn the tables on us, but we managed to wing him, and on examining our prey we found that his wings had the tiniest rim of down around them. He was no hornet at all, but a harmless clear wing moth, so closely resembling a hornet, as to deceive us even at a yard's distance! We have heard of wolves in sheep's clothing, but here was a sheep in wolf's clothing; or shall we say, the proverbial ass in the lion's skin,—and like the ass, you will say, he met with the reward that he deserved?

But is this so? Let us try to answer two questions—

(1). Why is the clear-wing arrayed like a hornet?

(2). How is he so arrayed?

The answer of the first question is the easier. The clear-wing is a soft dainty morsel, beloved of the warblers and linnets, and other small birds that frequent the marshes, and so would have little chance of escape if he were a conspicuous object with an individuality of his own ; whereas the hornet is a formidable insect, and the small bird knows by bitter experience that he has a sting, so the clear-wing has dressed himself like a hornet and goes on his way rejoicing, unless he chance to meet with a small boy who regards neither hornet nor other beast.

But how did he manage to do it? You see we are getting back to our old friend "evolution," or "Mother Carey" as Kingsley calls it, that wonderful power which makes new beasts out of old, and always takes care that the new ones shall be better fitted for their struggle in life than the old.

It all comes from that curious power of variation, which makes one cock sparrow a little different from his brother, and that little extra length of wing, or extra bit of cheek, which enables one to escape the clutch of the hawk, or pick up the bit of bread off the crowded crossing, while his brother failed, and so transmitting the new characteristic to his descendants (for like breeds like) to form gradually a race better fitted for the life that it has to live.

In this way creatures changed and developed enormously, of course it all took a long time, much longer than we can conceive. Some of you know how long it takes a gardener to produce a new flower, or a farmer to make a new breed of cattle with careful selection at every generation, and the time taken for Nature's unconscious selection must be infinitely longer.

Now of all characteristics of animals, colour is the most variable. To take a familiar instance. How differently different people's hair is coloured? In this case the colours vary quite at random. Babies with brown hair are looked after quite as well as those with golden, and so both are equally likely to survive. The colours of wild animals do not change in this way, but this is easily explained. Their colours are of two sorts, protective and warning. Small and defenceless animals are coloured, so as to escape the notice of their foes, *e.g.* the rabbit, the hedge-sparrow, and the grass-hopper, while predatory animals, such as the wolf, need the same protection to approach their victims.

Some creatures on the other hand which are unpleasant to the taste, or are eaters of carrion or lifeless food are gaily painted to warn off others from attacking them. Such are the magpie, the skunk, and many butterflies.

Now any change in the colour of most wild animals would serve to make them more conspicuous, and would generally cost the individual its life, so they would not be transmitted to descendants. It is only the useful variations that can be handed down.

Under domestication, where there is no fear of enemies, rapid changes occur at once; for instance, how a litter of pups will vary in colour!

I remember once keeping a pair of ordinary brown rabbits in a wire enclosure where they could burrow freely. They bred there, but after a time became a nuisance, as they turned up in the middle of the tennis court one morning, so we dug them out and found fifteen youngsters varying in colour from fawn to black.

You all know how rare white animals are in nature, and how common they are under domestication. The fact is that white varieties are constantly apt to occur, but in the natural state, their conspicuousness at once marks them as a prey to their foes.

The present colours of wild animals, then, are the result of long selection. We see how beautifully they are adapted to their surroundings. The rabbit in the fern is brown, the snipe and woodcock among dead leaves and broken sticks are mottled, while the grass-hopper is bright green. Most Arctic animals are white. Here selection favours the white variety. The polar bear needs his white coat to conceal himself from his victim, while the Ptarmigan and Arctic hare escape observation and capture in the same way. Even the exceptions prove the rule. The sable with his glossy brown coat hardly ever trusts himself out of trees, and the raven only seeks carrion, and is strong enough not to mind if his sombre hue attracts notice.

All animals that live in the desert, the lion as well as the antelope, are sand coloured.

We will look a little closer into one case of protective colouring, that of Birds' Eggs. They are made of chalk, and chalk we know is white, so the original birds' eggs were no doubt white too, just as those of crocodiles and lizards are to this day. But white is very conspicuous, and so a bird that happened to lay slightly coloured eggs would be more likely to save them from hawk or crow or predatory animal, and rear them successfully. The peculiarity would be transmitted just as a long nose with us, and so eggs would gradually become coloured.

What are the facts we observe now? Birds that build in holes—the sand-martin, king-fisher, and wren have still white, or almost white eggs. Those that lay in open nests on the ground—the plover, snipe and curlew have eggs so like the rough grass among which they lie, that you may easily tread upon them by mistake, while the pheasant, partridge and wild duck, that have light-coloured eggs, always cover them before they go from home.

Surely these facts are too strong for chance, there are instances of protective colouring, of which I should like to be able to speak at greater length, but they do not quite come under the head of mimicry proper. Mimicry depends on a resemblance between an animal and some object among its immediate surroundings, of which it is a practical gain to the creature to be a more or less exact copy. For instance if a toad so closely resembles a knob of wood that a heron fails to see it, when seeking for food, we have a case of true mimicry, for the toad saved its life by the imposture. Now of mimicry of this kind we have some examples in England. I mentioned to you the case of the clear-wing. Several caterpillars so closely resemble the food plant, on which they live, as to be almost indistinguishable. The Emperor caterpillar, which is found on heather, has alternate patches of black and dark green with little red edges, which easily pass for heather blossom. And the little geometer caterpillars are so called because they rest with their bodies at right angles to a branch so as to be almost certainly taken for little dried twigs.

There is one instance too of a predatory spider mimicking the blossom of the guelder rose so exactly that foolish insects settle within its deadly clutches in the hope of finding honey. But it is among tropical insects that we find the most perfect examples of mimicry. Let us notice one or two properties which are common to all the mimics.

(1). They are weak and defenceless, and generally good to eat.

(2). They move slowly, and depend for safety on fraud rather than on speed.

It is at the same time one of the surest and one of the saddest effects of evolution this great law of Nature—that when a creature gives up using any of its powers, it soon loses the power altogether. I remember when a small boy being very much impressed with a story told to me by an old lady. She had a beautiful little clock in her room, with a bell alarum beneath, which was set by a string that hung out in an irritating way. One day I was caught pulling it, but nothing happened. I suppose it was out of order, but my lasting impression of her story was this:—Once upon a time she used to get up every morning at 7, and then her alarum used to wake her with the utmost regularity, but at last she got old and lazy, and then the alarum refused to work when it found it was not listened to. I am afraid that this is not true of clockwork, but it is certainly true of Nature. The fish that live in the great caves of Kentucky lose their sight just as surely as the man who takes no exercise loses the proper use of his limbs.

In the first place then the mimic is defenceless. Next he must be much less common than the creature he mimics. If there were many more clear-wings than wasps or hornets, birds would begin to think it worth while attacking insects with yellow bands round their bodies. Lastly, the imitation, however minute, extends only to outward form and colour, and does not affect the internal character of the creature.

We have mentioned a few cases of mimicry among British insects, but it is among Tropical forms that we find the most numerous and perfect specimens. As I have said, we may divide insects into two classes :—

(1). Those that sting or are inedible by reason of possessing a disagreeable taste. It is to the advantage of these sort of insects that they should be avoided, and they are generally painted in bright warning colours—blue and red and yellow.

(2). Those which are edible and defenceless. Among these latter we find mimicry of two kind: that of inamimate objects around, that of their more fortunate neighbours.

It is to Mr. Wallace, who spent many years in studying the Natural History of the Malay Archipelego, and Mr. Bates, who travelled on the Amazons, that we are largely indebted for our knowledge of the subject.

Mr. Wallace was travelling with his natives one day, when they came to tell him that there was a new insect among the firewood. He looked at the place they pointed out, but could only see some bits of brown moss, when suddenly to his astonishment one of the bits of moss walked off—it was a live insect. Its back was all ragged and was even covered with little red spots to represent tiny lichens. Again, a bright moth of a rich purple hue with a bright band across its wings attracted his attention, but whenever he pursued it, it suddenly vanished. At last he saw the very spot where one alighted on a bush among some dead leaves, but no! it was gone. A careful examination shewed that it had turned into a veritable leaf attached by a twig to a branch, in such a way as to deceive him when gazing straight at it.

As Professor Drummond was travelling through Africa between Lakes Nyassa and Tanganyika his native servant suddenly exclaimed

'Chirombo'—a live creature, and pointed to a wisp of hay that had fallen on his coat. The Professor turned it over and asked where the 'Chirombo' was. "There in your hand" said the native. The wisp of hay was itself the Chirombo. Like all its kind, it had the power of shamming dead and lay a veritable bit of brown grass, which could be pinched or pulled about without shewing a sign of life. Another curious insect of the same type is the 'walking-stick' insect of which I am fortunate enough to have a specimen here to-night.

But even this was not the arch-deceiver. The Professor was lying one day among the bare rocks by a river-bed watching the life around him. There were a lot of white bird droppings about on the stones. He happened to have his eyes fixed on one, when suddenly it moved. There was no doubt about it. He walked up to it, but no! his eyes had deceived him. There it was, a mere bird dropping. However, he thought he would make sure, and turned it over, and there he found a head and six legs!

Perhaps the most beautiful cases of mimicry are those in which the imitator resembles an inedible species. In tropical forests of South America there is a large family of butterflies called the *Heliconidæ*. They are evidently unpleasant to the palate and exude an unpleasant juice; (neither the fowls nor a pet monkey would look at them), and so they are guadily decked with warning colours, to tell birds that they are not meant to be eaten. Another family, the *Pieridæ*, are unconspicuous, and move with a rapid flight, knowing that they are tempting morsels. But several species of the *Pieridæ* mimic exactly corresponding individuals among the *Heliconidæ*.

They differ utterly in shape, and are as different, from the naturalist's point of view, as a dog from a rabbit; *e.g.*, six legs to four, but when flying it is almost impossible to distinguish them apart. (They both have the same lazy nonchalant method of going about, and of hanging in the most conspicuous places). And this is not an isolated instance. Similar cases may be counted by the hundred.

The *Danaidæ* are a very numerous group of brightly painted butterflies, which more or less take the places of the *Heliconidæ* in the Old World. One of them, *D. Chrysippus*, is of a tawny red with black borders dotted with white. There are also four black spots in the middle of the hind wings. Like the *Heliconidæ* they are very tough and exude a powerfully smelling juice, and are not attacked by birds, and, extraordinary to relate, their colours and markings are exactly mimicked by six or eight other butterflies. The case of *Hypolimnas* is most curious. The male is a rich brown colour with a large white spot on each wing, while the female resembles *D. Chrysippus* exactly except that there is only one black spot instead of four on the hind wings. This mimicry by the female alone is quite common, and is easily explained, for the life of the male butterfly is of very little importance, while a female has to survive until she has laid her eggs in a suitable place.

Such resemblances are found in other insects besides butterflies. For instance, a certain Borneo beetle exactly resembles a large black wasp, while other soft beetles resemble this curculios or weevils, which are so hard that they have to be drilled in order to be pinned, and would doubtless give a small bird indigestion. Again, grasshoppers are found which mimic the curculios, or even the bright but inedible lady-bird.

Mr. Wallace discovered in Sumatra a butterfly called *Papiho Memnon*. The male is a rich black colour, on a ground of soft blue. Its wings are nearly five inches across, and the hind ones are rounded off with edges scalloped like a cockle. The females are of two kinds. About half resemble the male except in colours, but the rest are quite different. No one would suppose them to be the same insect, as their hind wings are lengthened out into large spoon-shaped tails, and are yellow instead of blue. When flying they exactly resemble another butterfly, the Papilio Coon, which is not attacked by birds.

The most curious thing is both sorts of females have offspring of both kinds. This is as though a roaming European on some desert island had two wives—one a negress, and the other a Red Indian, and they both had children, which did not mingle the characteristics of their parents, but all the boys were fair like the father, while half the girls of both mothers had black skins and woolly pates, while the other half were copper-coloured with long straight hair. We may well feel bewildered at the notion.

The whole forest then is peopled with shams. To us Englishmen, with our strong notions of sincerity and openness, there seems to be something mean and underhand about it all, but perhaps we should view the case differently if we lived in a tropical forest with tigers ready to pounce on us from behind and gorillas preparing to drop on us from above ; perhaps we should not even stick at dressing up like a monkey under the circumstances. At any rate it is better to be a live dog than a dead lion.

"THE COMMON FLOWERS OF CHELTENHAM."

BY MISS LAURIE.

THE following is a resumé of a very instructive lecture given to the Society by Miss Laurie, of the Ladies' College, on the "Common Flowers of Cheltenham." — In choosing a subject on which to address you, it seemed best to take something which would be useful to those among you who are exploring the flora of the district around Cheltenham. The easiest way to get to know the habitants of a district is to take walks, gather specimens of all the plants and get some friends to tell you the names. This is the easiest way, but it is open to several objections. A friend with the requisite knowledge is not always at hand, and it is very doubtful whether any real knowledge of the subject can be gained in this way, for, after all, if we could tell the names of all the trees in a forest, should we necessarily know all about them? To know the name of a plant is a very different thing from knowing the plant itself. What does really knowing a plant mean? Well, first it includes knowing all that can be observed of the plant by careful and persistent watching it, the way it grows, the time of year it flowers, the nature of the flower itself, the arrangement of the leaves. But even this is only partial knowledge. What happens to that plant during the long cold Winter, has it died entirely, will another plant like it grow up from its seed? If so, where has the seed been all the Winter? And if the plant is one of those forming underground stems and growing up in the Spring by putting out fresh shoots, the problem is even more difficult, how has the life of the plant been preserved in that underground stem when the ground has been frozen hard? Again, what is the relation of any given plant to other plants? Where does it stand in the scale of existence? These are some of the questions that would have to be answered, before we should begin to know anything at all, in any real sense, about a plant. In the limits of a single address it would be impossible to deal with all these questions, and I propose to-day to try and give some idea of the relation of plants to each other, and to shew you how to identify them.

The first thing that is absolutely necessary is to know the parts of a flower.

A perfect flower, besides the essential organs, stamens and pistils, has sepals and petals. The green sepals protect the flower in bud, and often drop off when the flower opens. Poppy is a good example of that. When in bud the red petals are all tightly folded and concealed, but as the bud opens, and the petals spread out, the sepals drop off, they are no longer wanted. The petals are nearly always bright in colour, as their use is to attract insects. Some botanists think that certain insects are attracted by certain colours, and ingenious theories have been put forward to shew how different colours must have originated; according to Grant Allen yellow was the first colour and blue is the last to be produced; bees are supposed to have a special fancy to blue. Flowers which are visited by night-flying insects are totally white, so that they may be seen; very often they are also sweet smelling. Insects visit flowers in order to get their honey and in doing so they also get pollen, which they carry to another flower of the same kind, and thus cross-fertilisation is brought about.

At first sight it seems as if the stamens and pistils are entirely different from sepals and petals; the poet-philosopher, Goethe, was one of the first to point out their real relationship. He shewed that sepals, stamens, and carpels all come off laterally from the stem. The idea first occurred to him while looking at a fern-palm at Padua. He was struck by the immense variety of changes of form which the successively developed stem leaves exhibit, by the way in which the first simple root leaflets are replaced by a series of more and more divided leaves, till we come to the most complicated. He afterwards succeeded in discovering the transformation of stem leaves into sepals and petals, and, of course, sepals and petals into stamens, nectaries, and ovaries.—Goethe's *Metamorphosis of Plants*, 1790.

More modern botanists argue that stamens are converted into petals, *e.g.*, garden flowers; c.f., a garden rose with a wild rose.

In botany anything that comes off laterally from a stem is called a leaf; so that sepals, petals, stamens, and carpels are really leaves; quite as much as the green leaves we all know so well; a botanist speaks of these green leaves as foliage leaves, while sepals, etc,, he calls floral leaves. It is very important to be clear about this, as it is impossible to understand the structure of a pistil, unless we remember that its parts are essentially leaves. The ordinary green leaf has a stalk and a blade, sometimes leaves have no stalks only the blade-like portion; down the middle of that blade-like portion there runs what is called the rib of the leaf. Now let us see how a pistil is formed from leaves like this. Supposing it consists of one leaf, as is the case in sweet pea. What happens is this: the leaf unites by its edges, so as to form a chamber and the ovules then become developed on the side of the chamber. In a ripe pod of sweet pea you know how the seeds are fastened on to the edges, that was the side along which the carpels united, the opposite side shews the position of the mid-rib; and the pod of the sweet pea splits along both places. Pistils are often formed from more than one carpel, and then the edges of the carpels may unite in various ways. Let us take the case of the daffodil, which has three carpels. These not only unite by their edges, but the edges curve in so as to divide the chamber into three parts; there are to all intents and purposes three chambers; if the carpels had united merely by their edges, a single chamber would have been formed. This chamber is called the ovary, and the ovules are formed in the ovary. Imagine the apex of a leaf lengthened out and you will understand how the style is produced, the stigma is the top part of the style on which the pollen is placed.

$$\text{Pistil}\left\{\begin{array}{l}\text{Stigma,}\\ \text{Style,}\\ \text{Ovary.}\end{array}\right.$$

Go through the dissection of daffodil:

1. The dark yellow is strictly speaking an outgrowth, not an actual part of the flower.
2. The bright yellow parts, answering to sepals and petals, form what is called "perianth"—outer coverings. If the daffodil be compared with the snowdrop, the three outer light yellow leaves answer to the outer white spreading leaves of the snowdrop, and the three inner light yellow leaves to the upright white petals. Thus the snowdrop has nothing answering to the dark yellow of the daffodil.
3. The position of the ovary, inferior.

We may compare with this Order the *Liliaceæ*. Hyacinth.

1. Six leaves forming the perianth.
2. Ovary above the rest of the flower.

The position of the ovary is a very distinctive feature in fixing the Order of a flower. Daffodil and hyacinth have a great deal in common, the rings of the flower each consists of three parts, or some multiple of three—thus, perianth = six leaves, androecium = six stamens, gynaecium = three carpels; but the different position of the ovary is quite sufficient to separate these flowers, they belong consequently to different Orders. The Linnean system—Linnæus grouped plants together largely by the number of their stamens. Plants with three stamens were *Triandria*, those with six *Hexandria*; this was very useful at the time, and Linnæus did a great deal for the systematizing of botany, but it was found to be really unscientific; plants which resembled each other as far as the number of stamens is concerned very often differed in other respects, the wall-flower, for instance, has six stamens, so has the hyacinth, in every other respect they are entirely different. Plants are grouped together now in proportion as they resemble each other as a whole. The hyacinth and daffodil belong to the great group of plants known as *Monocotyledons*. The easiest way of recognising a *Monocotyledon* is to look at its leaves, the veins all run parallel to each other. The term means: one seed leaf; plants that belong to this group have one seed leaf which remains undeveloped; whilst *Dicotyledons* have two. Again, in *Monocotyledons* the parts of a flower are arranged in threes.

One of the most interesting orders among the *Dicotyledons* is the *Cruciferæ*. Flowers belonging to this Order have always cruciform corallas.

In the young bud of the Cuckoo Flower which belongs to this Order, all the six anthers are turned towards the pistil which projects above them. Before the flower opens the four inner stamens elongate and overtop the stigma, and make a quarter of a revolution towards it, each one towards the small stamen nearest to it; so that now an insect in trying to reach the honey of one of the larger glands must rub its head or proboscis against the pollen bearing surface of one of the taller anthers. In cold rainy weather flowers are often found in which the revolution is incomplete or does not take place at all and in such cases the pollen of the longer stamens falls of itself upon the stigma. The shorter stamens always remain with the side at which they dehisce turned inwards towards the stigma, so that the pollen is rubbed off by a head or proboscis of any insect making for the smaller honey glands.

The *Leguminosæ*. There are some interesting facts about plants belonging to this Order. It is an Order that has two names, *Papilionaceæ*, from its corolla, but curiously enough this name only holds good in temperate regions, there are some plants growing in hot climates which are with the *Leguminosæ* that have not a papilionaceous corolla. It is almost the only Order that has stamens joined by their filaments; and many observations have been made on fertilisation in connection with the plants of this Order.

Rosaceæ. It is an order with almost every variety of fruit,—stone fruit: plum, cherry; false fruits with succulent receptacle, strawberry, blackberry, raspberry, which are not true berries at all, etc.

The *Umbelliferæ* are easily identified. The flowers are very small, but they occur together in such number that they are very conspicuous. It is said that plants belonging to this Order have more insect visits than any others (except *Compositæ*), the honey is particularly exposed, and it would be interesting to try and find out whether this is altogether a good thing. Any insect slight enough to balance itself on the small flower can get the honey, so that insect visits will occur plentifully; on the other hand, being exposed, honey is easily washed off. A flower which has the honey deep-seated will only be visited by insects with proboscis long enough to reach the honey; on the other hand honey is not washed away by rain, etc.

Compositæ is always easily recognised.

The two orders that are difficult to distinguish are the *Labiate* and *Scrophulariaceæ*; the condle too is very similar, but the manner of growth is very different.

The following are a few of the more uncommon flowers of Cheltenham, and the districts where they are found:—

GLENFALL.

Herb Paris.
Golden Saxifrage.

CHELT FIELD, RAILWAY BRIDGE.

Horse Tail.

CLEEVE.

Large Meadow Geranium.
Ragged Robin.
Hound's Tongue.
Quinancy Wont.
Spotted Orchis.
Pyramidal Orchis

LECKHAMPTON FIELDS.

Bee Orchis.

LECKHAMPTON HILL.

Tway Blade.
A rarer Saxifrage.
Ranunculus Ophioglossifolius.

HARTLEY BOTTOM.

Lady's Mantle.
Moonwort.
Tway Blade.
Butterfly Orchis.

DOWDESWELL.

Wood Vetch.
Herb Paris.
Solomon's Seal.

COOPER'S HILL AND CRANHAM.

Yellow Pimpernel.
White Helleborine.
Butterfly Orchis.
Bird's Nest Orchis.
Fly Orchis.
Belladonna.
Man Orchis.
Green Hellebore.

We must express our most cordial gratitude to Miss Laurie for her kindness in giving us a lecture so useful.

We append some notes printed specially for this lecture which may be useful to members of the Society.

Characteristic Features of a few Orders.

DICOTYLEDONS.

1. *Ranunculaceæ*—All the parts of the flower separate. The pistils superior.
Clematis, anemone, marsh marigold, buttercups, etc.

2. *Cruciferæ*—Petals four, forming a cross. Stamens six, of which two are shorter. Ovary shews two divisions.
Wallflower, cabbage, shepherd's purse, mustard, turnip, cuckoo flower.

3. *Leguminosæ*—Flowers papilionaceous (resembling a butterfly). Ten stamens, nine of which are usually combined. Ovary consists of one carpel. Fruit a pod.
Vetch, clover, pea, gorse, laburnum, acacia, rest harrow.

4. *Rosaceæ*—In many respects like *Ranunculaceæ*, but wall of ovary is often united to calyx.
Plum, cherry, apple, hawthorn, silver-weed, strawberry, meadowsweet.

5. *Umbelliferæ*—The flowers are all arranged in umbels, that is they are all given from the same point, and all the flower stalks are the same length. Flowers are usually white and often very small; the ovary is under the other parts of the flower.
Celery, carrot, parsley, hemlock.

6. *Compositæ*—Each apparent flower is a head of flowers.
Dandelion, coltsfoot, thistle, groundsel, daisy.

7. *Primulaceæ*—Parts of the flower are usually five. The stamens are often on the petals.
Primrose, cowslip, primula.

8. *Labiatæ*—Stems square. Leaves two and opposite. Flowers two-lipped.
Dead-nettle, mint, sage, thyme, ground-ivy.

9. *Scrophulariaceæ*—Flowers are very like those of Labiatæ, but the mode of growth of the plant, as a whole, is very different.
Flax, veronica, foxglove, snapdragon, rattle.

MONOCOTYLEDONS.

1. *Orchidaceæ*—The stamen is united with the pistil.
Bee, fly, bird's nest, etc.

2. *Amaryllideæ*—Perianth of six divisions, sometimes with a crown. Ovary under the rest of the flower.
Snowdrop, daffodil.

3. *Liliaceæ*—Perianth usually six divisions, but ovary above the rest of the flower.
Star of Bethlehem, tulip, hyacinth, asparagus, onion.

LECTURES BY W. H. D. ROUSE.

Rome.

A SHORT SKETCH was given of Roman history, shewing how large a part the city had played in the history of the world, and how traces of most of the greatest events of the last two thousand years can be found there. Slides were shown of the oldest remains in Rome: the Maritime Prison, where Jugurtha, Catilina, and so many others suffered; Cloaca Maxima, and the Wall of Servius Tullius. Next, the Forum as it is, with the foundations of the Basilica Jubia, remains of the temples of Castor and Pollux, of Saturn, and of Vespasian; the Rostra. the Sacred Way, the site of the Curia, and the Record Office. Then two bas-reliefs were shown, giving representations of the chief buildings in the Forum as they looked before their ruin: the Basilica and Temples. a triumphant arch, with the Sacred Fig-Tree, and the Mansyas. After this the Coliseum was thrown upon the screen, and the scenes were described which it had witnessed. The Imperial Palaces on the Palatine Hill followed, with anecdotes of their builders; the Tarpeian Rock and the site of the Roman Citadel, now crowned by the Church of Sta. Maria Araciali; some of the great Baths, and the Triumphal Arches. The bas-reliefs within the Arch of Titus created much interest, as they show the Golden Candlestick, the Table of Shewbread, and other spoils of the Temple at Jerusalem. After a few more of the ancient remains had passed before the audience then followed pictures of some modern churches, and of St. Peter's, with the granite obelisk that witnessed the massacres of the Christians in Nero's garden, and probably the crucifixion of St. Peter himself.

Greek Sculpture.

The primitive statues of Greece were rudely carved out of a tree-trunk. Of course none of these now remain, but their style can be observed from certain ancient stone and clay images, which have all the marks of wood technique, in the stiffness of attitude and straightness of line. Some of these are flat, as though their models were carved out of a board; others round, as though made from a tree-trunk. After these had been examined and explained, the lecturer proceeded to show Egyptian statues, and for comparison, one or two of the oldest Greek statues, pointing out how in the mode of sitting or standing, and in the arrangement of the masses of hair, the Greeks follow Egypt. The wonderful series of archaic statues unearthed upon the Acropolis at Athens showed the Greek genius breaking through the trammels of tradition, and step by step giving life and character to the stiff models; all the essentials still remaining the same, so that we see no wild revolt, but growth and progress. The quiet restraint of this early work has a charm quite its own, and suggests far more power in reserve than does the refined and finished technique of Praxiteles and the last great Attic school. The high importance of this Acropolis series was pointed out; how, as it was Xerxes who knocked them down, we are able to put an exact date, B.C. 480, later than which they cannot be; and how they are an almost continuous series from the rude and almost burlesque green bearded monster to the sweet and delicate pensiveness of the latest heads. Next came statues of the grand age, the Elgin Marbles of Pheidias; and lastly the Hermes of Praxiteles, where the art is just on the verge of decline, when technique was to take the place of genius.

A Summer Holiday in Syria.

The lecturer described how amid the tears of his friends and the jubilation of his enemies he started out for Syria in August, and found that the country instead of being a happy hunting ground of all the diseases under the sun, was simply delightful, though rather hot. A description was given of the great rocks of Lebanon, and of the scanty remains of the famous cedars; where for the first, and let us hope the last time in his life, he received from a lady of the land an offer of marriage. Baalbec was next shown, with its gigantic building-stones, each containing as many cubic feet as a respectable house. Then Damascus, with its historic straight street, the scene of St. Paul's escape, and the so-called House of Naaman. The Albana is there still. Mount Hermon followed, the summit of which was photographed for the first time by the lecturer. After a description of some small adventures with scorpions and other venomous beasts, and a night when the military guard of the traveller fell out and would have killed each other, like the Midianites of old, we came to the plain of Esraeldon, with Gilboa, Endor, and Jesreel: a short sketch of its battles was given. Then through Samaria and Shechen (where a visit was paid to the Samarian High Priest) to Jericho, Jerusalem, and Hebron.

SUMMARY OF A LECTURE ON "THE EYE,"

BY DR. FERGUSON.

On February 20th, at 5.30 p.m., Dr. Ferguson in the presence of the Principal and several of the Masters gave a most entertaining and instructive Lecture to the Natural History Society on the Eye. The presence of vision, he said, was related to light and use. The fishes and insects of the great dark Caves of Kentucky and Cuba were blind, and many deep sea fishes were even eyeless. Even perfect eyes would become blind unless kept in order by use. There was sight throughout the whole animal series, beginning with the simple imbedded lenses of sea anemonies and jelly fishes.

Then the structure of the human eye was described, and it was especially noticed that short-sighted people's eyes were too long from front to back and long-sighted people's too short. The mode by which the eye focuses near objects was specially dwelt on; this being effected by the natural elasticity of the lens, which is brought into play when the flattening influence of its suspensory ligament is lessened by the forward drag of the internal ciliary muscle.

The retina of the eye was described at length, more particularly its most important part, the rods and cones. No real retina, indeed, without rods or cones. The cones have probably most to do with the colour sense, as they are absent in most nocturnal animals.

Though with two eyes we see only one image, this is mainly because each right nerve of sight supplies the right halves of both eyes, and each left nerve the sight of both left halves. The pictures on our retina are inverted, but still we see all things upright. Thus, because we see the objects themselves, and not in our eyes, but in our brains, and judge of their positions by the direction from which their rays reach us.

Then a brief description, with lantern illustrations, was given of several other types of eyes; those of the snail, the nautilus, the cuttle-fish, the worm, and the insect. Eyes may be found in unexpected places: in our shrimp, on the legs; in the deep sea-fishes inside their mouths; and in the young Ascidian inside the brain. Then the eyes of fishes, birds and serpents were described. Next considerable reference was made to the third eye of many lizards—an eye not readily seen, unless one knew where and how to look for it. Its unexpected connection with the Pineal gland of the brain was then referred to—a discovery only about seven years old—from which we may assume that this long puzzling Pineal gland is only the undeveloped stalk or nerve of a third eye, with which we might have been provided had it been so ordered.

Finally the exactions in reference to eyesight of the Army and other Examining Boards were spoken about. No candidate can be accepted who has less than one-sixth of the natural sharpness of vision, as tested by types twenty feet away; but given that degree of vision he will be accepted, if with glasses one eye shall attain to normal vision and the other one to read small print at his own distance without glasses, and that he shall be able to distinguish the principal colours, and that he does not squint. For the Navy, no imperfections are permitted. For the Marines none beyond those that can be corrected by the weak lenses known as + or — ID (= 40in).

The lecture closed with the remarkable statement that whereas $3\frac{1}{2}$ per cent. of boys are colour-blind, the number of colour-blind girls is only one-twentieth of that percentage.

At the close of the lecture the Principal proposed a most hearty vote of thanks be given to Dr. Ferguson. This was carried by acclamation.

EXPEDITIONS.

A Visit to Oxford.

On Thursday, June 1st, 1893, an expedition was made by the Natural History Society to Oxford. On arriving we found our guides waiting at the station to show us the lions of the city. Different parties set out in search of the several places of interest. Our party first proceeded to the Ashmolean Museum, next to the Bodleian, and thence to the Natural History Museum; the greatest care being taken all the time to prevent the numerous parties from clashing. We then made our way to Christ Church, and after admiring the Cathedral, we turned our steps towards the ancient kitchen of the College, which is especially remarkable for its great size,—where before the fire is a spit capable of roasting sixty fowls or forty joints at the same time; there may also be seen a gridiron of considerable proportions, used in the time of Wolsey. The next object of interest was the great Dining Hall, certainly the finest in Oxford; its walls being adorned with portraits of former students. In the tower over the principal gateway hangs the great bell 'Tom,' and this we also saw before we left Christ Church.

But leaving Christ Church we went to Corpus, and then to Merton, whose fine chapel and spacious gardens are so well worth seeing. We next visited Magdalen, where we were delighted with the cloisters and the charming walk by the water-side. Our guide then took us to New College, with its cloisters and beautiful chapel. Among the numerous other Colleges, which we visited, St. John's was especially prominent with its splendid old gardens; the picturesque quad, and chapel of Exeter were also conspicuous.

After we had seen as much of the city as our limited time allowed us, we were very kindly entertained by the following O.C's. in their rooms:—W. H. Barrow, *Merton*; J. A. Inglis, *Christ Church*; L. T. Levick, *Pembroke*; L. L. Montagnon, *Hertford*; A. S. Owen, *New*; H. A. Thornton, *Christ Church*; T. C. Smith, *Hertford*; T. Vans Best, *Magdalen*; F. Worsey, *Corpus*; to whom the College owe their very best thanks for the kind way in which they conducted the Society about the Colleges and gave up so much of their time.

R.T.C.

Expedition to Chepstow and Tintern.

The first of the two annual expeditions of this Society took place on Saturday, May 26th, 1894. The places selected for our visit were Chepstow and Tintern, which fully justified the choice and the popularity which they gained some years ago when the Society visited them before. We were not very fortunate in respect of weather, which was very wet at times, and rather marred the pleasure of what was in all other respects a most enjoyable day. Leaving the Great Western Station at 1.15 p.m., we arrived at Chepstow shortly after three o'clock, in the midst of a heavy thunderstorm, which, however, did not prevent our admiring the view where the train leaves the cutting in the hillside to come out on the bridge over the Wye. Owing to the rain it was decided to proceed at once to Tintern, contrary to the original plan, which had been to see Chepstow and then go viâ the Wyndcliff to Tintern. Accordingly we went on to Tintern, through the most lovely scenery along the banks of the Wye. On arriving there, we were thankful to observe that the storm had ceased, and we at once went through the village to a picturesque little inn called the Beaufort Arms, situated immediately opposite the Abbey. Here a halt was called, and we were given the choice of remaining at Tintern till eight o'clock and going back to Cheltenham by train all the way, or of walking by the Wyndcliff to Chepstow. The majority chose the latter alternative, so while those who had decided to stay at Tintern were exploring the Abbey, the pedestrians were accommodated with an excellent tea, which was much appreciated by all. After, we went over the Abbey, a beautiful old building which is still, though possessing no roof and having the tracery of some of the windows damaged or missing, remarkably intact considering its age. It was built in 1131 by Walter de Clare, for monks of the Cistercian order. It is built in the Early English style for the most part, though in places the transition to the Decorated may be seen. We entered by the West door into the Abbey Church, by a ladder in the North transept of which access is gained to the top of the ruins, whence a fine view of the Wye valley may be obtained. Returning to the ground again and passing through the North transept we enter the cloisters. On the East side of these is the chapter house. Passing at the corner of the North and East walls the guests' dining chamber, and the gate leading to the river, we arrive at the refectory. In this room on the right hand as you enter is an opening in the wall, through which charity in the shape of loaves was administered by the monks to the poor, who stood in the cloisters. On the left is an opening in the wall communicating with the kitchen through which was passed the food for consumption in the refectory. In the centre of the same wall is a niche large enough to hold a man, and here it was that some brother read to his fellow-monks passages out of the Lives of the Saints, etc., as they were sitting at meals. Passing the refectory we come to the kitchen beyond, which at the corner of the North and West walls of the cloisters are two rooms, which were used as minor offices by the inhabitants. The situation of the Abbey is most beautiful. The river Wye flows a short distance from the East end of the Church, and all around on either banks, rise thickly wooded hills. Leaving the Abbey on our left we proceeded up the hill towards the Wyndcliff and Chepstow, the former, of which we were unable to ascend, on account of a heavy thunderstorm which overtook us as we were approaching it. Fortunately, before we had accomplished the three miles through a most beautifully wooded road, which brought us to Chepstow, this storm cleared off, and as we entered town the sun was shining again. We immediately proceeded to the Castle, a building dating from the XIV. Century, which, from its commanding position on a cliff overhanging the Wye, must before the days of artillery have been almost impregnable. The entrance to the Castle is on the East and as you enter on your right hand you see a massive tower. In this tower it was that Henry Marten the Regicide was imprisoned. On the left is seen a block of buildings of a more modern date, and still sufficiently intact to give shelter to the custodian, beneath these there is a fine vaulted chamber communicating with the river. Chepstow Castle is divided into three courts, of which the one described is the first and largest. Crossing this we come to another strong tower, which flanks the entrance to the second court. At the farther end of this is a building of much older date than any of the rest; in fact it is the only part remaining of the former Norman Castle built by Fitz Osbern, Earl of Hereford, in the 11th Century. This building was in all probability the dining hall, though some have thought that it was the Chapel. This structure occupies the whole of the rocky plateau on which the Castle is built, and which here narrows considerably, except a narrow passage communicating with the third court, at the farther end of which is the West gateway. This last court forms a sort of outwork to the rest. During the Civil War this Castle saw much fighting. It was garrisoned by the Royalists but soon surrendered to the Parliament. It was soon after recaptured by Sir Nicholas Kemeys. After this, Cromwell in person besieged it, but left the final attack to Colonel Ewer, who took it for the last time. After seeing the Castle we returned to Chepstow Station, where at 8 p.m., the train with those who had remained at Tintern arrived, and preceeded with us to Cheltenham, where we arrived at about 9 30 after a most enjoyable day. The hearty thanks of the Society are due to Mr. Hichens for kindly undertaking the management of the expedition, which task was so well performed that notwithstanding the change in our plans caused by the weather, everything passed off without a single hitch.

CHELTENHAM COLLEGE

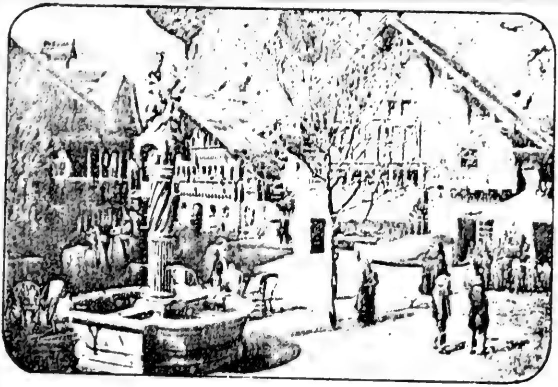
Natural History Society

LABOR OMNIA VINCIT

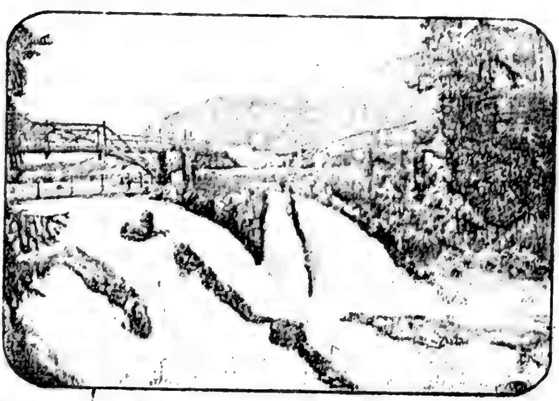
REPORT FOR THE YEAR 1900.

SUMPTIBUS EDITORUM CHELTONIENSIUM.

CHELTENHAM:
DARTER'S COLLEGE BOOK AND STATIONERY DEPOT,
NORTHWICK TERRACE.


Swiss Village at the Paris Exhibition—A. A. Johnston.


Lower Lode Ferry, Tewkesbury—S. Collett.


Falls on the Inn near St. Moritz—A. A. Johnston.

CHELTENHAM COLLEGE

NATURAL HISTORY SOCIETY

REPORT

OF THE PROCEEDINGS OF THE SOCIETY FOR THE YEAR

1900

Sumptibus Editorum Cheltoniensium.

CHELTENHAM:
JOHN DARTER, COLLEGE BOOK AND STATIONERY DEPOT,
NORTHWICK TERRACE.

CHELTENHAM:
THOMAS HAILING, PRINTER, THE OXFORD PRESS
1901.

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PREFACE.

THE numbers in the Society have been well maintained, and the interest shown in the Lectures and Excursions has been as keen as ever.

The Microscopical Section, which was started last year, has not had sufficient support given to it to make it worth while continuing its existence. All members of the Society must be very thankful to Mr. Scott for having done all he has for this Section, and perhaps, if there is any more interest shown in microscopical work in the future, he may consent to give it another trial.

There were five Excursions this year, one of a purely Archæological character, for we visited Hayles Abbey, where the excavations started last year under the superintendence of Mr. Baddeley and Mr. Bazeley have been continued during the summer. Everyone went enjoyed himself thoroughly, and we cannot be too grateful to the above two gentlemen for the care with which they explained to us the arrangements of the buildings and shewed to us the finds which had rewarded the excavators. We were very fortunate in being able to see a considerable strip of the pavement in the north aisle actually *in situ.*

In the beginning of the year, Mr. Witchell gave us a lecture on Observations which he had made on some of the habits of the commoner English birds. His kindness in giving up his time to come and talk to us on a subject he is so familiar with was much appreciated, and no one who heard him could have gone away without feeling what an enormous amount can be observed, and

that with no apparatus but a pair of keen eyes, in the animal world around us.

In the Winter Term, Mr. Prothero gave a marvellously clear and lucid account of the way in which a Church has often developed. Taking Churches in the neighbourhood as his examples, he did much to suggest to members how interesting and pleasant a pursuit is that of the archæologist. There is hardly one of our old English Churches which will not repay investigation, if only a certain amount of preliminary knowledge is obtained,—such as might be picked up from Mr. Prothero's lecture.

The gratitude of the Society is also due to those masters who so kindly lectured. Mr. Hedley's lecture on Explosives proving so interesing that it drew what must have been a record attendance to hear it.

Very little rearrangement has been done in the Museum during the year, but the collections have beee added to.

The Sectional evening Meetings which have been held during the year have been well attended, and on the whole the Sectional work has been better than in the previous year. During 1899 we lost several keen members whose places have been hard to fill, but there are many who, if they continue to take their present interest in Natural History, should turn into good observers.

We were glad to see Mr. Protheıo's lecture illustrated by lantern slides taken by members of the Photographic Section. It is to be hoped that this sort of thing will continue, and that this Section will provide the Museum with photographs of objects of interest in the neighbourhood.

It is with great pleasure that we publish some of the excellent photographs sent in for the competition; it is only from reasons of economy that more are not published.

THE COUNCIL, 1900.

President	THE PRINCIPAL.
Vice-President	REV. J. MUGLISTON.
Treasurer	W. M. BAKER, ESQ
Secretary	C. I. GARDINER, ESQ.
President of Archæological Section	A. S. OWEN, ESQ.
President of Botanical Section ...	REV. J. R. WYNNE-EDWARDS.
President of Entomological Section	J. C. SALTER, ESQ
President of Geological Section ...	C. I. GARDINER, ESQ.
President of Ornithological Section	M. TANNER, ESQ.
President of Photographic Section	C E. YOUNGMAN, ESQ.
President of Junior School ...	F J. CADE, ESQ.

RULES.

1.—That this Society be called The Cheltenham College Natural History Society, and have for its object the promotion of the study of Natural History.

2.—That Ordinary Meetings of this Society be held on Fridays once in three weeks, at 5.30 p.m., or at such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited and the ordinary business of the Society transacted.

3.—That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4.—That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5.—That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-, and that all Members who have paid five consecutive terminal subscriptions, be exempt from any further payment.

6.—That any Member whose Subscription shall be a whole term in arrears, shall cease to be a Member of the Society.

7.—That Members be encouraged to join Sections for the more accurate study of the different branches of Natural History: that the formation of these be arranged, and the work settled at the first Meeting of each term: that each Section be under a President, who is responsible for its meetings and organization, and that a Secretary be appointed by each Section to keep minutes of its proceedings, of which a summary shall appear in the report.

8.—That the Society issue a Report as often as the Council think fit.

9.—That the Officers of this Society consist of a President, Vice-President, a Secretary, and Treasurer, who, with the Presidents

and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10.—That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11.—That in the absence of the President, the Vice-President shall preside, or, in his absence, a member of the Council.

12.—That the duties of the Secretary shall be to give notice of Meetings of the Society and the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13.—That the Treasurer's accounts, after the approval and signature of the two Auditors, to be appointed at the last Meeting of each year, be laid on the table at the first Meeting of the succeeding year.

14.—That the Officers constitute for the time being the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15.—That the Secretary have power by a vote of the majority of Members present, at a Special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct should be adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of an ex-member to be permitted during the next term.

16.—That the Members of the Society on leaving the College become corresponding Members.

17.—That no alteration be made in these Rules except at a General Meeting at which 21 Members at least are present, and then only provided it is carried by a majority of two-thirds of those present.

Cheltenham College Natural History Society.

President ... ... THE PRINCIPAL.

Secretary ... ... C. I. GARDINER, ESQ.

Treasurer ... ... W. M. BAKER, ESQ.

LIST OF MEMBERS.

EASTER TERM, 1900.

LIFE MEMBERS.

Adams
Adamthwaite
Anderson
Armitage
Balfour
Bickerdike
Black
Bouch
Brinton
Bride
Burke, H.
Campbell, J. Donald
Cardew, J.
Clark, G. M.
Clarke, G.
Collett
Congreve, F. L.
Congreve, W. M.
Copland
Corfield
Crailsheim
Crosse
Currie
Davids
Dicken
Dixon
Dobell
Dunn
Dunsterville
Fitzherbert, C. H.
Fowke
Fox
Fraser
Fry
Furse
Gardiner
Glanville
Greer
Griffiths
Haldinstein
Harrison
Hawkins
Hodson
Holford
Holliday
James
Jenkins, N. M.
Johnston, A.
Johnston, R.
Lee
Lemon
Long
Mackie
Mackintosh
Martin
Milton, R.
Mortimore
Moore
Neame
Nicholls

Oakey
Oliver
Oppenheim, G.
Payne
Penny, H.
Penny, R.
Phillips, C.
Ponsonby
Pottinger
Radcliffe, S. R.
Raper
Rendle
Salter
Sanders
Sawyer
Sharp
Shaw, G. H.
Sherwill
Sington
Sloan
Stephen
Stranack
Tillard
Unett
Wells
White
Whitehead
Whittack
Wilson
Wolff
Young
Young, J. A. R.

ORDINARY MEMBERS.

Allan
Allen
Appleby
Aston
Bake
Banks
Bathe
Begbie
Bignell
Blockley
Blundell
Bourke
Brettell
Brown
Browning
Burke, E.
Cardew, E.
Capel-Davies
Chambers
Chapman
Chard
Clarke
Clarke, G. A. E.
Clerk
Cohen, D.
Cohen, E.
Congreve, C. R.
Conran
Cooper
Courtney
Cowan
Cox
Davidson
Davis, A. H.
Davis, F.
Davis, W.
Dickinson, G. B.
Dickinson, H. C.
Dill
Earle
Edwards
Exham
Ezra, D.
Ezra, E.
Ferguson
Festing, F. E.
Festing, H. W.
Flack
Forbes-Robertson
Freeland
Furnell
Gall
Gard'ner
Grieve
Grose
Guthrie
Hamilton
Harrington
Herbert
Hetherington
Higgon
Hill
Holliday
Howe
Howell
Howlden
Jenkins, R. A.
Jopp
Kennedy
Kershaw
Klein
Knowling
Kruger
Laming
Lamotte
Lathbury
Lawford
Lawson
Layton
Lee
Lesser
Lewis
Locke
Long
Lowther
Maitland-King
Malden
Maxwell
Maxwell
Megaw
Meyer
Middleton
Montague
Moore
Morris
Murray, G.
Nathan
Nicholson
Norton
O'Donel
Oppenheim
Orr-Ewing
Passingham
Paxton
Peel

Perkins
Priday
Quill
Radcliffe, F. V.
Ramsbottom, R.
Redfern
Roberts, A.
Robertson
Robinson
Russell
Samuelson, E.
Samuelson, V.
Sanderson
Sidebottom
Simpson
Solomon, D.
Solomon, L.
Stewart
Stockwell
Studd
Thomas, T. I. G.
Thrupp
Tolson
Turner, G. P.
Vicat
Wheeler
Whittall
Whittuck
Williams
Willoughby
Wilson
Wilson, J. V.
Woods
Woolatt
Wyatt

MIDSUMMER TERM, 1900.

LIFE MEMBERS.

Adams
Adamthwaite
Anderson
Armitage
Aston
Balfour
Bickerdike
Bignell
Black
Bouch
Bourke
Brinton
Burke, H.
Campbell, J. Donald
Cardew, E.
Cardew, J.
Chapman
Chard
Clark, G. M.
Clarke, G. A. E.
Clarke, J. G.
Clarke, T.
Collett
Congreve, F. L.
Congreve, W. M.
Cooper
Copland
Corfield
Cox
Crailsheim
Crosse
Currie
Davids
Davis, A. H.
Dicken
Dill
Dixon
Dobell
Dunn
Dunsterville
Exham
Fitzherbert
Fowke
Fox
Fraser
Fry
Furse
Gardiner
Gatacre, E.
Glanvile
Greer
Griffiths
Grose
Haldinstein
Hamilton
Harrison
Hawkins
Hodson
Holliday
Howlden
James
Jenkins, N. M.
Johnston, A.
Johnston, R.
Knowling
Lamotte
Lee
Lemon
Lesser
Lewis
Long
Lowther
Mackie
Mackintosh
Maitland-King
McCulloch
Meyer
Milton, R.
Moore
Nathan
Neame
Nicholls
Norton
Oakey
Oliver
Oppenheim, D.
Oppenheim, G.
Payne
Paxton
Penny, H.

Penny, R.
Perkins
Phillips, C.
Ponsonby
Porteous
Pottinger
Quill
Radcliffe, S. R.
Raper
Rendle
Salter
Sanders
Sawyer
Sharp
Shaw
Sherwill
Simpson
Sington
Sloan
Solomon, D.
Solomon, L.
Stockwell
Stranack
Studd
Tillard
Thrupp
Wells
Wheeler
White
Whittuck
Williams
Wilson, W. A.
Wolff
Young
Young, J. A. R.

ORDINARY MEMBERS.

Adderley, R.
Adderley, R. W.
Allan
Allen
Appleby
Bake
Banks
Bathe
Bazeley
Beadon
Begbie
Bell
Biscoe
Blundell
Brettell
Browning
Brinton
Buckley
Burke, E.
Capel-Davies
Chadwick
Chambers
Clarke, R. O.
Clerk
Cohen, D.
Cohen, E.
Congreve, C. R.
Conran
Courtney
Cowan
Cummins
Cunningham
Davidson
Davis, F.
Davis, W.
Dickinson, G. B.
Dickinson, H. C.
Earle
Edwards
Ezra, D.
Ezra, E.
Farmer
Fawkes
Festing, H. E.
Festing, H. W.
Fitzherbert, E.
Freeland
Furnell
Gall
Gardiner
Gatacre, G.
Glendinning
Gould, H. L.
Grieve
Guthrie
Hamilton
Harrington
Herbert
Hetherington
Higgon
Hill
Howe
Howell
Jenkins, R. A.
Jopp
Kennedy
Kenworthy
Ker
Kershaw
Klein
Laming
Lathbury
Lawford
Lawson
Layton
Lee
Littleton
Locke
Malden
Marklove
Maxwell
McSwiney
Megaw
Middleton
Milton, L.
Montague
Morris
Morrison
Murray, G.
Nicholson
Nicolls
O'Donel
Orr-Ewing
Pardoe
Pearce, H. G.
Peel
Priday
Radcliffe, F. V.
Ramsbottom, R.
Roberts, A. A.
Robertson-Shersby
Robinson
Russell
Samuelson, E.
Samuelson, V.

Sanderson
Sidebottom
Stephens, R. C.
Storr
Suarez
Thomas, T. I. G.
Thoyts
Tinson
Tolson
Tulloch
Turner, G. P.
Turner, H. S.
Turpin
Tyzack
Vicat
Walter
Webb
Wells
Whittall
Williams, H. F.
Wilson
Wilson, J. V.
Woods
Woolatt
Wright, R. A.
Wright, H. N.
Wyatt

CHRISTMAS TERM, 1900.

LIFE MEMBERS.

Adamthwaite
Armitage
Aston
Bathe
Balfour
Bickerdike
Blundell
Bouch
Bourke
Brinton
Burke, E.
Chapman
Chard
Clark, G. M.
Clarke, G. A. E.
Clarke, G.
Clerk
Collett
Congreve, W. M.
Cooper
Corfield
Cox
Crailsheim
Currie
Davids
Davis, A. H.
Dickinson, H. C.
Dixon
Dobell
Earle
Edwards
Exham
Fitzherbert, C. H.
Fowke
Fox
Fraser
Fry
Furnell
Gall
Gard'ner
Gatacre, E.
Greer
Griffiths
Grose
Haldinstein
Hamilton
Holliday
Howlden
Jenkins, N. M.
Johnston, A.
Johnston, R.
Knowling
Lamotte
Layton
Lemon
Lesser
Lewis
Lowther
Mackintosh
Maitland-King
McCulloch
Meyer
Milton, R.
Mitchell-Dawson
Nathan
Oppenheim, D.
Oppenheim, G.
Penny, H.
Phillips, C.
Porteous
Pottinger
Quill
Radcliffe, S. R.
Raper
Rendle
Sanders
Sharp
Sherwill
Simpson
Sington
Solomon, D.
Solomon, L.
Studd
Thrupp
Wheeler
Whittall
Whittuck
Wilson, W. A.
Young

ORDINARY MEMBERS.

Adderley, R.
Adderley, R. W.
Allan
Allen
Appleby
Banks
Bathe
Bazeley
Begbie
Bell
Birch
Biscoe
Brettell
Brinton
Buckley
Burke, E. P.
Campbell
Capel-Davies
Chadwick
Chambers
Clarke, R. C.
Clarke, R. O.
Cohen, D.
Cohen, E.
Congreve, C. R.
Conran
Courtney
Cowan
Cummins
Cunningham
Dane
Daubeney
Davidson
Davis, F.
Davis, W.
Dickinson, G. B.
Farmer
Fawkes
Festing, H. E.
Fitzherbert, E. C. W.
Forbes-Robertson, J.
Freeland
Fryer
Gatacre, G.
Gill
Glendinning
Gordon
Gould, H. L.
Guthrie
Harrington
Harker
Herbert
Hetherington
Higgon
Hill
Howe
Hunot
Jenkins, R. A.
Jopp
Joyner
Kennedy
Kenworthy
Kershaw
Laming
Lawford
Lawson
Lee
Littleton
Locke
Lodwick
Macdonnell
Malden
Marklove
Matthews
Maxwell
McSwiney
Megaw
Milne
Montague
Morris
Morrison
Murray, G.
Neame, G. T.
Nicolls
O'Donel
Orr-Ewing
Osborne
Pardoe
Pearce, H. G.
Peel
Priday
Radcliffe, F. V.
Ramsbottom, R.
Robertson-Shersby
Russell
Samuelson, E.
Samuelson, V.
Sanderson
Scovell
Smythies
Stephens, R. C.
Stopford
Storr
Suarez, N.
Suarez, R.
Tate
Thomas
Thoyts
Tinson
Tolson
Turner
Turpin
Tyzack
Vicat
Wade
Walter
Waterhouse
Webb
West
Williams, H. F.
Woods
Woolatt, C. H.
Woolatt, R.
Wright, H. N.
Wright, R. A.
Wyatt

LECTURES AND EXCURSIONS.

Feb. 6 ... Lecture on "Observations on Birds," by C. A. Witchell, Esq.

Feb. 20 ... Lecture on "The Bottom of the Deep Blue Sea," by C. I. Gardiner, Esq.

May 29 ... Excursion to Andoversford.

June 8 ... Excursion to Hayles Abbey.

June 19 ... Excursion to Colesbourne.

June 30 ... Excursion to Birdlip.

July 17 ... Excursion to Postlip Hall.

Oct. 22 ... Lecture on "Some of the Churches Near Cheltenham," by H. Prothero, Esq., O.C.

Nov. 22 ... Lecture on "Coral Islands," by S. D. Scott, Esq.

Nov. 27 ... Lecture on "Explosives," by G. W. Hedley, Esq.

ARTICLES PRESENTED TO MUSEUM

DURING 1900.

Date.	*Articles.*	*Presented by.*
Jan. 28 ...	Case of Eagles	Mr. J. White.
„ 27 ...	Gadfly	C. H. Campbell, C.
Feb. 9 ...	Pictures relating to Buddhists Gods	G. W. Egleston, Esq.
Mar. 21 ...	Native Instruments and Egg of Emu	Mrs. J. Abercrombie.
„ 31 ...	A Chinese Rain Coat ...	Mrs. J. Abercrombie.
April 3 ...	Blackbird, stuffed	J. Forbes-Robertson, C.
„ 14 ..	Specimens of Rock-Salt ...	S. Collett, C.
May 2 ...	Carved Emu's Egg	S. A. Kisch, Esq., O.C.
„ 4 ...	A Leopard's Skin, a Bison's Skull, a Deer's Skull, a Gong	Col. Jenkins.
„ 8 ...	A Blackbird's Egg and Adder	J. H. Campbell, C.
„ 11 ...	Specimen of Coral	J. Berry-Torr, Esq., O.C.
„ 18 ...	Fir Ball, from Colemere Mire	Lady Marling.
„ 19 ...	Post Card, from Blomfontein	Wyndham Peel, Esq., O.C.
„ 26 ...	Eggs of Bullfinch and Stone-chat...	J. H. Cardew, C.
„ 31 ...	Native Silver, from Ems Mines, Germany	E. N. Ezra, C.
Sept. 24 ...	Specimens of Lava and other rocks from the French Colony, Réunion ...	Courtney Bennett, Esq.

Date.	*Article.*	*Presented by.*
Sept. 28	Two copies of Seals of Hailes Abbey	A. A. Hunter, Esq., O.C.
,, 28	Burmese Hat, Umbrella and Pictures	J. H. Cardew, O.C.
,, 30	Ceylon Outrigger and Bottle containing Scorpions ...	E. B. Cardew, Esq., O C.
Nov. 14	Partridge in Case	Mr. J. Darter, Librarian.
,, 20	Skin cast by Indian Grass Snake	R. F. Francis, C.
Dec. 7	Case of Australian Birds ...	*Lent by* J. C. Cade, Esq.
,, 8	Specimens of Kaolin and Lignite	L. Richardson, Esq.
,, 12	Cabinet, containing Shells and Minerals	General Cox.
,, 12	Kruger Coin	Dr. Scot-Skirving, O.C.
,, 14	Cartridges and Clip from Mauser Rifle	Dr. Scot-Skirving, O.C.
,, 19	Cases of the following Shells fired by the Boers during the War, 1899—1900; 1 Cruesot, 1 15-pounder, 1 Howitzer, 1 Pom-Pom (Vickers-Maxim) and 1 Clip, Mauser Ammunition	Lieut. P. E. Lindsedge-Elgee, O.C.

Reports from Sections.

ARCHAEOLOGICAL SECTION.

President : A. S. OWEN, ESQ.

Members :

G. B. Allen	J. G. Black
H. R. C. Balfour (Sec.)	R. Glanvile
J. R. Balfour	G. Marsden
T. Bouch	E. C. Willoughby

IN the Summer Term several of the general expeditions contained matter of archœological interest. The Society took advantage of the excavations at present being conducted at Hayles Abbey to obtain the very best possible guidance in Archæology. Under the escort of the Rev. W. Bazeley, O.C., and Mr. E. St. Clair Baddeley, who are responsible for the excavations, they went round the "diggings" and saw the interesting discoveries that have made in the ground plan of the Church and the monastic buildings. While we were there, one discovery of considerable interest was made, the first tile with an inscription upon it that had been found, though from the tiles bearing heraldic designs or rebuses that have been found the gaps in the hitherto unknown history of the Abbey could almost be written.

In the excursion to Birdlip on the day after Speech Day, the usual visit was paid to the scanty remains of the Roman Villa.

A new and very interesting excursion was made in July to Postlip House, a picturesque Elizabethan mansion behind Cleeve Hill. By the kindness of the owners we were allowed to see all over it, and to visit the little church of the reign of Stephen, long used as a barn, but now restored for purposes of worship.

A Sectional excursion was made on the first Saturday of the Christmas Term to Gloucester, where several of us went over the Cathedral, and saw something of the many picturesque corners in which the City abounds.

BOTANICAL SECTION.

SENIOR.

President: REV. J. R. WYNNE-EDWARDS.

JUNIOR.

President: F. J. CADE, ESQ.

WORKING MEMBERS.

SENIOR.

BANKS, P. D'A. (4).	JENKINS, R. A. (*J.*)	SANDERS, H. R. (2).
CONGREVE, C. (*Cc.*)	LOWTHER, R. C. (*L.*)	WRIGHT, G. A.
CONGREVE, W. M. (*C.*)	MORRISON, H. (*M.*)	WRIGHT, H. N. (*W.*)
CURRIE, M. M. L. (1).	PASSINGHAM, C. W. (*P.*)	YOUNG, G. A. W. (2) (*Y.*)
HODSON, T. A. (1).	ROBERTS, A. A. (3) (*R.*)	SALTER, T. M. (*S.*)

(1) Winner of Prize in 1896.
(2) „ „ 1898.
(3) „ „ 1899 and 1900.
(4) „ Junior Prize in 1898.

The initials in Italics refer to the list of records.

SENIOR DEPARTMENT.

ONCE more we have to record the results of a very successful season. The number of competitors for the prize was not quite so great as last year, but the merit of the work was of a still higher order. We must congratulate A. A. Roberts on beating the record established by Banks in 1898; he got 399 plants, exclusive of sedges and grasses. The following boys got over 50 specimens.

A. A. Roberts ...	433	C. W. Passingham ...	106
H. N. Wright ...	294	W. M. Congreve ...	98
R. A. Jenkins ...	214	H. Morrison ...	63
G. A. W. Young ...	177		

Great service was rendered to the Section by Mr. Hedley, who found several plants which we have not previously recorded. We must also give our best thanks to J. E. Little, Esq., who joined all the expeditions that took place while he was here, and gave us valuable help in the identification of grasses.

Among this year's additions to our list were Alyssum calycinum, which seems to be rapidly establishing itself in several cornfields; Lathyrus Nissolius, the beautiful Grass Vetchling, and Lathyrus palustris, both of which were found near Churchdown; Antennaria margaritacea and Chrysanthemum parthenium, two more of the many garden escapes which seem to have firmly established themselves in the Birdlip woods; Carduus marianus; Calluna vulgaris (Ling), which we have known for some years above Postlip, but have never previously found in flower; Crocus vernus and Juncus tennis

There were four expeditions during the Summer term. The first, on June 8th, was to Hailes Abbey. This was of course, in the first instance, for the Archaeologists, and the long journey left but little time for flower hunting, but it was interesting to get into a district where ferns were plentiful.

On May 29th we went to Whittington, and visited the curious floral "oasis" near Puckham Woods. Here in a tiny bit of marsh land may be found Menyanthes trifoliata (Bogbean), Eriophorum polystachion (Cotton Grass), Orchis latifolia (Marsh Orchid), Parnassia palustris (Grass of Parnassus) and Epipactus palustris (Marsh Helleborine), although they are quite unknown in any other parts of the Cheltenham district.

On June 19th we went to Hilcot Woods and Colesbourne, and found as usual Mimulus luteus (Monkey Flower), and Cephalanthera grandiflora (White Helleborine). We also came upon a large patch of Cynoglossum officinale (Hound's Tongue) and Hyoscyam niger (Henbane).

The expedition to Tewkesbury on July 17th proved a complete failure owing to the vagaries of our steed, which was apparently seized with sunstroke on the way, so that we spent most of the afternoon on the road. We found Thalictrum major (Meadow Rue) once more after the lapse of some years, but it was not in flower.

The competition for the prize in 1901 will begin at once, and those who intend to compete should give in their names to the President of the Section as early as possible.

It may interest some of our readers to see the following list of flowers, 34 in all, found between Cheltenham and the top of Leckhampton Hill, on the 4th of January, 1901. They illustrate the remarkable mildness of the early part of the Winter.

Ranunculus acris (Buttercup).
Papaver Rhoeas (Red Poppy).
Capsella Bursa-pastoris (Shepherd's Purse).
Sisymbrium officinale (Yellow Mustard).
Alliaria officinalis (Garlic Mustard).
Reseda luteola (Dyer's Weed).
Stellaria media (Chickweed).
Cerastium vulgatum (Mouse-ear Chickweed).
Arenaria serpyllifolia (Thyme-leaved Sandwort).
Geranium Robertianum (Herb Robert).
Ulex europaeus (Gorse).
Geum urbanum (Herb Bennet).
Pastinaca sativa (Wild Parsnip).
Bellis perennis (Daisy).
Sonchus arvensis (Sow Thistle).
Lapsana communis (Nipplewort).
Achillea Millefolium (Yarrow).
Taraxacum officinale (Dandelion).
Senecio vulgaris (Groundsel).
Centaurea scabiosa (Knapweed).
Chlora perfoliata (Yellow-wort).
Galium Aparine (Cleavers).
Veronica agrestis (Field Speedwell).
Linaria cymballaria (Ivy-leaved Toadflax).
Teucrium Scorodonia (Wood Germander).
Lamium purpureum (Red Dead Nettle).
Lamium album (White Dead Nettle)
Euphorbia Peplus (Petty Spurge).
Euphorbia Helioscopia (Sun Spurge)
Mercurialis perennis (Dog's Mercury)
Poa annua (Meadow Grass).
Arrhenatherum avenaceum (False Oat Grass).
Brachypodium pinnatum (False Brome Grass).
Dactylis glomerata (Cock's-foot Grass).

In the list of records, when a flower was first found by a master, and afterwards by a boy, the master's date and the boy's initials are given, the master's initials only being given when no boy found the flower during the year.

JUNIOR DEPARTMENT.

The work was not so good as it has often been. J. C. Wynne-Edwards gained the prize with 134 specimens, C. S. Roberts being second with 115, and L. C. Tate third with 68. Epipactus palustris and Parnassia palustris were found by Roberts, and also Carduus marianus which has not been recorded for several years. The usual Summer expedition was prevented by a devastating outbreak of measles in the department.

LIST OF FLOWERS WITH DATES OF FIRST BLOOM.

Latin Name.	*English Name.*	*Date.*	*Record.*
Clematis Vitalba ...	Traveller's Joy ...	July 18 ...	R.
Anemone nemorosa ...	Wood Anemone ...	May 5 ...	J.
Adonis autumnalis ...	Pheasant's Eye ...	June 10 ...	E, J.
Ranunculus aquatilis ...	Water Crowfoot ...	May 4 ...	J.
,, Flammula ...	Spearwort ...	May 17 ...	R.
,, Ficaria ...	Celandine ...	Jan. 17 ...	R.
,, sceleratus ...	Scelery-leaved Crowfoot	June 8 ...	C.
,, auricomus ...	Goldilocks ...	May 5 ...	R.
,, acris	Common Buttercup ...	May 5 ...	C. J.
,, repens	Common Buttercup ...	May 12 ...	P.
,, bulbosus	Common Buttercup ...	May 3 ...	R.
,, arvensis ...	Corn Buttercup	May 25 ...	L.
,, hederaceus ...	Water Crowfoot ...		
Thalictrum flavum ...	Meadow Rue ...		
Helleborus viridis ...	Green Hellebore ...	Mar. 17 ...	R.
Caltha palustris ...	Marsh Marigold ...	Mar. 31 ...	R.
Aquilegia vulgaris ...	Columbine ...	May 29 ...	P.
Berberis vulgaris ...	Common Barberry ...	May 15 ...	R.
Nuphar luteum ...	Yellow Water Lily ...	June 16 ...	R.
Nymphæa alba ...	White Water Lily ...	July 28 ...	*G. W. H.*
Papaver Rhoeas ...	Field Poppy ...	May 30 ...	W.
,, dubium ...	Long-headed Poppy ...	June 5 ...	C.
,, Argemone ...	Pale Poppy ...		
Chelidonium majus ...	Common Celandine ...	May 8 ...	R.
Fumaria officinalis ...	,, Fumitory ...	May 8 ...	J.
Corydalis lutea ...	Yellow ,, ...	May 22 ...	R.
Barbarea vulgaris ...	Yellow Rocket ...	May 10 ...	J.
Cheiranthus Cheiri ...	Wall Flower ...		
Nasturtium officinale ...	Common Water Cress ...	June 2 ...	Y.
,, palustre ...	Marsh ,, ...	June 8 ...	C.
,, amphibium ...	Great ,, ...	June 9 ...	R, Y.
Arabis hirsuta ...	Hairy Rock Cress ...	May 20 ...	R, Y.

Latin Name.	*English Name.*	*Date.*	*Record.*
Cardamine amara ...	Large Bitter Cress ...	June 3 ...	*J.R.W.E*
,, pratensis ...	Cuckoo Flower ...	May 3 ...	R.
,, hirsuta ...	Hairy Bitter Cress ...	May 3 ...	R.
,, impatiens ..	Narrow-leaved Bitter Cress...	July 31 ...	R.
Hesperis matronalis ...	Dame's Violet ...	June 5 ...	*G.W.H.*
Sisymbrium officinale ...	Yellow Hedge Mustard...	May 5 ...	R.
Alliaria officinale ...	Garlic Mustard ...	May 3 ...	R, C.
Erysimum cheiranthoides	Treacle Mustard ...	May 19 ...	W.
Brassica muralis ...	Wall Brassica ...	May 5 ...	C.
,, oleracea ...	Cabbage ...	May 13 ...	R.
,, campestris ...	Field Brassica ...	June 5 ...	*G.W.H.*
,, alba ...	Cultivated Mustard ...	May 29 ...	P.
,, sinapistrum ...	Charlock ...	May 8 ...	R, Y.
,, nigra ...	Black Mustard ...	June 20 ...	R.
Cochlearia armoracia ...	Horse Radish ...	May 20 ...	J.
Alyssum calycinum ...	Small Alyssum ...	May 20 ...	R, C.
Draba verna ...	Common Whitlow Grass	Mar. 11 ...	R.
,, muralis ...	Wall ,, ,,		
Thlaspi arvense ...	Penny Cress ...	June 16 ...	*G.W.H.*
Iberis Amara ...	Candytuft ...	July 15 ...	*G.W.H.*
Capsella Bursa-pastoris ...	Shepherd's Purse ...	Feb. 12 ...	Y.
Lepidium campestre ...	Common Pepperwort ...	May 17 ...	W.
,, Draba ...	Hoary Cress ...	May 19 ...	R.
,, Smithii ...	Smith's ,, ...	June 13 ...	R, W.
,, ruderale ...	Narrow-leaved Cress ...	June 25 ...	*G.W.H.*
Senebiera Coronopus ...	Common Wart Cress ...	June 20 ...	R.
,, didyma ...	Lesser Cress ...	May 31 ...	Y.
Isatis Tinctoria ...	Woad ...	May 8 ...	R.
Reseda luteola ...	Dyer's Weed ...	June 16 ...	R.
,, lutea ...	Cut Leaved Mignonette	June 16 ...	W.
Helianthemum vulgare ...	Rock Rose ...	May 21 ...	R.
Viola odorata ...	Sweet Violet ...	April ...	R.
,, hirta ...	Hairy ,, ...	May 14 ...	R, Y.
,, canina ...	Dog ,, ...	Mar. 17 ...	R.
,, tricolor ...	Pansy ...	May 8 ...	R.
Polygala vulgaris ...	Milkwort ..	May 11 ...	Cc.
Silene inflata ...	Bladder Campion ...	June 17 ...	R, J.
Lychnis vespertina ...	White ,, ...	May 10 ...	C.
,, diurna ..	Red ,, ...	May 11 ...	R, Y.
,, Githago ...	Corn Cockle ...	June 28 ...	R.
,, Flos-cuculi ...	Ragged Robin ...	June 2 ...	R.
Sagina procumbens ...	Procumbent Pearlwort...	May 20 ...	C.
,, nodosa ...	Knotted ,, ...	June 3 ...	R.
Arenaria serpyllifolia ...	Thyme-leaved Sandwort	May 29 ...	R.
,, trinervis ...	Three-nerved ,, ...	May 8 ...	R.
Cerastium vulgatum ...	Mouse-ear Chickweed ...	May 5 ...	Y.
,, arvense ...	Field-ear ,, ...	May 19 ...	R.

Latin Name.	*English Name.*	*Date.*	*Record.*
Stellaria aquatica ...	Water Starwort ...	July 5 ...	R.
,, media ...	Chickweed ...	Jan. 11 ...	R.
,, uliginosa ...	Bog Starwort ...		
,, graminea ...	Lesser ,, ...	June 10 ...	R, W.
,, holostea ...	Common ,, ...	May 3 ...	C.
Speigula arvensis ...	Corn Spurry ...	June 23 ...	Y.
Hypericum perforatum ...	Common St. John's Wort	June 28 ...	W.
,, dubium ...	Imperforate ,, ,,	June 30 ...	R, W.
,, quadrangulum	Square-stalked ,, ,,	July 3 ...	R, W.
,, humifusum ...	Trailing ,, ,,		
,, pulchrum ...	Slender ,, ,,		
,, hirsutum ...	Hairy ,, ,,	June 18 ...	W.
Linum catharticum ...	Purging Flax ...	May 29 ...	C.
Malva rotundifolia ...	Dwarf Mallow ...	June 29 ...	R.
,, sylvestris ...	Common ,, ...	June 16 ...	R.
,, moschata ...	Musk ,, ...	July 8 ...	R.
Tilia Europea ..	Lime ...	July 5 ...	R.
Geranium pratense ...	Meadow Cranesbill ...	June 18 ...	W.
,, Robertianum ...	Herb-Robert ...	May 8 ...	R.
,, molle ...	Dove's-foot Cranesbill ...	May 10 ...	C.
,, dissectum ...	Jagged ,, ...	June 8 ...	R, J, P, W.
,, lucidum ...	Shining ,, ...	May 19 ...	R.
,, pusillum ...	Small-flower ,, ...	May 19 ...	R.
,, columbinum ...	Long-stalked ,, ...	June 19 ...	R.
,, sylvaticum ...	Wood ,, ...		
,, pyrenaicum ...	Mountain ,, ...	June 2 ...	R.
Erodium cicutarium ...	Common Storksbill ...		
Oxalis Acetosella ...	Wood Sorrel ...	May 5 ...	J.
Impatiens Noli-me-tangere	Yellow Balsam ...		
Acer campestre ...	Maple ...	May 3 ...	L.
,, Pseudo-platanus ...	Sycamore ...	May 3 ...	R.
Ilex Aquifolium ...	Holly ...	May 17 ...	R, Y.
Euonymus europaeus ...	Spindle Tree ...	June 15 ...	R, J, W.
Rhamnus catharticus ...	Buckthorn ...	June 19 ...	R.
Ulex europaeus ...	Gorse ...	Jan. 2 ...	R.
Genista tinctoria ...	Dyer's Greenwood ...	June 20 ...	R.
Cytisus scoparius ...	Broom ...		
Ononis arvensis ...	Rest Harrow ...	July 2 ...	R.
,, campestris ...	Spiny ,, ...	July 2 ...	R.
Medicago sativa ...	Lucern ...		
,, Lupulina ...	Nonsuch ...	May 25 ...	*G. W. H.*
Melilotus officinalis ...	Melilot ...	June 18 ...	R.
Trifolium arvense ...	Hare's Foot Trefoil ...		
,, incarnatum ...	Crimson Clover ...	June 5 ...	*G. W. H.*
,, hybridum ...	Alsike ,, ...	May 8 ...	R.
,, pratense ...	Purple ,, ...	May 14 ...	R, Y.
,, repens ...	Dutch ,, ...	May 30 ...	W.
,, procumbens ...	Hop Trefoil ...	June 16 ...	R, W.

Latin Name.	*English Name.*	*Date.*	*Record.*
Trifolium minus ...	Lesser Trefoil ...	May 7 ...	C.
Lotus corniculatus ...	Bird's Foot Trefoil ...	May 11 ...	J.
Anthyllis Vulneraria ...	Kidney Vetch ...	May 19 ...	R.
Hippocrepis comosa ..	Horse-shoe Vetch ...	June 3 ...	W.
Onobrychis sativa ...	Sainfoin ...	June ...	R, J.
Vicia tetrasperma ...	Slender Vetch ...	May 11 ...	W.
,, hirsuta ...	Hairy ,, ...	July 19 ...	*G. W. H.*
,, Cracca ...	Tufted ,, ...	June 16 ...	R.
,, sylvatica ...	Wood ,, ...	June 16 ...	W.
,, sepium ...	Bush ,, ...	May 2 ...	J.
,, sativa ...	Common ,, ...	May 11 ...	R, Y.
,, lathyroides ...	Spring ,, ...	June 5 ...	*G. W. H.*
Lathyrus pratensis ...	Yellow ,, ...	June 9 ...	R.
,, sylvestris ...	Everlasting Vetch ...	July 3 ...	W.
,, macrorrhizus ...	Tuberous Bitter ,, ...		
,, Nissolia ...	Grass Vetchling ...	July 1 ...	S.
,, palustris ...	Marsh Pea ...	July 8 ...	R.
Prunus communis ...	Blackthorn ...	May 3 ..	R.
,, Cerasus ...	Cherry ...	May 10 ...	*G. W. H.*
,, Padus ...	Bird Cherry ...		
Spiraea Ulmaria ...	Meadow Sweet ...	June 16 ...	R, W.
,, Filipendula ...	Dropwort ...		
Geum urbanum ...	Wood Avens ...	May 26 ...	R, W.
Rubus Idaeus ...	Raspberry ...	June 29 ...	R, P, W.
,, fruticosus ...	Common Blackberry ...	June 1 ...	R, J, W.
,, caesius ...	Dewberry ...	June 9 ...	R.
,, corylifolius ...	Hazel-leaved Blackberry	June 12 ...	W.
Fragaria vesca ...	True Strawberry ...	May 5 ...	R.
Potentilla Fragariastrum...	Barren ,, ...	Mar. 21 ...	J.
,, reptans ...	Creeping Cinquefoil ...	May 31 ...	W.
,, Tormentilla ...	Tormentil ...	May 11 ...	Y.
,, anserina ...	Silverweed ...	May 23 ...	J.
Alchemilla vulgaris ...	Lady's Mantle ...	May 14 ...	R.
Sanguisorba officinalis ...	Great Burnet ...	July 1 ...	R, J, W.
Poterium Sanguisorba ...	Salad ,, ...	May 5 ..	J.
Agrimonia Eupatoria ...	Agrimony ...	June 26 ...	E.
Rosa canina ...	Dog Rose ...	June 5 ...	R.
,, arvensis ..	Trailing Rose ...	June 18 ...	R, Y, P, [W, M.
Pyrus communis ...	Pear ...	May 3 ...	R.
,, Malus ...	Apple ...	May 3 ...	R, Y.
,, Aucuparia ...	Mountain Ash ...	May 23 ...	E.
,, Aria ...	Beam Tree ...	June 1 ...	R.
,, torminalis ...	Wild Service-tree ...		
Crataegus Oxyacantha ...	Hawthorn ...	May 13 ...	R.
Epilobium angustifolium	Rose-bay Willow Herb	June 23 ...	R.
,, hirsutum ...	Hairy ,, ,,	July 5 ...	R.
,, parviflorum ...	Small-flower'd,, ,,	July 3 ...	W.
,, montanum ...	Common ,, ,,	June 15 ...	J.

Latin Name.	*English Name.*	*Date.*	*Record.*
Epilobium tetragonum ...	Square Willow Herb ...		
,, palustre ...	Marsh ,, ,, ...	July 24 ...	Y.
Circaea lutetiana ...	Enchanter's Nightshade	July 3 ...	W.
Oenothera biennis ...	Evening Primrose ...		
Lythrum Salicaria ...	Purple Loosestrife ...	July 5 ...	R.
Bryonia dioica ...	Bryony ...	June 1 ...	R.
Cotyledon Umbilicus ...	Pennywort ...		
Sedum rhodiola ...	Rose-root Stonecrop ...		
,, album ...	White ,, ...	June 19 ...	R.
,, acre ...	Biting ,, ..	June 9 ...	R.
,, rupestre ...	Rock ,, ...	July 24 ...	*G. W. H.*
,, Telephium ...	Orpine ,, ...	July 28 ...	*G. W. H.*
Semper-virens tectorum...	Houseleek ...		
Ribes Grossularia ...	Gooseberry ...	May 8 ...	*G. W. H.*
,, rubrum ...	Red Currant ...	May 5 ...	Y.
Saxifraga granulata ...	Meadow Saxifrage ...		
,, tridactylites ...	Rue-leaved ,, ...	May 29 ...	*G. W. H.*
,, umbrosa ...	London Pride ...		
Chrysosplenium oppositifolium...	Golden Saxifrage ...	April 7 ...	R.
,, alternifolium...	,, ,, ...		
Parnassia palustris ...	Grass of Parnassus ...	July 24 ...	R, Rc.
Sanicula europea ...	Wood Sanicle ...	May 8 ...	J.
Apium graveolens ...	Celery ...	June 10 ...	W.
,, nodiflorum ...	Procumbent Celery ...	June 28 ...	R.
Sison Amomum ...	Hedge Sison ...	July 26 ...	R.
Aegopodium Podagraria	Goutweed ...	June 6 ...	W.
Carum Carvi ...	Caraway ...	July 3 ...	W.
,, segetum ...	,, ...	July 17 ...	*G. W. H.*
Petroselinum Sativa ...	Parsley ...		
Pimpinella Saxifraga ...	Burnet Saxifrage ...	June 6 ...	W.
,, magna ...	Greater Burnet Saxifrage	July 31 ...	R.
Oenanthe fistulosa ...	Water Dropwort ...	June 9 ...	R.
,, Phellandrium...	Fine-leaved ,, ...	July 21 ...	*G. W. H.*
,, pimpinelloides	Parsley ,, ...	July 8 ...	C.
Aethusa Cynapium ...	Fool's Parsley ...	June 18 ...	R.
Silaus pratensis ...	Pepper Saxifrage ...	July 13 ...	R.
Angelica sylvestris ...	Wild Angelica ...	July 14 ...	*J. R. W. E.*
Pastinaca sativa ...	Parsnip ...	June 5 ...	C, W.
Heracleum Sphondylium	Cow Parsnip ...	May 10 ...	C.
Scandix Pecten-Veneris...	Shepherd's Needle ...	May 31 ...	C, W.
Conopodium denudatum	Earth Nut ...	May 20 ...	R, Y.
Chaerophyllum sylvestre	Wild Chervil ...	May 3 ...	R. P.
,, temulum	Rough ,, ...	June 3 ...	W.
,, Anthriscus	Burr ,, ...	July 13 ...	R.
Caucalis nodosa ...	Knotted Hedge Parsley...		
,, Anthriscus ...	Upright ,, ,, ...	June 10 ...	E.
Daucus Carota ...	Carrot ...	June 30 ..	Y.

Latin Name.	*English Name.*	*Date.*	*Record.*
Conium maculatum ...	Hemlock ...	June 16 ...	W.
Hedera Helix ...	Ivy ...	Oct. ...	
Smyrnium Olusatrum ...	Alexanders ...		
Viscum album ...	Mistletoe ...		
Cornus sanguinea ...	Dogwood ...	June 15 ...	R.
Adoxa Moschatellina ..	Moschatel ...	May 5 ...	G.
Sambucus nigra ...	Elder ...	June 8 ...	C.
Viburnum Lantana ...	Wayfaring Tree ...	May 12 ...	J.
,, Opulus ...	Guelder Rose ...	June 9 ..	R, Y, J, W, [M.
Lonicera Periclymenum...	Honeysuckle ...	June 14 ...	R.
Galium Cruciata ...	Crosswort ...	May 5 ...	R.
,, verum ...	Yellow Bedstraw ...	June 20 ...	W.
,, palustre ...	Marsh ,, ...	June 20 ...	R.
,, uliginosum ...	Bog ,, ...	June 26 ...	R.
,, saxatile ...	Rock ,, ...	July 14 ...	*C.I.G.*
,, Mollugo ...	Great Hedge Bedstraw...	June 16 ...	R.
,, Aparine ...	Cleavers ...	May 22 ...	L, J.
Asperula odorata ...	Woodruff ...	May 5 ...	J.
,, cynanchica ...	Squinancywort ...	June 20 ...	R.
Sherardia arvensis ...	Field Madder ...	May 3 ..	J.
Centranthus ruber ...	Red Valerian ...		
Valeriana officinalis ...	Great ,, ...	May 14 ...	Rc.
,, dioica ...	Marsh ,, ...	May 13 ...	R.
Valerianella olitoria ...	Lamb's Lettuce ...	July 11 ...	W.
,, Auricula ...	,, ,, ...	June 26 ...	R.
Dipsacus pilosus ...	Small Teasel ...	July 14 ...	R, W.
,, sylvestris ...	Common ,, ...	July 24 ...	R.
Scabiosa succisa ...	Devil's-bit Scabious ...	July 8 ...	R.
,, Columbaria ...	Small ,, ...	June 30 ...	R, W.
,, arvensis ...	Field ,, ...	June 21 ...	R, Y, J.
Eupatorium cannabinum	Hemp Agrimony ..	July 3 ...	W.
Aster Linosyris ...	Goldilocks ...	July 28 ...	*G.W.H.*
Solidago Virga-aurea ...	Goldenrod ...		
Bellis perennis ...	Daisy ...	Feb. 3 ...	R, Y.
Filago Germanica ...	Cudweed ...	July 14 ...	R.
,, Gallica ...	Narrow Cudweed ...		
Gnaphalium Sylvaticum...	Wood ,, ...	July 21 ...	R.
Antennaria margaritacea	Pearl Antennaria ...	July 24 ...	*G.W.H.*
Inula dysenterica ...	Fleabane ...	July 19 ...	R.
,, Coniza ...	Ploughman's Spikenard	July 19 ...	*G.W.H.*
,, Pulicaria ...	Small Fleabane ...		
,, Helenium ...	Elecampane ...		
Chrysanthemum Leucanthemum...	Dog Daisy ...	May 23 ...	Y.
,, segetum...	Corn Marigold ...	July 5 ..	W.
,, Parthenium	Feverfew Chrysanthemum	June 30 ...	R, Y, J, W.
Matricaria Chamomilla ...	Camomile ...	June 8 ...	C.
,, inodora ...	Feverfew ...	May 23 ...	J.

Latin Name.	*English Name.*	*Date.*	*Record.*
Anthemis Cotula ...	Stinking Mayweed ...	June 26 ...	R.
,, arvensis ...	Corn Camomile ...		
Achillea Millefolium ...	Yarrow ...	June 16 ...	W.
,, Ptarmica ...	Sneezewort ...		
Tanacetum vulgare ...	Tansy ...	July 17 ...	R, J, W.
Artemesia vulgaris ...	Mugwort ...	July 21 ...	R.
Tussilago Farfara ...	Coltsfoot ...	Mar. 11 ...	Y.
,, Petasites ...	Butterbur ...	April 9 ...	*G. W. H.*
Senecio vulgaris ...	Groundsel ...	Jan. 11 ...	R.
,, sylvaticus ...	Wood Groundsel ...		
,, erucifolius ...	Narrow-leaved Ragwort	June 23 ...	R.
,, aquaticus ...	Marsh ,, ...	July 17 ...	J.
,, Jacobaea ...	Common ,, ...	June 23 ...	R, W.
Arctium Lappa ...	Burdock ...	July 23 ...	R.
Serratula tinctoria ...	Sawwort ...	June 23 ...	R.
Carduus Marianus ...	Milk Thistle ...	July 24 ...	R, Rc.
,, nutans ...	Musk ,, ...	June 20 ...	R, J.
,, acanthoides ...	Welted ,, ...	June 23 ...	W.
,, lanceolatus ...	Spear ,, ...	July 7 ...	Y.
,, palustris ...	Marsh ,, ...	June 8 ...	J.
,, arvensis ...	Creeping,, ...	June 26 ...	W.
,, pratensis ...	Meadow ,, ...		
,, acaulis ...	Dwarf ,, ...	June 30 ...	Y.
,, pycnocephalus...	Slender ,, ...	June 6 ...	R.
,, eriophorus ...	Woolly ,, ...	July 26 ...	R.
Carlina vulgaris ...	Carline ,, ...	July 14 ...	R, W.
Centaurea nigra ...	Black Knapweed ...	June 19 ...	W.
,, Scabiosa ...	Scabious ,, ...	June 28 ...	R.
,, Cyanus ...	Cornflower ...	June 10 ...	E.
Tragopogon pratensis ...	Goat's Beard ...	May 30 ...	H.
Helminthia echioides ...	Ox-tongue ...	July 1 ...	E.
Picris hieracioides ...	Hawkweed Picris ...	July 24 ...	R.
Leontodon hispidus ...	Common Hawkbit ...	June 10 ...	R, W.
,, autumnalis ...	Autumnal ,, ...	June 10 ...	R, W.
Hypochaeris radicata ...	Cat's Ear ...	June 1 ...	W.
Lactuca muralis ...	Wall Lettuce ...	June 6 ...	J.
Sonchus arvensis ...	Corn Sow Thistle ...	June 16 ...	W.
,, oleraceus ...	Common ,, ...	June 8 ...	C, J, W.
,, palustris ...	Marsh ,, ...	June 16 ...	*G. W. H.*
Taraxacum Dens-leonis ...	Dandelion ...	Mar. 17 ...	Y.
Crepis virens ...	Common Crepis ...	June 8 ...	R, J, W.
,, biennis ...	Rough ,, ...	May 23 ...	C.
,, taraxacifolia ...	Beaked ,, ...	June 10 ...	E.
Hieracium Pilosella ...	Mouse-ear Hawkweed ...	May 30 ...	W.
,, murorum ...	Wall ,, ...	June 2 ...	R.
,, aurantiacum...	Orange ,, ...	June 17 ...	T.
Cichorium Intybus ...	Succory ,, ...	July 17 ...	R.
Lapsana communis ...	Nipplewort ,, ...	June 14 ...	R, W.

Latin Name.	*English Name.*	*Date.*	*Record.*
Campanula glomerata ...	Clustered Bell Flower ...	July 14 ...	R, W.
,, Trachelium ...	Nettle-leaved ,, ...	June 30 ...	R, Y, J.
,, Rapunculoides	Creeping ,, ...	July 22 ...	Rc.
,, rotundifolia ...	Harebell ...	June 30 ...	W.
,, hybrida ...	Corn Bell Flower ...	May 29 ...	R.
Calluna vulgaris ...	Ling ...	July 31 ...	R.
Monotropa Hypopithys ...	Bird's Nest ...		
Primula veris ...	Cowslip ...	May 3 ...	R.
,, vulgaris ...	Primrose ...	Mar. 10 ...	R.
,, Elatior ...	Oxlip ...		
Lysimachia vulgaris ...	Yellow Loosestrife ...		
,, nemorum ...	Moneywort ...	May 24 ...	J.
,, Nummularia	Creeping Jenny ...	July 3 ...	J, W.
Anagallis arvensis ...	Scarlet Pimpernel ...	June 12 ...	W.
,, tenella ...	Bog ,, ...	July 28 ...	*G. W. H.*
Pinguicula vulgaris ...	Butterwort ...		
Fraxinus excelsior ...	Ash ...	June 26 ...	R.
Ligustrum vulgare ...	Privet ...	June 15 ...	R.
Vinca major ...	Greater Periwinkle ...	May 5 ..	*G. W. H.*
,, minor ...	Lesser ,, ...	...	R.
Erythraea Centaurium ...	Centaury ...	July 1 ...	Rc, E.
Gentiana campestris ...	Common Gentian ...	Aug. ...	R.
Menyanthes trifoliata ...	Buckbean ...	May 29 ..	R, P.
Limnanthemum nymphae-oides ...	Water Gentian ...	June 18 ...	R, J, W.
Chlora perfoliata ...	Yellowwort ...	June 24 ...	Y.
Convolvulus arvensis ...	Small Bind Weed ...	June 10 ...	J, W.
,, sepium ...	Great ,, ...	June 28 ...	R, W.
Cuscuta europæa ...	Greater Dodder ...	July 21 ...	R.
Echium vulgare ...	Viper's Bugloss ...	June 19 ...	J.
Myosotis palustris ...	True Forget-me-not ...	June 23 ...	R, J, W.
,, arvensis ...	Field ,, ...	May 8 ...	R.
,, collina ...	Early ,, ...	May 29 ...	W.
,, versicolor ...	Changing ,, ...	June 5 ...	W.
,, sylvatica ...	Wood ,, ...	May 29 ...	R, J, P.
,, repens ...	Creeping ,, ...	June 8 ...	C.
Pulmonaria officinalis ...	Lungwort ...		
Lithospermum officinale...	Gromwell ...		
,, arvense ...	Corn Gromwell ...	June 2 ...	R.
Anchusa semper-virens ...	Alkanet ...	June 10 ...	J.
Symphytum officinale ...	Comfrey ...	May 20 ...	J.
Borago officinalis ...	Borage ...	July 21 ...	R.
Cynoglossum officinale ...	Hound's-tongue ...	June 2 ...	R.
Hyoscyamus niger ...	Henbane ...	June 19 ...	R, W.
Solanum Dulcamara ...	Bitter Sweet ...	May 31 ...	R.
,, nigrum ...	Black Nightshade ...	...	
Atropa Belladonna ...	Deadly ,, ...	June 2 ...	R.
Orobanche major ...	Great Broomrape ...		

Latin Name.	*English Name.*	*Date.*	*Record.*
Lathraea squamaria ...	Toothwort ...	May 24 ...	J.
Verbascum Thapsus ...	Common Mullein ...	July 8 ...	R.
,, nigrum ...	Black ,, ...	June 29 ...	R.
Linaria vulgaris ...	Yellow Toad Flax ...	July 14 ...	R, W.
,, minor ...	Lesser ,, ...	June 19 ...	R, Y, W.
,, Cymballaria ...	Ivy-leaved ,, ...	May 3 ...	R.
,, spuria ...	Round ,, ...	July 14 ...	R.
Scrophularia nodosa ...	Knotted Figwort ...	May 26 ...	R.
,, aquatica ...	Marsh ,, ...	June 13 ...	R, W.
Mimulus luteus ...	Monkey Flower ...	June 13 ...	R, W.
Digitalis purpurea ...	Foxglove ...	June 16 ...	W.
Veronica Serpyllifolia ...	Thyme-leaved Speedwell	May 10 ...	R.
,, officinalis ...	Common ,, ...	June 19 ...	R, W, M.
,, Anagallis ...	Water ,, ...	June 8 ...	C.
,, Beccabunga ...	Brooklime ,, ...	May 29 ..	R, P.
,, montana ...	Mountain ,, ...	May 11 ...	C.
,, Chamaedrys ...	Germander ,, ...	May 7 ...	C.
,, hederaefolia ...	Ivy-leaved ,, ...	Jan. 24 ...	R.
,, agrestis ...	Procumbent ,, ...	Jan. 11 ...	R.
,, Buxbaumii ...	Buxbaums's ,, ...	Mar. 21 ...	Y.
,, arvensis ...	Wall ,, ...	May 19 ...	R, J, P, W.
Bartsia Odontites ...	Red Bartsia ...	July 5 ..	W.
Euphrasia officinalis ...	Eye-bright ...	June 9 ...	R, W.
Rhinanthus Crista-galli ...	Yellow Rattle ...	June 3 ...	Y.
Pedicularis palustris ...	Marsh Lousewort ...	May 14 ...	E.
,, sylvatica ...	Common ,, ...	May 20 ...	R, Y.
Melampyrum pratense ...	Cow Wheat ...		
Lycopus arvensis ...	Gipsywort ...	July 21 ...	R.
Mentha aquatica ...	Water Mint ...	July 28 ...	R.
,, sativa ...	Whorled ,, ...	July 21 ..	R.
,, arvensis ...	Corn ,, ...		
,, rotundifolia ..	Round-leaved ,, ...		
,, piperita ...	Pepper ,, ...		
Thymus Serpyllum ...	Thyme ...	June 1 ...	J.
Origanum vulgare ...	Marjoram ...	July 14 ...	R, W.
Calamintha Acinos ...	Basil Thyme ...	June 26 ...	R.
,, Clinopodium	Wild Basil ...	July 7 ...	R.
,, officinalis ...	Common Calamint ...		
Nepeta Glechoma ...	Ground Ivy ...	May 5 ...	C.
Prunella vulgaris ...	Self Heal ...	June 9 ...	R.
Scutellaria galericulata ...	Common Scullcap ...	June 8 ...	C.
,, minor ...	Lesser ,, ...	July 28 ...	*G.W.H.*
Marrubium vulgare ...	White Horehound ...		
Stachys Betonica ...	Betony ...	June 19 ...	W.
,, sylvatica ...	Hedge Woundwort ...	June 16 ...	R.
,, palustris ...	Marsh ,, ..	July 1 ...	R, J, W.
,, arvensis ...	Corn ,, ...		
Galeopsis Ladanum ...	Red Hemp Nettle ...	July 14 ...	R.

Latin Name.	*English Name.*	*Date.*	*Record.*
Galeopsis Tetrahit	Common Nettle	July 14	*J.R.W.E.*
Ballota nigra	Black Horehound	June 28	W.
Lamium purpureum	Red Dead Nettle	Feb. 19	Y.
,, album	White ,,	Mar. 25	R.
,, maculatum	Spotted ,,		
,, Galeobdolon	Yellow ,,	May 8	R.
,, amplexicaule	Henbit ,,	May 13	R.
,, incisum	Small ,,		
Teucrium Scorodonia	Wood Germander	July 24	R.
Ajuga reptans	Bugle	May 5	J.
Armeria plantaginea	Plantain Thrift		
Plantago major	Great Plantain	June 2	W.
,, media	Hoary ,,	May 22	R.
,, lanceolata	Ribwort ,,	May 10	C.
Chenopodium Bonus-Henricus	Good King Henry	May 29	P.
,, urbicum	Upright Goosefoot	June 27	R.
,, murale	Nettle-leaved ,,	July 27	R.
,, album	White ,,	July 3	R, Y.
,, rubrum	Red ,,	July 21	*G.W.H.*
Atriplex patula	Orache		
Rumex Acetosa	Common Sorrel	May 12	R, Y.
,, Acetosella	Sheep's ,,	May 20	R, Y.
,, obtusifolius	Common Dock	June 5	R.
,, crispus	Curled ,,	June 9	R.
,, Hydrolapathum	Water ,,	July 17	R, J, W.
,, maritimus	Golden ,,	July 21	R.
Polygonum Fagopyrum	Buckwheat	June 23	Y.
,, aviculare	Knot Grass	June 15	R.
,, Convolvulus	Black Bindweed	July 3	Y.
,, amphibium	Amphibious Bistort	June 16	Y.
,, Persicaria	Persicaria	July 24	R.
,, lapathafolium	Pale Bistort		
Euphorbia Helioscopia	Sun Spurge	May 8	R.
,, Peplus	Petty ,,	June 20	W.
,, exigua	Small ,,	June 15	W.
,, Amygdaloides	Wood ,,	May 5	J.
,, platyphyllos	Broad ,,		
,, Lathyris	Caper ,,		
Mercurialis perennis	Dog's Mercury	Feb. 19	C.
Callitriche aquatica	Water Starwort		
Urtica urens	Small Nettle	May 27	R.
,, dioica	Common ,,	May 24	R.
Parietaria officinalis	Pellitory-of-the-Wall	June 8	R, Y, J, W.
Humulus Lupulus	Hop		
Ulmus campestris	Common Elm	Feb. 26	*G.W.H.*
,, montana	Wych ,,	Mar. 20	Y.
Alnus glutinosa	Alder	Mar. 1	*C.I.G.*

Latin Name.	*English Name.*	*Date.*	*Record.*
Betula alba ...	Birch ...	May 5 ...	R.
Carpinus Betulus ...	Hornbeam ...	May 21 ...	*G. W. H.*
Corylus Avellana (Female)	Hazel Nut ...	Feb. 24 ...	Y.
Fagus sylvatica ...	Beech ...	May 5 ...	J.
Quercus Robur ...	Oak ...	May 13 ...	R.
Salix Capræa ...	Sallow Willow ...	Feb. 19 ...	R.
,, purpurea ...	Purple ,, ...		
,, fragilis ...	Crack ,, ...	May 20 ...	R, Y.
,, alba ...	White ,, ...	May 26 ...	R, Cc.
Populus nigra ...	Black Poplar ...	Mar. 25 ...	Y.
Pinus sylvestris ...	Scotch Fir ...	May 30 ...	W.
Juniperus communis ...	Juniper ...	June 19 ...	R.
Taxus baccata ...	Yew ...	Mar. 12 ...	Y.
Typha latifolia ...	Bulrush ...	July 14 ...	R.
Sparganum ramosum ...	Branched Bur-reed ...	June 19 ...	R, W.
,, simplex ...	Simple ,, ...	July 17 ...	R.
Arum maculatum ...	Lords and Ladies ...	May 7 ...	R.
Acorus Calamus ...	Sweet Flag ...	July 7 ...	R.
Lemna minor ...	Lesser Duckweed ...	June 9 ...	R.
Potamogeton natans ...	Pondweed ...	June 22 ...	R.
Triglochin palustre ...	Arrowgrass ...	June 28 ...	R.
Butomus umbellatus ...	Flowering Rush ...	June 30 ...	R.
Sagittaria sagittifolia ...	Arrowhead ...	July 10 ...	R.
Alisma Plantago ...	Water Plantain ...	June 22 ...	R.
Hydrocharis Morsus-ranae	Frogbit ...	July 7 ...	R.
Epipactis latifolia ...	Broad Helleborine ...	July 29 ...	R.
,, palustris ...	Marsh ,, ...	July 22 ...	Rc.
Cephalanthera grandiflora	Large ,, ...	June 2 ...	R.
Listera ovata ...	Twayblade ...	May 24 ...	E.
Neottia Nidusavis ...	Bird's-nest Orchid ...	June 5 ...	R, W.
Orchis Morio ...	Green-winged ,, ...	May 13 ...	R.
,, maculata ...	Spotted ,, ...	May 29 ...	R.
,, mascula ...	Early Purple ,, ...	May 10 ...	J.
,, latifolia ...	Marsh ,, ...	May 29 ...	R, P.
,, pyramidalis ...	Pyramidal ,, ...	June 20 ...	R.
,, Conopsea ...	Fragrant ,, ...	June 18 ...	*C. I. G.*
Habenaria bifolia ...	Butterfly ,, ...	June 19 ...	Y.
Herminium Monorchis ...	Musk ,, ...		
Ophrys apifera ...	Bee ,, ...	June 20 ...	R.
,, muscifera ...	Fly ,, ...	June 9 ...	R.
Iris Pseudacorus ...	Yellow Flag ...	June 8 ...	C.
Crocus Vernus ...	Purple Crocus ...	Mar. 31 ...	R.
Narcissus Pseudonarcissus	Lent Lily ...	Mar. 1 ...	*A. S. O.*
Galanthus nivalis ...	Snowdrop ...		
Tamus communis ...	Black Bryony ...	June 3 ...	W.
Paris quadrifolia ...	Herb Paris ...	May 10 ...	J.
Polygonatum officinale ...	Angular Solomon's Seal	May 12 ...	J.
,, multiflorum	Common ,, ,,		

Latin Name.	*English Name.*	*Record.*	*Date.*
Convallaria majalis	Lily-of-the-Valley	May 12	J.
Ornithogalum umbellatum	Star of Bethlehem		
Scilla nutans	Wild Hyacinth	May 5	R, H.
Allium ursinum	Common Garlic	May 5	R.
,, vineale	Crow ,,	July 1	E, W.
Colchicum autumnale	Meadow Saffron	Sept. 26	*G. W. H.*
Juncus communis	Common Rush	June 12	W.
,, articulatus	Jointed ,,	July 15	*G. W. H.*
,, glaucus	Hard ,,	June 9	C.
,, obtusiflorus	Obtuse ,,	July 2	R.
,, bufonius	Toad ,,		
,, tenuis	Slender ,,	July 7	R.
Luzula pilosa	Hairy Wood Rush	May 10	J.
,, campestris	Field ,,	May 3	R.
Scirpus sylvaticus	Wood Scirpus	June 8	R, Y, J, W.
,, palustris	Marsh ,,	June 9	R.
Eriophorum polystachion	Cotton Grass	May 29	R, P.
Carex praecox	Early Sedge	May 10	J.
,, pendula	Pendulous,,	May 12	J, Cc.
,, vulpina	Fox ,,	June	R.
,, remota	Remote ,,	July 24	*G. W. H.*
Blysmus compressus	Broad Blismus		
Anthoxanthum odoratum	Vernal Grass	May 10	C.
Phalaris canarensis	Canary ,,		
Digraphis arundinacea	Reed ,,	July 18	R.
Phleum pratense	Timothy ,,	July 5	W.
Alopecurus pratensis	Meadow Foxtail Grass	May 12	J.
,, geniculatus	Marsh ,, ,,	June 4	R.
,, agrestis	Slender ,, ,,	June 10	J, W.
Avena fatua	Wild Oat	June 16	R.
Arrhenatherum avenaceum	False ,,	June 19	R.
Holcus lanatus	Common Holcus	July 30	R.
,, mollis	Soft ,,	July 10	R.
Hordeum pratense	Meadow Barley	June 23	R, W.
,, murinum	Wall ,,	June 1	R.
Lolium perenne	Rye Grass	June 12	W.
,, temulentum	Darnel	July 7	R.
Bromus sterilis	Barren Brome Grass	June 16	R.
,, asper	Rough ,,	July 17	R.
Festuca ovina	Sheep's Fescue ,,	June 30	R.
Dactylis Glomerata	Cock's-foot ,,	June 10	J.
Cynosurus cristatus	Dog's-tail ,,	June 30	R.
Briza media	Quaking ,,	June 15	R.
Poa annua	Common Meadow Grass	May 14	R.
,, pratensis	Smooth ,,	June 16	R, W.
,, nemoralis	Wood ,,	June 16	R.
[illegible]	Floating ,,	June 8	R, J, W.
,, trivialis	Roughish ,,	June 30	R.

Latin Name.	*English Name.*	*Date.*	*Record.*
Poa aquatica ...	Reed Meadow Grass ...	July 10 ...	R.
Catabrosa aquatica ...	Water Catabrosa ...	July 1 ...	R.
Melica uniflora ...	Wood Melick ...	June 23 ...	R.
,, nutans ...	Mountain ,, ...	June 2 ...	*J.R.W.E.*
Equisetum palustre ...	Marsh Horse-tail ...	May 26 ...	R.
,, arvense ..	Field ,, ...	May 8 ...	C.
,, Telmateia ...	Great ,, ...	May 10 ...	R.
Ophioglossum vulgatum...	Adder's Tongue ...		
Polypodium vulgare ...	Common Polypody ...	June 2 ...	R.
,, Phegopteris...	Beech Fern ...		
Aspidium Filix-mas ...	Male ,, ...	May 13 ...	R, P.
,, aculeatum ...	Prickly Shield Fern ...	June 8 ...	R.
,, angulare ...	,, ,, ,, ...		
,, spinulosum ...	Broad ,, ,, ...	May 20 ...	Y.
Asplenium Ruta-muraria	Wall Rue Spleenwort ...	May 8 ...	R.
,, Trichomanes...	Black ,, ...	May 26 ...	*G.W.H.*
,, Felix-foemina	Lady Fern ...	June 30 ...	R.
Scolopendrium vulgare ...	Hart's Tongue ...	July 28 ...	*G.W.H.*
Ceterach officinarum ...	Scaly Fern ...	May 5 ...	*G.W.H.*
Pteris aquilina ...	Bracken ...	June 19 ...	R, W.

ENTOMOLOGICAL SECTION.

President: J. C. SALTER, ESQ.

THREE collections were sent in, of which Lowther's was by far the best: he had the advantage of being able to get several varieties only to be found in the North. The collection was very well arranged, and accompanied by a complete list shewing the localities, which as a rule it is very hard to get information about.

The special feature of the year seems to have been the large number of Clouded Yellows and Death's Head moths: neither of which, however, are included in the prize collection. The stories about the Death's Head caterpillar are numerous and alarming: one that was told me represented a specimen, accidently injured by a potato fork, as leaping a foot in the air with a violent squeal!

BUTTERFLIES.

No.	*English Name.*	*Latin Name.*	*Locality.*
1	Brimstone ...	Gonepteryx Rhamni ...	Grange, N. Lancs.
2	Clouded Yellow ...	Colias Edusa ...	,, ,,
3	Large White ...	Pieris Brassicae ...	,, ,,
4	Small ,, ...	,, Rapae ...	,, ,,
5	Green Veined ...	,, Napi ...	,, ,,
6	Orange Tip ...	Euchloe Cardamines ...	Cheltenham
7	Gate Keeper, Wall Brown ...	Hipparchia Megaera ...	Witherslack, Westmoreland
8	Grayling, Rock Eyed Underwing ...	,, Semele ...	Near Windermere
9	Large Meadow Brown ...	,, Janira ...	Cheltenham
10	English Marsh Ringlet ...	Papilio Typhon ...	Witherslack, Westmoreland
11	Scotch Marsh ,, ...	Hipparchia Davus ...	Rannoch, Perthshire
12	Small Heath, Least Meadow Brown ...	,, Pamphilus ...	Cheltenham

No.	*English Name.*	*Latin Name.*	*Locality.*
13	Scotch Argus, Northern Brown ...	,, Blandina ...	Rannoch, Perthshire
14	Mountain Ringlet ...	,, Cassiope ...	,, ,,
15	Red Admiral ...	Vanessa Atalanta ...	Grange, N. Lancs.
16	Peacock ...	,, Io ...	,, ,,
17	Small Tortoiseshell ...	,, Urticae ...	,, ,,
18	Painted Lady ...	,, Cardui ...	,, ,,
19	Purple Hairstreak ...	Thecla Quercus ...	,, ,,
20	Green ,, ...	Thecla Rubi ...	Leckhampton, Cheltenham
21	Pearl-Bordered Fritillary ...	Argynnis Euphrosyne ...	Cheltenham
22	Small Pearl-Bordered Fritillary ...	,, Selene ...	Near Windermere
23	High-Brown Fritillary ...	,, Adippe ...	,, ,,
24	Dark-Green ,, ...	,, Aglaia ...	Witherslack, Westmoreland
25	Small Copper ...	Polyommatus hlaeas ...	Grange, N. Lancs.
26	Common Blue ...	,, Icarus ...	Cheltenham
27	Brown Argus ...	,, Agestis ...	,,
28	Grizzled Skipper ...	Papilio Malvae ...	,,
29	Dingy ,, ...	,, Tages ...	,,
30	Large ,, ...	,, Sylvanus ...	,,

MOTHS.

Sphinges.

1	Lime Hawk ...	Smerinthus Tiliae ...	Cheltenham
2	Humming Bird Hawk ...	Macroglossa Stellatorum...	Grange, N. Lancs.
3	Currant Clearwing ...	Sesia Tipuliformis ...	,, ,,
4	Narrow-Bordered 5-spot Burnet ...	Zygœna Lonicererae ...	Cheltenham
5	Broad-Bordered 5-spot Burnet ...	,, Trifolii ...	,,
6	Six-spot Burnet ...	,, Filipendulae ...	,,
7	Forester ...	Procris Statices ...	,,
8	Cinnabar ...	Euchelia Jacobœœ ...	,,

Bombyces.

1	Common Swift ...	Hepialus Lupulinus ...	Grange, N. Lancs.
2	Ghost ,, ...	,, Humuli ...	,, ,,
3	Northern ,, ...	,, Velleda ...	,, ,,
4	Lackey ...	Bombyx Neustria ...	Cheltenham
5	Yellow-Tail ...	Liparis Auriflua ...	,,

Noctuae.

1	Grey Dagger ...	Acronycta Psi ...	Grange, N. Lancs.
2	Clay ...	Leucania Lithargyria ...	,, ,,
3	Common Wainscot ...	,, Pallens ...	,, ,,

No.	*English Name.*	*Latin Name.*	*Locality.*
4	Ear-Moth ...	Hydrœcia Nictitans ...	Grange, N. Lancs.
5	Dark Arches ...	Xylophasia Polyodon ...	,, ,,
6	Antler ...	Charœas Graminis ...	Rannoch, Perthshire
7	Cabbage ...	Mamestra Brassicœ ...	Grange, N. Lancs.
8	Common Rustic ...	Apamea Oculea ...	,, ,,
9	Pale Mottled Willow ...	Caradrina Cubicularis ...	,, ,,
10	Garden Dart ...	Agrotis Nigricans ...	,, ,,
11	White-Line Dart ...	,, Tritici ...	Loch Morlich, Inverness-shire
12	Lesser Broad-Border ...	Tryphaena Ianthina ...	Grange, N. Lancs.
13	Lesser Yellow Underwing...	,, Orbona ...	,, ,,
14	Large Yellow ,, ...	,, Pronuba ...	,, ,,
15	Purple Clay ...	Noctua Brunnea ...	,, ,,
16	Hebrew Character ...	Taeniocampa Gothica ...	,, ,,
17	Sallow ...	Xanthia Cerago ...	,, ,,
18	Grey Chi ...	Polia Chi ...	,, ,,
19	Angle Shades ...	Phlogaphora Meticulosa...	,, ,,
20	Small Angle Shades ...	Euplexia Lucipara ...	,, ,,
21	Early Grey ...	Xylocampa Lithorhiza ...	,, ,,
22	Golden Rod Brindle ...	Cloantha Solidaginis ...	Abernethy Forest, Inverness-shire
23	Shark ...	Cucullia Umbratica ...	Grange, N. Lancs.
24	Small Yellow Underwing...	Heliodes Arbuti ...	Grange, N. Lancs.
25	Light Spectacle ...	Abrostola Urticœ ...	,, ,,
26	Dark ,, ...	,, Triplasia ...	,, ,,
27	Burnished Brass ...	Plusia Chrysitis ...	,, ,,
28	Plain Golden Y ...	,, Iota ...	,, ,,
29	Silver Y ...	,, Gamma ...	,, ,,
30	Herald ...	Gonoptera Libatrix ...	,, ,,
31	Mouse ...	Amphipyra Tragopogonis...	,, ,,
32	Gothic ...	Naenia Typica ...	,, ,,
33	Old Lady ...	Mania Maura ...	,, ,,
34	Mother Shipton ...	Euchlidia Mi ...	Cheltenham
35	Burnet Noctua ...	,, Glyphica ...	,,

GEOMETERS.

1	Swallow-Tail ...	Urapteryx Sambucaria ...	Grange, N. Lancs.
2	Brimstone ...	Rumia Cratœgata ...	Cheltenham
3	Scalloped Oak ...	Crocallis Elinguaria ...	Rannoch, Perthshire
4	Willow Beauty ...	Boarmia Rhomboidaria ...	Grange, N. Lancs.
5	Grass Emerald ...	Pseudoterpna Cytisaria ...	,, ,,
6	Single-Dotted Wave ...	Acidalia Scutulata ...	Witherslack, Westmoreland
7	Small Fan-Footed Wave...	,, Bisetata ...	Grange, N. Lancs.
8	Lace-Border ...	,, Ornata ...	Cheltenham
9	Smoky Wave ...	,, Fumata ...	Grange, N. Lancs.

No.	English Name.	Latin Name.	Locality.
10	Common White Wave ...	Cabera Pusaria ...	Cheltenham
11	V Moth ...	Halia Wavaria ...	,,
12	Latticed Heath ...	Strenia Clathrata ...	,,
13	Common ,, ...	Fidonia Atomaria ...	,,
14	Rannoch ...	,, Pinetaria ...	Rannoch, Perthshire
15	Bordered White ...	,, Piniaria ...	Cheltenham
16	Currant ...	Abraxas Grossulariata ...	Grange, N. Lancs.
17	Scorched Carpet ...	Ligdia Adustata ...	,, ,,
18	Clouded Border ...	Lomaspilis Marginata ...	Cheltenham
19	Twin-Spot Carpet ...	Larentia Didymata ...	,,
20	Grey Mountain ,, ...	,, Cœsiata ...	Rannoch, Perthshire
21	Yellow-Ringed ,, ...	,, Ruficinctata ...	,, ,,
22	Green ,, ...	Larentia Pectinitaria ...	Cheltenham
23	Grass Rivulet ...	Emmelesia Albulata ...	Rannoch, Perthshire
24	Pretty Pinion ...	,, Blandiata ...	,, ,,
25	Juniper Pug ...	Eupithecia Sobrinata ...	Abernethy Forest, nr. Grantown, Inverness
26	Shaded Broad Bar ...	Thera Obeliscata ...	Rannoch, Perthshire
27	Pine Carpet ...	,, Firmata ...	Black Forest, Rannock, Perthshire
28	July High-Flyer ...	Ypsipetes Elutata ...	Grange, N. Lancs.
29	Blue-Bordered Carpet ...	Melanthia Rubiginata ...	Rannoch, Perthshire
30	...	,, Plumbata ...	,, ,,
31	Purple Bar ...	,, Ocellata ...	Witherslack, Westmoreland
32	Wood Carpet...	Melanippe Rivata ...	Cheltenham
33	Common ,, ...	,, Subtristata ...	,,
34	Galium ,, ...	,, Galiata ...	,,
35	Garden ,, ...	,, Fluctuata ...	,,
36	Red Twin-Spot ,, ...	Coremia Ferrugata ...	,,
37	Dark-Barred ,, ,, ...	,, Unindentata ...	Rannoch, Perthshire
38	Yellow Shell ...	Camptogramma Bilineata	Cheltenham
39	Small Waved Umber ...	Phibalapteryx Vitalbata...	,,
40	Tissue ...	Scotosia Dubitata ...	Grange, N. Lancs.
41	Scallop Shell ...	Eucosmia Undulata ...	,, ,,
42	CommonMarbledCarpet...	Cidaria Centum-notata ...	Rannoch, Perthshire
43	Brown ,, ,, ...	,, Perfuscata ...	,, ,,
44	Dark ,, ,, ...	,, Immanata ...	,, ,,
45	Marbled Carpet ...	,, Marmorata ...	Rannoch, Perthshire
46	Small Phœnix ...	,, Silaceata ...	Grange, N. Lancs.
47	Phœnix ...	,, Rubesiaria ...	,, ,,
48	Chevron ...	,, Testata ...	Rannoch, Perthshire
49	Northern Spinach ...	,, Populata ...	,, ,,
50	Barred Straw ...	,, Pyraliata ...	Grange, N. Lancs.
51	Small Mallow ...	Eubolia Mensuraria ...	,, ,,
52	Chimney Sweeper ...	Tanagra Chœrophyllata...	Cheltenham

Pyrales.

N.	*Latin Name.*		*English Name.*		*Locality.*
1	Large Snout	...	Hypena Proboscidalis	...	Witherslack, Westmoreland
2	Small Fan-Foot	...	Zanclognatha Grisealis	...	Rannoch, Perthshire
3	Common ,,	...	Pechypogon Barbalis	...	Grange, N. Lancs.
4	Dingy Purple	...	Herbula Cespitalis	...	Witherslack, Westmoreland
5	Bordered Pearl	...	Botys Pandalis	...	Loch Tummel, Perthshire
6	Garden ,,	...	Pionea Forficalis	...	Grange, N. Lancs.
7	Fulvous ,,	...	Scopula Lutealis	...	,, ,,

Tortrices.

1	Green Oak	...	Tortrix	...	Cheltenham
2		...	,, Corylata	...	Grange, N. Lancs.
3		...	Ænectra Pilleriana	...	,, ,,
4		...	Carpocapsa Splendidana	...	,, ,,

Phycitae.

1	Mellissoblates Bipunctanus	...	Melissoblaptes Bipunctanus	...	Grange, N. Lancs.
2		...	Aphomia Sociella	...	,, ,,

Tineae.

1	Small Ermine	...	Hyponomeuta Padella	...	Cheltenham
2		...	Acompsia Pseudosprella	...	Grange, N. Lancs.

JUNIOR DEPARTMENT.

M. Salter and P. Baker sent in collections. The specimens in both were well set and named, but not as numerous as could be wished. Both had obtained Polyommattus Bellargus and P. Argiolus. Only one specimen of Colias Edusa was shown though the butterfly was plentiful this year. The prize was awarded to Salter.

GEOLOGICAL SECTION.

President: C. I. GARDINER, ESQ.

WORKING MEMBERS.

BLUNDELL.	HALDINSTEIN.	MEYER.
FURNELL.	LAMING.	LONG.

THOUGH the above have shown themselves energetic enough on the excursions of the Society, and on other occasions, to be considered as working members, there are other members of the Society who have shown considerable interest in the work of the Section. In fact more interest has been shown in fossil hunting this year than for some time past. Several visits have been paid to Leckhampton hill and to neighbouring brickpits, and some very good specimens have rewarded the searchers.

The latter part of this year has seen considerable excavations in various parts of the town, which were rendered necessary by the new drainage works. In the region near the Midland Station the Middle Lias was cut into, the depth of the excavations being some fifteen feet.

Many small Ammonites have been obtained from the Lansdown Road. Some of them are Ammonites Oxynotus, but a complete list will be given in next year's Report. Gryphæa Incurva was also found, and one or two Belemnites.

In the Old Bath Road, the digging was done for some distance in a fine yellow sand only, and as the men worked along towards Leckhampton they came on clay, nearly opposite the house called "Laracor," but there was said to be a small amount of coarse gravel between the sand and the clay. This is a useful piece of evidence as determining the extension of these sands which are sand on the top of the Lias clay all round the opening of the Chelt valley on to the Severn valley plain. These sands are seen at Charlton Kings to the right and left of the Oxford Road about a mile below the Dowdeswell Reservoir. They are also seen in a small pit near the Leckhampton Parish Room, and in the railway cutting between Leckhampton and Charlton Kings' Stations. During some excavations near the College Armoury towards the end of the Christmas term, similar yellow sands were exposed to a depth of about ten feet. Specimens of this gravel when viewed under the microscope were seen to be composed almost entirely of small angular and subangular siliceous fragments, and on treatment with Hydrochloric acid no effervescence was noticed. The origin of these sands is an interesting question and observations on any new pits which may be opened in them in the future should be given to the President of the Section by anyone who makes them.

It is worth noticing that the pit to the North of the Oxford Road, about half a mile below Dowdeswell Reservior, and called "Cooper's Charity" is in quite a different material. This pit is in a late Chelt river-gravel, composed chiefly of fragments of Oolite rolled down from the hills, and amongst these are seen well rolled fragments of iron-stained clay nodules and also rolled fossils from the Oolite,—though some very fresh and perfect Oolite fossils have also been found in this gravel.

In some excavations for some houses in Bath Parade, close to where it runs into College Road, Lias clay was seen without any covering of sand.

The railway from Andoversford, through Charlton Kings, to Cheltenham, is going to be doubled, and already the company has got to work widening the cuttings near the Dowdeswell tunnel. As yet, however, very little except preparatory work has been done, and no fossils have been found. Throughout the course of 1901, however, we may hope to get many additions to our College Museum local collection from these cuttings, as the Upper and Middle Lias should all be cut through.

Amongst the additions to our Museum during the last year has been a collection of minerals, presented by General Cox, with the cabinet which contained them. This collection was originally made by Lady Murchison, many of the specimens being probably collected by Sir Roderick Murchison himself. They will form a valuable addition to our College Museum minerals.

No one sent in a collection for the competition for a geological hammer at the end of the Winter term, and the hammer will be offered for any collection made during the Easter term and Easter vacation. All the fossils should be labelled with their names (if possible), and also with the locality from which they came, and the rock from which they were obtained. Thus an Ammonite, from the Hewlett's Hill brickpit, might be labelled,—Ammonite, Lias clay, Hewlett's Hill. Though if more can be told on the label as to what the kind of Ammonite was, and from what part of the Lias it came, so much the better.

ORNITHOLOGICAL SECTION.

President: M. TANNER, ESQ.

THIS year we decided not to keep a list of records in birds' eggs, but to award the sectional prize for the best note-book on the habits of birds. This prize was awarded to T. I. G. Thomas, and his note-book, from which some extracts are given at the end of the Report, shows considerable powers of observation for one so young. The prize chosen was one of Fowler's books, "A Year with the Birds." While speaking of note-books we will repeat what we have said before. It is not necessary to wait until the Spring to begin, for notes may be made all the year round. Birds are interesting at other times than the breeding season. Notes should be taken on those birds that remain during the Winter with us. What do they feed on? Where do they roost? Is their plumage the same in Winter as in Summer? Which go in flocks and which not? Careful notes should be taken in early Spring on the arrivals of migratory species and of the nesting places, nests, eggs and localities, with dates of all birds, and then the dates as nearly as possible of the migrants. The notes cannot be too profuse. A very large amount of pleasure is to be derived from the study of birds in this way without ever taking an egg.

During the Summer Mr. Menneer kindly took out individual members of the Section to study birds in the neighbourhood and he has consented to be President of the Section in the future.

The following are some extracts from notes taken by Mr. White, during the season.

"Towards the end of the season I saw a fine Large-Spotted Woodpecker in my garden: this bird is rarely seen in Gloucestershire.

"Early in April I saw a pair of Cuckoos at Leckhampton: this is the first time I have seen a pair so early.

"At Whittington I observed a Magpie's nest built in an ash tree, a fine well-made nest. On lifting off the dome, I found seven eggs. It seems that there are two species of Magpie,—Tree and Bush. The Bush Magpie, though not so brilliant in colour as the other, and having shorter tail feathers, makes a far better talker, while its nest is made more loosely and may be found embedded in high hedges.

"I found nine eggs of the Song Thrush this year devoid of the customary black spots.

"Ham Lane is a good place for taking notes. There I found a Butcher-bird's nest containing four young ones. The parent birds had spiked a Robin some six or seven yards from the nest. While watching I noticed that they plucked every feather off the Robin before giving any to their young and they did not cease fetching portions of flesh till all was consumed.

"Many people say that the Swift ascends and keeps away from sun-set till sun-rise; but whenever I have searched, whether during the breeding season or not, I have always found both birds at home."

PHOTOGRAPHIC SECTION.

President: C. E. YOUNGMAN, ESQ.

DARK ROOM MEMBERS.

[illegible]ley, R.
[illegible], W. T.
[illegible], H.
[illegible], V. F.
[illegible], R. O.
[illegible]rke, G. A. E.
[illegible], T. H.
[illegible], R. V.
[illegible]ett, S.
[illegible]rtney, D. G.
[illegible]terville, K. S.
[illegible]Herbert. E. C. W.
[illegible]re, G. W.
[illegible]hrie, S. C. B.
Harrington, W. G.
H[illegible]lden, R. C.
H[illegible]ot, La F.
Jopp, C. H. K.
Ker, C. H.
Kershaw, S. R.
Laming, C. H. R.
Lamotte, L.
Lawford, A. N.
MacDonnell, H. C.
Mackintosh, W. A. O. C.
Matthews, F. M.
Milne, R. M.
Neame, G. T.
Oppenheim, D. V.
Oppenheim, G. P.
Orr-Ewing, F.
Passingham, C. W.
Salter, W. E.
Smythies, B.
Stephens, R. C.
Suarez, N.
Suarez, R.
Thoyts, H. R. M,
Tolson, W. G.
Trewheler, A.
Tulloch, G. S. T.
Turpin, T. K.
Webb, S. N. C.
Wells, F. W. A.
Wilson, W. A.
Wolff, M. A.
Woollatt, C. H.
Woollatt, R.
Young, G. A. W.

THE year's work, as estimated at any rate by results shown up, has not equalled that of former years. Cameras in plenty have been in use, but what they did remains, to the Society in general, unknown. Nobody apparently has had the perseverance to take a connected series of photographs and then to [illegible] them together in form suitable for preservation and study.

In the Summer term S. Collett took the prize for the best set [illegible] prints: but the competition was not keen. It is a pity [illegible] the best season of the year should not bring forth more prints [illegible] by the end of term; the lantern slides of the next term [illegible] tendency to limit themselves to the Summer holiday results. [illegible] show in December, however, was distinguished this year by a [illegible] contribution from R. W. Turnbull, picturing mostly the cricket life of the College. The number of competitors, ten, half of whom had not exhibited before, testified to an increased interest, which it is to be hoped will endure and bear good fruit. A. A. Johnston, the winner of the first prize, has now had some experience, and he takes advantages of opportunities abroad, where he can get good lighting. D. L. Solomon, who came second, was content with English, that is to say Welsh, homes and scenery; and closely following him were several others who had done good, clean, careful work. We are every year indebted to Mr. Borchardt for some of the most interesting slides of the show, done, like other good works, in the scant leisure of a busy life: this time, views from Switzerland. Mr. Bell Haworth shewed the beginnings of a collection that he is making (with a view to use at the College Mission) of slides dealing with the College and its belongings. The collection promises to be full of interest, and Mr. Bell Haworth's appeal for more ought to secure it a substantial addition.

The Section, it seems certain, contains too few of those who who are Natural Historians to begin with, and come in out of desire to use photography as a means of record and a help to investigation. Will not more of such people join? Anybody who is really in earnest in wishing to study nature is bound nowadays to use the camera; personally, if he does his duty; by proxy, if he is callous enough to be content with other people's clumsiness. The College Museum will not be complete until it has, in many editions, picture-records of flower and tree, hill, valley, cloud and river, birds, beasts, and even boys; and all these *ought* of course to be supplied by the Photographic Section.

OBSERVATIONS ON BIRDS' NESTS AND EGGS.

By T. I. G. Thomas.

Thrush.

A nest with eggs in it was found on May 1st near Leckhampton. The nest was about two feet off the ground, was made of straw and lined with mud.

Blackbird.

A nest with five eggs in it was found near Leckhampton on May 1st, about 2ft. 6in. off the ground; it was made of hay and had mud inside. When made to move off its nest the bird utters a shrill chuckle.

Missel Thrush.

This bird is slightly larger than the Common Thrush, and its eggs are a pale reddish brown instead of being blue with black spots. Its nest of five eggs was found on May 22nd, near Saurdington, in the fork of a tree, about five feet above the ground. The material used in the construction of the nest was hay.

Chaffinch.

This bird lays four eggs, and was first found on May 21st, near the Crippetts. The nest was some six feet off the ground, beautiful in construction, being made of lichen and moss and lined with hair and feathers.

Bullfinch.

A nest with five eggs was found on June 2nd, near Coombe Hill in a wood. It was built of sticks on the outside, and lined internally with hair.

Jay.

A Jay's nest was found on May 28th, near Ham Lane. It was about six feet above the ground in a tall round bush. On getting closer to the bird it made a very peculiar noise. The outside of the nest was of sticks and the inside was lined with fine threads. There were young ones in the nest.

Swallow.

This bird is of a dull reddish brown; its nest was made of clay and lined with feathers, and had five eggs in it. They were found near Leckhampton on June 5th.

Sand Martin.

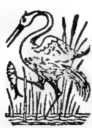
Nest found on June 6th, close to the London Road in a bank of sand. The eggs were lying about two feet from the face of the sand pit, and the nest was made of hay and feathers. There were probably fifty nests in the same bank.

Greenfinch.

The nest which was found was high up in a bush, about five feet off the ground; it was made of moss and straw, and lined with horse hair and feathers. The place where it was found was near Hatherley, on June 8th.

Pied-agtail.

The nest was found in a hay rick, and was made of hay lined with feathers; it was situated about six feet off the ground. The eggs were a bluish white spotted with light brown. They were found on June 1st.



SOME OLD BUILDINGS ROUND CHELTENHAM.

By H. A. Prothero, M.A., F.R.I.B.A., O.C.

This lecture was given on October 22nd, in the Physics Lecture Room and was illustrated by photographic lantern slides made by Mr. Borchart, Mr. Youngman, Marklove, Whittuck and others.

The lecturer began by saying that he should speak mostly about *Churches* because most of the slides illustrated that part of the subject; and that he intended to talk not so much about architectural features as about ground plan, growth, and development. There were two lines of ancestry from which our Churches were derived,—one, which may be called native or British; the other imported from Italy; and these two very commonly acted on one another, so that a majority of our larger Churches shewed gradual transformation from one to the other.

Taking the native and simpler type first, the lecturer showed a slide of the Chapel at Bradford-on-Avon, and explained that these small Churches were simply two-roomed buildings, the larger room being the Nave and the smaller one the Chancel; the opening between the two being often hardly more than a doorway. Churches on this plan abounded near Cheltenham: Postlip, Southam, Little Washbourne, Stoke-Orchard, being examples.

Two slides were next shewn of the Palatine Basilica, *i.e.*, Law Court at Rome, a building with Nave, Aisles, Chancel and Apse; in plan just like a modern Church, but which never was a Church at all: and of the first Cathedral at Canterbury, which, being built under the influence of Italian traditions, could hardly be distinguished in plan from the Basilica.

When the Normans came they began to develope the simple two-roomed Churches that they found, and not uncommonly introduced a Tower on two arches between the Nave and Chancel (as at Brockworth, Overbury, etc.) Next Transepts appeared, and thus the *Cross* form already common abroad became usual in England.

When once a Church was built it frequently happened that the village it belonged to grew, and with the increasing population there came the demand for increased accommodation inside its Church. To meet this demand a side Aisle, as it is termed, was built along the North side of the Nave. This position was no doubt determined by the desire not to interfere with the passage of the sun's light into the building, the light of course coming from the South. This was a particularly important point when we remember the small size of the early Norman windows.

If still more accommodation was afterwards found to be necessary a South Aisle was then added, and by the time this was needed broader windows were made, and so an extra amount of light was introduced into the building. If even more room was wanted, first the North Aisle and then the South one was broadened, and arches were opened into the Transepts, with the not uncommon result that the central Tower fell down: and the fourteenth century builders often preferred to build their new Tower at the West end instead.

Cleeve Church (about four miles off), being accessible from Cheltenham by bicycle, was taken as a good example of the gradual development of a large parish Church, and several slides were available to illustrate it. In the first instance, a cruciform Norman building consisting of Nave, two narrow Aisles, South Porch, central Tower, Transepts and Chancel (probably apsidal), it preserves its original features where we might expect to find them; viz., a very fine Norman West end with turrets, a rich transition Porch, and a part of the Nave Arcade, originally of six bays. Here, as elsewhere, the Aisles were widened to the North by the removal of the old Aisle, and the substitution of a very wide fourteenth century one: to the South by the addition of the Delabere Chapel outside the narrow Norman Aisle. At the same time the Chancel was rebuilt and lengthened, and a large decorated window inserted in the West end. In 1696 the Tower fell and was rebuilt in its old place in 1700, when much damage was done to the Church by the removal of the alternate pillars in the Nave, and the formation of the present sprawling arches.

Attention was called to some of the internal fittings, especially to the very fine seventeenth monument of Richard Delabere of Southam and his wife, inclosed by an iron railing, with a smaller and very fine effigy; and the singularly rich Jacobean gallery at the West end, preserved from demolition by the urgent remonstrance of the architect of the restoration now in progress.

There was no time to describe in detail other ancient buildings in the neighbourhood, but slides were exhibited and commented on, of Postlip Hall and Chapel, Elkstone Church, Cirencester Church, and other places of interest.

Cheltenham College Natural History Society Accounts for 1900.

Receipts.	£	s.	d.
Jan.—Balance in hand	32	0	3
Lent Term—April			
Ordinary Members' Subscriptions, per C.I.G.	6	14	0
Dark Room Subscriptions, per C.I.G. ...	3	2	6
Summer Term—July.			
Ordinary Members' Subscriptions, per C.I.G.	5	12	0
Dark Room Subscriptions, per C.I.G. ...	7	12	6
Received for five Excursions, per C.I.G....	20	8	2
Christmas Term—December.			
Ordinary Members' Subscriptions, per C.I.G.	5	9	0
Dark Room Subscriptions, per C.I.G. ...	5	0	0
	£85	18	5

Expenditure.	£	s.	d.
Lent Term—January.			
Sectional Reports, per C.I G.	0	17	6
Entomological Prize	0	10	6
Ornithological Prize	0	5	8
Botany Prize, per J.R.W.E.	0	12	0
Martyn, Dark Room	3	10	6
Darter, Printing Flower Lists	0	7	0
,, ,, 1899 Reports	6	1	6
Postage of Reports, per C.I.G.	0	2	0
Summer Term—July.			
Martyn, Dark Room	5	19	0
Photo Prize, per C.E.Y.	0	10	0
Expenses of five Excursions per C.I.G. ...	12	19	0
Brakes for ditto	22	0	3
Christmas Term—December.			
Mills, etc., for Lecture Attendance ...	0	9	6
Martyn, Dark Room	4	8	0
Lantern Slide Prizes, per C.E.Y. ..	1	10	0
Ten Lantern Slides, per C.I.G.	0	8	0
Norman, Sawyer & Co., for Map. ..	0	12	6
Darter, Prize	0	6	0
Balance in hand	24	9	6
	£85	18	5

W. M. BAKER,
Hon. Treasurer.

Audited and found correct, Jan. 31, 1901,
A. A. BOURNE.

Cheltenham College Natural History Society

LABOR OMNIA VINCIT

REPORT FOR THE YEAR 1908

Sumptibus Editorum Cheltoniensium

CHELTENHAM
CARTER'S COLLEGE BOOK AND STATIONERY DEPOT
NORTHWICK TERRACE

Cheltenham College
Natural History Society

REPORT

OF THE PROCEEDINGS OF
THE SOCIETY FOR THE
YEAR 1903

Sumptibus Editorum Cheltoniensium

CHELTENHAM
JOHN DARTER, COLLEGE BOOK AND STATIONERY DEPOT
NORTHWICK TERRACE

CONTENTS

PREFACE

The Lectures to the Society have been better attended during the past year than for some time, and our best thanks are due to those who have been so kind as to give up some of their time to come and talk to us.

The Excursions have been as popular as ever, and a great deal of good work has been done on them.

The Microscope presented last year has been used by the section started to use it, and also by others working at Geology. It can be used any Wednesday in the Museum between twelve and one o'clock.

During the year Mr. Baker resigned the office of Treasurer, which he has held for many years. At a meeting of the Society a unanimous vote was passed, thanking him for all the time and labour he has spent in keeping the accounts. At the same meeting Mr. Towers was elected to the vacant office.

Another loss we have to deplore is that of Mr. Menneer. The late President of the Ornithological Section has not been with us for very long, but the spirit of enthusiasm and keenness which was instilled into his section under his fostering care will, it is to be hoped, remain. We wish him all success in his new work, and hope that the country round him will teem with the bird life which he so much enjoys.

In the list of working members the end of the year shows many sad gaps. G. B. Allen, the keen Secretary of the Archaeological Section, has gone; Lowther and Gardner have disappeared from the Botanical Section; Nicholls, A. M. Stuart,

and Roberts from the Geological Section, and several others from other Sections. Still, there are plenty of keen members still left, and it is to be hoped that more work will be done in the coming year than in the past one.

We are glad to be able to print some of the notes of the prize-winner in the Ornithological Section report. As is well known, the prize in this section is given for the best notebook on bird life, and no account is given to egg collection.

The Summer was so wet that it prevented any good collection being sent up from the Entomological Section; in consequence there was no prize awarded.

THE COUNCIL, 1903

President.

THE PRINCIPAL.

Treasurer.

R. M. TOWERS, ESQ.

Secretary.

C. I. GARDINER, ESQ.

President of Archaeological Section.

A. S. OWEN, ESQ.

President of Botanical Section.

G. W. HEDLEY, ESQ.

President of Entomological Section.

J. C. SALTER, ESQ.

President of Geological Section.

C. I. GARDINER, ESQ.

President of Microscopical Section.

REV. A. D. PERROTT.

President of Ornithological Section.

E. A. MENNEER, ESQ.

President of Photographic Section.

C. E. YOUNGMAN, ESQ.

President of Junior School.

F. J. CADE, ESQ.

RULES

1. That this Society be called 'The Cheltenham College Natural History Society,' and have for its object the promotion of the study of Natural History.

2. That ordinary Meetings of the Society be held on Fridays, once in three weeks, at 5.30 p.m., or at any such other times as the Council of the said Society may appoint, when papers and notes on observations shall be read and discussed, specimens exhibited, and the ordinary business of the Society transacted.

3. That each Member of the Society is entitled to introduce two friends at any Meeting. Visitors may speak and read papers with the leave of the President or Chairman of the Meeting.

4. That field days be appointed for the purpose of making excursions to places of interest in the neighbourhood.

5. That a terminal Subscription of 1/- be payable in advance by all Members, except Honorary Members, who shall subscribe 5/-, and that all Members who have paid five consecutive terminal subscriptions be exempt from further payment.

6. That any Member whose Subscription shall be a whole term in arrear shall cease to be a Member of the Society.

7. That Members be encouraged to join Sections for the more accurate study of the different branches of Natural History; that the formation of these be arranged, and the work settled at the first Meeting of each term; that each Section be under a President, who is responsible for its meetings and organization, and that a Secretary be appointed by each Section to keep minutes of its proceedings, of which a summary shall appear in the Report.

8. That the Society issue a Report as often as the Council think fit.

9. That the Officers of this Society consist of a President, Vice-President, a Secretary, and Treasurer, who, with the Presidents and Secretaries of the branches, shall constitute the Council of the Society, besides the Natural Science Masters, who shall be ex-officio Members of the Council.

10. That the duties of the President shall be to preside at Meetings, and act as general referee on all questions of order.

11. That in the absence of the President, the Vice-President shall preside, or, in his absence, a Member of the Council.

12. That the duties of the Secretary shall be to give notice of Meetings of the Society and of the Council, and to enter the minutes of Meetings in a book kept for that purpose, to collect subscriptions, and to give account of the same.

13. That the Treasurer's accounts, after the approval and signature of two Auditors, to be appointed at the last meeting of each year, shall be laid on the table at the first meeting of the succeeding year.

14. That the Officers constitute, for the time being, the Council of the Society, in which shall be vested all arrangements not provided for in these Rules.

15. That the Secretary have power by a vote of the majority of Members present, at a special or Ordinary Meeting, to erase from the list of the Society any Member whose conduct shall be adverse to the interests and objects of the Society. Fees and Subscriptions are in no case to be returned, but re-election of an ex-member to be permitted during the next term.

16. That the Members of the Society on leaving the College become corresponding Members.

17. That no alteration be made in these Rules except at a General Meeting, at which 21 Members at least are present, and then only provided it is carried by a majority of two-thirds of those present.

LIST OF MEMBERS

Cheltenham College Natural History Society

President, The Rev. R. Waterfield.
Secretary, C. I. Gardiner, Esq.
Treasurer, R. M. Towers, Esq.

First Term, 1903.

Life Members.

Adderly.
Appleby.
Bazeley.
Beadon.
Belfield.
Bingham.
Birch.
Biscoe.
Brettell.
Brierley.
Buckley.
Burke.
Campbell, W. U. M.
Clark, R. O.
Cohen, J. B.
Conran.
Cummins, R. C.
Cunningham.
Daubeney, E. C.
Davis, F.
Davis, W.
Egleston.
Farmer.
Festing.
Fitzherbert, E.
Fryer.
Gardner, B.
Glendinning.
Gordon, G.
Grieve.
Harker.
Hill.
Jenkins.
Jopp.
Knowling.
Laming.
Lamotte.
Littleton, J.
Malden.
Maxwell.
McSwiney.
Megaw.
Milne.
Milton, F.
Milton, L.
Neame, G. T.
Oppenheim.
Pardoe.
Pearce.
Priday.
Radcliffe.
Roberts, A. L.
Russell, E. N.
Russell.
Samuelson, E.
Simpson.
Smith, W. H.
Smythies, B. E.
Spackman.
Stokes.
Storr.
Tate.
Thomas, T. I. G.
Tinson.
Tulloch.
Turner.
Tyzack.
Waterhouse, G.
Webb.
Williams, H. F.
Woolatt.
Young, R. P.

Ordinary Members.

Addington.
Allen.
Attwood.
Baker, P. M.
Barrington.
Barrow.
Bateman.
Blood.
Bourke.
Browne, W. H.
Burrard.
Capel-Davies.
erson-Smith.
Cochran.
Cohen, E. C.
Coker.
Cork.
Darwin.
Dashwood.
Davies.
Denham, W.
Dickinson.
Doria.
Drysdale.
Edwards, A. G.
Edwards, J. F.
Egleston, V.
Gibson.
Graham, F.
Griffiths.
Hale.
Hall.
Harrington.
Hind.
Hogg.
Homfray.
Kilne.
Kingsbury.
Krauss.

Lemon.
Lesser.
Lloyd, G. A.
Lloyd-Jones, W.
Marsden.
Martin, C.
Matthews.
Mayne.
McNeile, H. C.
Mercer.
Mitchell.
Montgomerie.
Muirhead.
Murray, A. C.
Neame, H.
Neame, P.
Neame, T.
Nicholls, T. B.
Nixon, A. L.
Noel.
Parcell.
Peel.
Pelham-Burn.
Perkins, H. B.
Prendergast.
Ritter, J.
Roberts, C. S.
Roberts, F. L.
Rohde.
Rushbrooke.
Sampson, E.
Shepherd.
Standen.
Startin.
Stewart-Sadler.
Strauss.
Stuart, A. M.
Studdy.
Summers.
Sutcliffe, A. L.
Tatam.
Tate, W.
Thomas, E. M.
Thomas, O. R.
Walford, H.
Walker.
Whitfield.
Williams.
Wilson, W.
Woodhouse, G. S.
Woodiwiss.

Second Term, 1903.

Life Members.

Allen, G. B.
Appleby.
Bazeley.
Beadon.
Belfield.
Bingham.
Bird.
Blood.
Brettell.
Brierley.
Browne, W. H.
Buckley.
Burke.
Campbell, W. U. M.
Cohen, J. B.
Congreve, C. R.
Conran.
Cummins, R. C.
Cunningham.
Darwin.
Daubeney.
Davis, F.
Davis, W.
Edwards, J. F.
Egleston.
Farmer.
Festing.
Fitzherbert.
Fryer.
Gardner, B.
Glendinning.
Gordon, G.
Grieve.
Hall, E. V.
Harker.
Hill.
Jenkins.
Jopp.
Knowling.
Krauss.
Laming.
Lamotte.
Lesser.
Littleton, J.
Malden.
Maxwell.
McSwiney.
Megaw.
Milne.
Milton, F.
Milton, L.
Neame, T.
Oppenheim.
Parcell.
Pardoe.
Pearce.
Priday.
Roberts, A. L.
Rushbrooke.
Russell.
Samuelson, E.
Shepherd.
Simpson.
Smith, W. H.
Spackman.
Stokes.
Storr.
Tate.
Thomas, E. M.
Thomas, T. I. G.
Tinson.
Turner.
Tyzack.
Waterhouse.
Webb.
Williams, H. F.
Woolatt.
Young, R. P.

Ordinary Members.

Addington.
Baker, P. M.
Barker.
Barrington.
Barrow.
Bateman.
Becher.
Bourke.
Browne, M. G.
Burrard.
Capel-Davies.
Catterson-Smith.
Cochran.
Cohen, E. C.
Coker.
Coomber.
Corbett.
Cork.
Cummins, H. J.
Darell, R.
Dashwood.
Davies.
Denham, W.
Dickinson.
Doria.
Drysdale.
Dyce.
Edwards, A. G.
Egleston.
Garnett.
Gibson.
Graham.
Griffiths.
Grundy.
Hall.
Harford.
Harrington.
Hart.
Heywood.
Hind.
Hogg.
Homfray.
Jessop.
Kilne.
Kingsbury.
Laurie.
Lemon, B. B.
Lemon, P. H.
Lloyd, G. A.
Lousada, B. C.
Lousada, E. A.
Mackenzie.
Marsden.
Martin, C.
Matthews.
Mayne.
McNeile.
Mercer.
Mitchell.
Montgomerie.
Moore, C.
Muirhead.
Murray, A. C.
Neame, H.
Neame, P.
Newton.
Nixon, A. L.
Noel.
Paterson.
Peel.
Pelham-Burn.
Perkins.
Pitman.
Playfair.
Prendergast.
Ritter, E. S.
Ritter, J.
Roberts, C. S.
Roberts, F. L.
Roch.
Rohde.
Sampson, E.
Samuelson, D.
Sharpe, A. C.
Sim.
Standen.
Startin.
Stephens.
Stewart-Sadler.
Stock.
Strauss.
Stuart, A. M.
Studdy.
Summers.
Sutcliffe, A. L.
Synnott.
Tatam.
Tate.
Taylor, A. C. B.
Thomas, O. R.
Thornton, C. V.
Thursby.
Townshend.
Trefusis.
Walford.
Walker.
Waterhouse, R.
Webb.
Whitfield.
Williams.
Wilson, T. L.
Wilson, W.
Wood.
Woodhouse, G. S.
Woodhouse, H. L.
Woodiwiss.
Woodley.

THIRD TERM, 1903.

Life Members.

Baker, P. M.
Beadon.
Belfield.
Bingham.
Blood.
Bourke.
Brierley.
Browne, W. H.
Buckley.
Burke.
Burrard.
Campbell, W. U. M.
Conran.
Cork.
Cummins, R. C.

Cunningham.
Darwin.
Daubeney.
Davies.
Davis, W.
Edwards, J. F.
Egleston.
Fryer.
Glendinning.
Gordon.
Grieve.
Hall, E. V.
Harker.
Harrington.
Jenkins.
Knowling.
Krauss.
Laming.
Lesser.
Littleton, J.
Malden.
Marsden.
Maxwell.
Mayne.
McSwiney.
Milne.
Milton, F.
Neame, T.
Oppenheim.
Roberts, A. L.
Roberts, F. L.
Rushbrooke.
Shepherd.
Simpson.
Smith, W. H.
Spackman.
Stokes.
Storr.
Sutcliffe, A. L.
Tatam.
Tate.
Thomas, E. M.
Tinson.
Turner.
Waterhouse.
Webb.
Williams, H. F.
Young, R. P.

Ordinary Members.

Addington.
Baker, H. W.
Barker.
Barrington.
Barrow.
Bateman.
Becher.
Bennett.
Brooksmith.
Browne, M. G.
Capel-Davies.
Catterson-Smith.
Cochran.
Cohen, E. C.
Collis.
Coomber.
Corbett.
Cummins, H. J.
Darell.
Dashwood.
Davenport.
Davies.
Davis, E.
Denham, W.
Dickinson.
Doria.
Drysdale.
Dyce.
Earwaker.
Edwards, A. G.
Egleston.
Ellis.
Fraser.
Gardner, A. R. L.
Garnett.
Gibson.
Graham.
Graham.
Griffiths.
Grogan.
Grundy.
Gudgeon.
Hall.
Harford.
Hart.
Heywood.
Hind.
Homfray.
Hunot.
Jessop.
Kilne.
Kingsbury.
Lemon, B. B.
Lemon, H.
Lemon, P. H.
Lloyd, G. A.
Lousada, B. C.
Lousada, E. A.
Mackenzie.
Martin, C.
Matthews.
McNeile.
Mercer.
Mitchell.
Momter.
Montgomerie.
Moore, C.
Morrison.
Muirhead.
Murray, A. C.
Neame, H.
Neame, P.
Newton.
Nixon.
Noel.
Oakey.
Paterson.
Peel.
Pelham-Burn.
Perkins, H. B.
Pinder, E.
Pitman.
Playfair.
Preedy.
Prendergast.
Ramsay.
Reid.
Ritter, E. S.
Ritter, J.
Roberts, C. S.
Roch.
Rohde.
Sampson.
Samuelson, D.
Sawyer.
Sharpe, A. C.

Sim.
Slaughter.
Smith, H. A.
Standen.
Startin.
Stephens.
Stewart-Sadler.
Stock.
Strauss.
Stuart, A. M.
Studdy.
Summers.
Sutcliffe, A. L.
Synnott.
Tate.
Taylor, A. C. B.
Thomas, O. R.
Thornton, C. V.
Thursby.
Townshend.
Trefusis.
Walford.
Walker.
Waterhouse, R.
Webb.
Whitfield.
Williams.
Wilson, T. L.
Wilson, W.
Wood.
Woodhouse, G. S.
Woodhouse, H. L.
Woodiwiss.
Woodley.

LECTURES AND EXCURSIONS

Date.	
Feb. 5.	Lecture on 'Earth Sculpture.' By H. C. W. McLaughlin, Esq. (O.C.).
Mar. 9.	Lecture on 'The Human Muscles.' By Dr. McLeod Munro.
May 26.	Excursion to Witcombe.
June 5.	Excursion to Andoversford.
June 16.	Excursion to Cranham.
June 27.	Excursion to Colesborne.
July 18.	Excursions to Wainlode Hill and Cleeve Hill.
Oct. 23.	Lecture on 'Ants and their Ways.' By R. Briant, Esq.
Oct. 29.	Lecture on 'Pompeii.' By Canon Bazeley (O.C.).

LIST OF ARTICLES PRESENTED TO THE MUSEUM, 1903

Date.		*Presented by*
Feb.	33 volumes of the *Zoologist.*	Col. H. W. Fielden, C.B. (O.C.).
April.	20 volumes of the *Proceedings of the Zoological Society,* and other Books.	
May.	Skull of Walrus.	
"	Guides, and other Books of interest	British Museum.
"	Early Flint Implements and Ornaments	H. G. Bennett, Esq.
June.	Chinese Coin	R. L. Barrow (C.).
July.	Water-stone, Bolas, Sling-stones, Tea and Tea-pot.	E. Fitz-Herbert, Esq.
Sept.	Wild Flowers and Seaweed (Western Australia).	O. L. Haines, Esq. (O.C.).
Oct.	Wood, showing chambers made by Hill Ants	R. Briant, Esq.
"	Articles of Dress and Combs (Malay Aboriginal).	W. K. Furse, Esq. (O.C.).
"	Whip made of the Lace-tree (West Indies).	Lent by Miss Bennett.
"	Ludwigia Murchisoni, from the Inferior oolite at Whittington .	H. McLaughlin (O.C.).

REPORTS OF SECTIONS

Archaeological Section

President, A. S. Owen, Esq.

Secretary—Jan.–July, G. B. Allen.
„ Sept.–Dec., W. B. Brierley.

It would probably be necessary to go back to the year B.C. 2348 to find a rainfall equal to that of last year, consequently, for a Section which has to pursue its quests at a considerable distance, it has not been easy to compass many expeditions, but four successful ones have been made. In the Easter term we went to the old church of Elkstone in the Cotswolds; and in the summer term, when we had the advantage of Mr. Prothero's guidance, we visited Brockworth, which, like Elkstone, has some of the finest Norman work in the neighbourhood, while close to the church is a magnificent timbered house; still further afield, an expedition was made at the end of the summer term to Ashworth across the Severn, which is partly a Saxon church; while in the winter term Badgworth and Churchdown were visited. It is to be hoped that the weather will be kinder to us in the coming year, and that more expeditions will be practicable. In the winter term a very interesting lecture was given to the Society on 'Pompeii' by the Rev. Canon Bazeley.

Botanical Section

SENIOR DEPARTMENT:

President, G. W. HEDLEY, ESQ.

JUNIOR DEPARTMENT:

President, F. J. CADE, ESQ.

Working Members.

SENIOR.

ADDINGTON, R. A. (*A*)
BARRINGTON, A. H. M. (*Ba*)
BOURKE, U. L. (*B*)[1]
CATTERSON-SMITH, T. O. M. (*S*)
COCHRAN, D. J. (*C*)
DRYSDALE, H. D. (*D*)
JENKINS, R. A. (*J*)
LAURIE, D. C. M. (*L*)
MARSDEN, H. (*M*)
MILTON, F. (*Ml*)
MITCHELL, R. R. (*Mi*)
MUIRHEAD, C. A. (*Mu*)
RITTER, J. A. (*R*)[1]
ROBERTS, A. A. L. (*Ra*)[2]
ROBERTS, C. S. (*Rc*)
ROCH, H. L. (*Ro*)
STUDDY, R. F. B. (*St*)
TAYLOR, A. C. B. (*T*)
WILSON, C. G. (*Wl*)
WOODHOUSE, G. S. (*W*)

JUNIOR.

BURRELL, E. W. (*Bj*)
BYRON, F. N. (*By*)
GUISE-MOORES, B. S. K. (*Mo*)
HARVEY, K. W. (*H*)
MILLS, F. L. V. (*Mj*)
NOEL, J. A. V. (*N*)
POCKLINGTON, J. F. J. (*P*)
TITTERTON, G. A. (*Tj*)
WALTERS, E. C. (*Wj*)[3]
WOOD, C. K. (*Wo*)
WYNNE-EDWARDS, J. C. (*We*)

[1] Winner of Prize in 1903.
[2] Winner of Prize in 1899 and 1900.
[3] Winner of Junior Prize, 1903.

SENIOR DEPARTMENT.

The section consisted this year of thirty-two members, of whom twenty earned the title of 'working member.' A very good start was made in the Spring Term, no less than seventy-three species being recorded before April 8. This number is about double that usually found at this date, and is due to the early spring, which did not receive any check during March. As a rule, after an early spring, there is a period of three to four weeks, in March or April, during which vegetation seems to make no advance. In 1903, this period did not come till May, when very cold and wet weather set in. So severe was this, that in July the flowers were fully three weeks later in making their appearance than in 1902—itself a late year. This fact, together with the general exodus of members which occurred towards the end of the Summer Term, prevented anything like a record being made. Five members, however, obtained over 200 specimens, which compares favourably with last year. Two prizes were awarded—the first to J. A. Ritter, and the second to U. L. Bourke. The following collected over fifty specimens—

J. A. Ritter	282	T. O. M. Catterson-Smith	142
U. L. Bourke	272	H. Marsden	135
D. J. Cochran	257	D. C. M. Laurie	131
H. L. Roch	221	R. R. Mitchell	60
A. C. B. Taylor	211	A. H. M. Barrington	53
C. A. Muirhead	149		

Our list now contains 638 species, of which 476 were found this year. Where the name of a flower is recorded without any date it means that it has been found in some previous year but not during this one. Eight new species are recorded for the first time; their names being distinguished in the list by italics. The two most interesting are *Samolus valeriandi* (Brookweed), and *Salvia Verbenaca* (Wild Sage), both found at Longhope, on July 21. This district is new to the section, and its exploration formed the seventh of the eight botanical excursions made in the Summer Term. There were no competitors for the prize offered for a collection of plants dried in sand, but a few members tried some preliminary experiments. The prize will be again offered in 1904, when it is hoped that some members will take up the matter more thoroughly.

In order to arouse some interest in other parts of botany, besides the collection and classification of specimens, it is proposed to hold combined meetings, from time to time, with the Microscopical Section. In this way opportunities will be given for observing and learning something about the minute inner structure of plants.

In addition to this new departure, prizes will also be offered, if a sufficient number of names are sent in, for :—

1. An account of the life-history of some plant or plants grown from a seed during the year. The account is to be accompanied by sketches representing the various stages of growth. Suitable for this purpose are the bean, pea, acorn, crocus, hyacinth, &c. They may be grown at first in glasses, and afterwards planted in pots. The record should include an account of the order in which the plant develops, action of light, &c. Diagrams should be given of the seed, early growth, full growth, leaves, flower, &c. The President will be glad to give information as to means of obtaining seeds, glasses, and other necessaries.

2. A series of coloured drawings, of not less than six plants, wild or cultivated. The drawing and colouring to be done directly from the plants themselves. If any member wishes to do microscopic work, drawings of self-cut and self-mounted sections of some one plant or series of plants may be substituted.

Any one wishing to join the section should give in his name as soon as possible, and state for which prize or prizes he intends to compete. No one who does not intend to do some kind of real botanical work will in future be considered a member of the section.

JUNIOR DEPARTMENT.

E. C. Walters gained the prize, with 87 marks; K. W. Harvey being second, with 64. Circumstances have unfortunately prevented much work being done by Juniors in the past year, but it is hoped there may be a better record in the coming season.

COMMON BOTANICAL TERMS.

Complete flowers contain:

1. Calyx, i. e. *sepals* (S) usually green.
2. Corolla, i. e. *petals* (P) usually brightly coloured.
3. Stamens (St), bearing pollen—a yellow powder contained in the *anthers*.
4. Pistil, consisting of *carpels*. Each carpel has an *ovary* at the base, and a *style* arising from it.

When it is difficult to distinguish the calyx from the corolla the term *perianth* is used to include them both.

A Flower (Fl) is *regular* (reg) when all the petals (or other parts) are equal; otherwise it is *irregular*.

Flowers are *solitary*, in *heads*, in *spikes*, in *umbels*, in *racemes* (spikes with stalked flowers), &c.

A Fruit (Fr) is a ripened ovary, and may be a *berry*, *pod* or *capsule*, *nut*, or *stone-fruit*.

Leaves (Ls) are *opposite*, when two spring from the same point on stem on different sides; *alternate*, when only one comes off at one point, the next springing from the other side of the stem; *whorled*, when many leaves spring from same point on the stem; *radical*, when they come from near the root, and not from the stem.

CLASSIFICATION OF PLANTS.

There are two main Divisions, viz. :—

I. **PHANEROGAMS**, or flowering plants.
II. **CRYPTOGAMS**, or flowerless plants.

Division I. is separated into two Classes, viz. :—

1. DICOTYLEDONS, or plants with two seed-leaves.
2. MONOCOTYLEDONS, or plants with one seed-leaf.

Each Class is divided into Groups, which are sub-divided into Families or Orders. Each Order contains several Genera, each genus one or more Species, each species one or more Variety.

THE GROUPS OF DICOTYLEDONS are :—

(i) POLYPETALOUS FLOWERS—separate petals.
(ii) MONOPETALOUS FLOWERS—one compound petal.
(iii) APETALOUS FLOWERS—no petals.

(i) POLYPETALS are :—(*a*) Hypogynous—petals and stamens arise from *under* the ovary (seed-vessel), i.e. ovary is superior and free.
(*b*) Perigynous—stamens *round* the ovary, or Epigynous—stamens *upon* the ovary.

In (*b*) the ovary is sometimes superior sometimes inferior, according as the *petals* arise from below or above the ovary.

(ii) MONOPETALS have ovary (*a*) inferior—below base of petal.
or (*b*) superior—above base of petal.
(iii) APETALOUS FLOWERS are (*a*) without a corolla.
or (*b*) without both corolla and calyx.

THE GROUPS OF MONOCOTYLEDONS are :—

(i) PETALOID FLOWERS—with a perianth.
(ii) GLUME-BEARING FLOWERS—without a perianth, but with dry bracts called glumes instead, as in wheat or oats.

PETALOIDS have ovary
(*a*) inferior, i.e. below and joined to perianth.
or (*b*) superior, i.e. above and free from perianth.

Division II. includes (1) Ferns and Horse-tails, and also (2) Fungi, Mosses, &c. The latter group does not appear in our list.

PHANEROGAMS OR FLOWERING PLANTS

I.—DICOTYLEDONS.

[Seeds with two primary leaves. All trees and shrubs are in this class and all herbs (except *Herb Paris*) with opposite or whorled or net-veined leaves, and nearly all which have the parts of the flowers in fours, fives, or eights.]

1. POLYPETALOUS FLOWERS.

A. STAMENS HYPOGYNOUS—*under* the seed vessel (ovary).

[Orders I to XXII.]

I. RANUNCULACEÆ. BUTTERCUP FAMILY.

[Herbs. S 3 to 6. P 5+, free. St 12+.]*

Genus. Species.	*English Name.*	*Date.*	*Record.*
Clematis Vitalba . . .	Traveller's Joy	July 21	Mu, Ro. T.
Thalictrum flavum . .	Meadow Rue	July 25	T.
Anemone nemorosa . .	Wood Anemone	Feb. 18	B.
Adonis autumnalis . .	Pheasant's Eye		
Ranunculus aquatilis .	Water Crowfoot	April 8	Ro.
" Flammula .	Spearwort	June 17	B, C, L.
" Ficaria . .	Celandine	Jan. 24	B, C.
" sceleratus .	Celery-leaved Crowfoot .	June 2	M.
" auricomus .	Goldilocks	April 3	Rc.
" acris	Common Buttercup . .	April 18	M, Ra.
" repens	Common Buttercup . .	May 7	Ba.
" bulbosus	Common Buttercup . .	April 3	B, C.
" arvensis .	Corn Buttercup	June 25	R.
Caltha palustris . . .	Marsh Marigold . . .	Mar. 4	B, C.
Helleborus viridis . . .	Green Hellebore		
" fœtidus . .	Stinking " . . .	Feb. 17	B, C, Ra.
Aquilegia vulgaris . . .	Columbine	May 24	E, Mo, Bj, Mj.

II. BERBERIDEÆ. BARBERRY FAMILY.

[Spiny Shrubs.]

Berberis vulgaris . . .	Common Barberry . . .	May 27	B, C, M, R, S, Ro, T.

III. NYMPHÆACEÆ. WATER-LILY FAMILY.

[Water plants. S 4 to 6. P ∞. St ∞. Ls cordate or peltate, floating.]

Nymphæa alba . . .	White Water-Lily		
Nuphar luteum	Yellow " " . . .	July 25	T.

IV. PAPAVERACEÆ. POPPY FAMILY.

[Herbs, milky juice. S 2 to 3. P 4. St ∞ free. Fr a capsule.]

Papaver Rhœas . . .	Field Poppy . . .	June 3	B.
" dubium . . .	Long-headed " . . .	June 2	B, C.
" Argemone . .	Pale "		
Chelidonium majus . .	Common Celandine . .	May 27	S.

* 'St 12 +' means '12 Stamens or more,' '∞' means 'many.'

V. FUMARIACEÆ. FUMITORY FAMILY.

[Slender herbs. Fls irreg. in racemes. S 2. P 4. St 6.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Fumaria officinalis . .	Common Fumitory . . .	May 27	B, C, R, S, Ro.
Corydalis lutea	Yellow „	May 7	B, C, M, R, L, Ro.

VI. CRUCIFERÆ. CRUCIFER FAMILY.

[Herbs. Fl reg. racemes. S 4. P 4, cruciform. St 6 (2 short ones). Fr pod or pouch.]

Cheiranthus cheiri . .	Wall Flower	April 7	Ra.
Barbarea vulgaris . . .	Yellow Rocket	May 7	B, C.
Nasturtium officinale .	Common Water Cress .	June 12	Wj.
„ palustre . .	Marsh „ . .	July 9	R.
„ amphibium .	Great „ . .	June 23	R.
Arabis hirsuta	Hairy Rock Cress . .	May 26	B, C, M, R, Mi.
„ Thaliana . . .	Thale „		
Cardamine amara . . .	Large Bitter „		
„ pratensis . .	Cuckoo Flower	Feb. 17	B, C.
„ impatiens .	Narrow-leaved Bitter Cress	June 13	T.
„ hirsuta . .	Hairy Bitter Cress . . .	Feb. 17	B, C, Ra.
Hesperis matronalis . .	Dame's Violet	May 7	B, C.
Sisymbrium officinale .	Yellow Hedge Mustard .	May 4	B, C, R.
Alliaria „ .	Garlic „ . . .	Mar. 2.	C, S.
Erysimum cheiranthoides	Treacle „		
Brassica tenuifolia . .	Rocket		
„ muralis . . .	Sand Brassica	May 11	St.
„ oleracea . . .	Cabbage „	May 6	B, C, R.
„ campestris . .	Field „	May 14	C, T.
„ alba	Cultivated Mustard . .	July 2	B, R.
„ Sinapis . . .	Charlock	May 31	Mj.
„ nigra	Black Mustard	July 9	Mu, Ro, T.
Cochlearia armoracia .	Horse-radish	June 1	*G. W. H.*
Alyssum calycinum . .	Small Alyssum		
Draba muralis	Wall Whitlow Grass		
„ verna	Common „ „ . .	Jan. 28	M.
Thlaspi arvense . . .	Penny Cress	June 12	Wj.
Teesdalia nudicaulis . .	Common Teesdalia		
Iberis Amara	Candytuft	June 30	*G. W. H.*
Capsella Bursa-pastoris	Shepherd's Purse . . .	Feb. 7	B, C, Ra.
Lepidium campestre . .	Common Pepperwort . .	July 21	Mu, Ro.
„ Smithii	Smith's Cress . .	June 12	*C. I. G.*
„ Draba . . .	Hoary „ . . .	May 7	T.
„ ruderale . .	Narrow-leaved „ . .	July 18	R, Mu.
Senebiera Coronopus .	Common Wart „ . .	July 18	R, Mu.
„ didyma . .	Lesser „ „		
Isatis Tinctoria	Woad	May 9	T.

VII. RESEDACEÆ. MIGNONETTE FAMILY.

[Herbs. Fl greenish. S 4 to 6. P 4 to 6. St 10 +.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Reseda luteola	Dyer's Weed	June 5	Tj.
„ lutea	Cut Leaved Mignonette .	May 26	B, C.

VIII. CISTACEÆ. CISTUS FAMILY.

[Undershrub. Fl reg. S 5. St ∞, free.]

Helianthemum vulgare .	Rock Rose	June 5	B, C, M, R, Ro, T, A, Tj.

IX. VIOLACEÆ. VIOLET FAMILY.

[Herbs. Fl irreg. S 5. P 5 (lower one spurred). St 5. Fr tripartite.]

Viola odorata	Sweet Violet	Mar. 4	B.
„ hirta	Hairy „	April 6	B, C, L, Ro.
„ canina	Dog „	Mar. 18	M.
„ tricolor	Pansy	April 7	Ra.

X. POLYGALACEÆ. MILKWORT FAMILY.

[Herbs. Fl irreg. S 5. P 3 to 5. St 8 in two bundles.]

Polygala vulgaris . . .	Milkwort	May 21	M.

XII. CARYOPHYLLACEÆ. PINK FAMILY.

[Herbs. Fl reg. S 4 to 5, free or tubular. P 4 to 5, clawed. St 4 to 5 or 8 to 10.]

Silene Cucubalus. . . .	Bladder Campion	June 17	B, C, L.
Lynchnis vespertina . .	White „	May 22	B.
„ diurna	Red „	April 23	Ra, Rc.
„ Githago . .	Corn Cockle		
„ Flos-cuculi .	Ragged Robin	May 26	B, C, Ro, Mi.
Sagina procumbens . .	Procumbent Pearlwort .	May 25	M.
„ nodosa	Knotted „		
Arenaria serpyllifolia .	Thyme-leaved Sandwort .	May 23	R.
„ trinervis . . .	Three-nerved „ .	May 7	B, C, L.
Cerastium vulgatum . .	Mouse-ear Chickweed .	April 1	C.
„ arvense . .	Field „ .	April 8	Ra.
Stellaria aquatica . . .	Water Starwort	July 4	T.
„ media . . .	Chickweed	Jan. 28	M.
„ uliginosa . . .	Bog Starwort	July 15	*G. W. H.*
„ graminea . .	Lesser „	July 2	B, C.
„ holostea . . .	Common „	Mar. 29	M.
Spergula arvensis . . .	Corn Spurry		

XVI. HYPERICINEÆ. ST. JOHN'S WORT FAMILY.

[Herbs or Shrubs. Ls dotted. Fl yellow. S 4 to 5 (often dotted). P 4 to 5 (often dotted). St ∞.]

Hypericum perforatum .	Common St. John's Wort	July 15	B.
„ dubium . .	Imperforate „ „	July 7	R.
„ quadrangulum	Square-stalked „ „	July 18	Ba, R, Mu.
„ humifusum .	Trailing „ „		
„ pulchrum .	Slender „ „		
„ hirsutum . .	Hairy „ „	June 27	B, R.

XVII. LINACEÆ. FLAX FAMILY.

[Herbs. S 4 to 5. P 4 to 5, clawed. St 4 to 5, alternate with Ps.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Linum cartharticum . .	Purging Flax	May 26	C, R.

XVIII. MALVACEÆ. MALLOW FAMILY.

[Herbs or Shrubs. Ls downy. Fl reg. S 5. P 5. St ∞, united in a tube.]

Malva rotundifolia . .	Dwarf Mallow	July 4	B, C.
,, sylvestris . . .	Common ,, ...	June 23	Wl.
,, moschata . . .	Musk ,, ...	July 18	Ro.

XIX. TILIACEÆ. LIME FAMILY.

[Trees.]

Tilia Europæa	Lime	July 8	B, C.

XX. GERANIACEÆ. GERANIUM FAMILY.

[Herbs, swollen joints. S 5. P 5. St 5 to 10. Styles 5.]

Geranium phœum . .	Dusky Geranium		
,, pratense . .	Meadow Cranesbill . .	June 17	B, C, L.
,, pyrenaicum .	Mountain ,, . .	May 20	Rc.
,, Robertianum	Herb Robert	April 8	W.
,, lucidum . .	Shining Cranesbill .	July 4	B, C.
,, molle . . .	Dove's-Foot ,, .	May 10	R, E.
,, pusillum . .	Small-flower ,, .	May 20	B, C, L.
,, dissectum . .	Jagged ,, .	June 5	M.
,, columbinum .	Long-stalked ,, .	June 27	*C. I. G.*
Erodium cicutarium . .	Common Storksbill		
Oxalis Acetosella . . .	Wood Sorrel	April 1	B, C.
Impatiens Noli-me-tangere	Yellow Balsam		

XXI. ACERACEÆ. MAPLE TRIBE.

[Trees. Fl green. S 4 to 9. P 4 to 9. St 5 to 12 on disk.]

Acer campestre	Maple	May 17	E.
,, Pseudo-platanus .	Sycamore	May 1	B, C.

XXII. AQUIFOLIACEÆ. HOLLY FAMILY.

[Evergreen Trees.]

Ilex Aquifolium . . .	Holly	May 26	B, C, R, Ro, Mi.

POLYPETALOUS FLOWERS.

B. Stamens Hypogynous or Epigynous.

[Orders XXIII to XXXVIII.]

XXIII. CELASTRACEÆ. SPINDLE-TREE FAMILY.

[Shrubs or Trees.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Evonymus europæus	Spindle-Tree	June 3	B, C.

XXIV. RHAMNACEÆ. BUCKTHORN FAMILY.

[Shrubs.]

Rhamnus catharticus	Buckthorn		

XXV. PAPILIONACEÆ. PEA-FLOWER TRIBE.

[Herbs, Shrubs, or Trees. Calyx 5-lobed. corolla of 5 irreg. Ps (1 *standard*, 2 *wings*, and 2 forming a *keel*). St 10, in two bundles. Fr pods.]

Ulex europæus	Gorse	Jan. 24	B, C, Ra.
Genista tinctoria	Dyer's Greenweed	June 21	Ro.
Cytisus scoparius	Broom	April 8	W, Ra.
Ononis arvensis	Rest Harrow	July 15	B, C, Ro.
„ campestris	Spiny „	July 28	*G. W. H.*
Medicago sativa	Lucern		
„ Lupulina	Nonsuch	July 4	B, C.
Melilotus officinalis	Melilot	June 30	B, C.
Trifolium incarnatum	Crimson Clover	June 2	M.
„ arvense	Hare's Foot Trefoil		
„ pratense	Purple Clover	May 9	B, C.
„ medium	Zig-zag „		
„ fragiferum	Strawberry „		
„ repens	Dutch „	May 28	R.
„ hybridum	Alsike „	June 29	C, D.
„ procumbens	Hop Trefoil	June 27	B, R.
„ minus	Lesser „	May 9	R.
Lotus corniculatus	Bird's Foot „	May 26	B, C, R, S, L, Ro, Mi.
Anthyllis Vulneraria	Kidney Vetch	June 17	B, C, L.
Astragalus hypoglottis	Purple Astragal		
„ glycyphyllos	Milk Vetch		
Hippocrepis comosa	Horse-shoe „	June 27	B, R, L, D.
Onobrychis sativa	Sainfoin	June 5	M, R, S, E.
Vicia hirsuta	Hairy Vetch	June 20	M.
„ tetrasperma	Slender „	June 27	B, R, S, L, Ro.
„ Cracca	Tufted „	June 20	B, R, S, Ro.
„ sylvatica	Wood „	June 24	*C. I. G.*
„ sepium	Bush „	April 8	M.
„ sativa	Common „	May 14	Ba.
„ lathyroides	Spring „		
Lathyrus Nissolia	Grass Vetchling	June 12	*G. W. H.*
„ pratensis	Yellow Vetch.	June 17	C, T.
„ sylvestris	Everlasting „	July 25	T.
„ palustris	Marsh Pea		
„ macrorrhizus	Tuberous Bitter „		

XXVI. ROSACEÆ. ROSE FAMILY.

[Herbs, Shrubs, or Trees. Ls with stipules. Calyx 4- or 5-lobed. P 4 to 8. St variable, perigyn.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Prunus Communis . .	Blackthorn	Mar. 15	B, C.
„ Cerasus . . .	Cherry	April 1	B, C.
„ Padus	Bird Cherry		
Spiræa Ulmaria . . .	Meadow Sweet	June 23	M.
„ Filipendula . .	Dropwort		
Geum urbanum . . .	Wood Avens	May 14	B, C.
Rubus Idæus	Raspberry	May 26	B.
„ fruticosus . .	Common Blackberry . .	June 5	M, S.
„ corylifolius . .	Hazel-leaved Blackberry .	May 29	C.
„ cæsius	Dewberry	May 31	B, C, L, T.
Fragaria vesca	True Strawberry . . .	April 8	L.
Potentilla Fragariastrum	Barren „ . . .	Feb. 7	M.
„ reptans . .	Creeping Cinquefoil . .	June 20	B, R.
„ Tormentilla .	Tormentil	May 26	S.
„ anserina . .	Silverweed	May 26	C, R, B.
Alchemilla vulgaris . .	Lady's mantle	May 19	R.
Sanguisorba officinalis .	Great Burnet	July 2	Ba, R, Ma.
Poterium Sanguisorba .	Salad „	May 24	C, L, E.
Agrimonia Eupatoria .	Agrimony	July 16	Ba, R, Mu, Ro.
Rosa canina	Dog Rose	June 3	C.
„ arvensis	Trailing „	June 7	T.
Pyrus communis	Pear	April 8	Ra.
„ Malus	Apple	April 8	St.
„ Aria	Beam Tree	June 5	W, B, C, M, R, Ro, T.
„ torminalis . . .	Wild Service Tree . . .		
„ Aucuparia . . .	Mountain Ash	May 16	B.
Cratægus Oxyacantha .	Hawthorn	May 3	S.

XXVII. ONAGRACEÆ. WILLOW HERB FAMILY.

[Herbs or Shrubs. Fl reg. Calyx in 2 or 4, tubular. Ps 2 to 4. St 2, 4, or 8, perigyn. Ovary inferior.]

Epilobium angustifolium	Rose-bay Willow Herb	July 15	*G. W. H.*
„ hirsutum . .	Great „ „	July 14	Ba, R, Mu.
„ parviflorum .	Hoary „ „	June 17	B, R, S, L, Ro.
„ montanum .	Broad-leaved „ „	June 28	Wj.
„ tetragonum .	Square „ „	June 30	*C. I. G.*
„ palustre . .	Marsh „ „		
Œnothera biennis . .	Evening Primrose		
Circæa lutetiana . . .	Enchanter's Nightshade .	June 28	Wj.

XXVIII. LYTHRARIEÆ. LOOSESTRIFE FAMILY.

[Herbs.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Lythrum Salicaria . .	Purple Loosestrife . . .	July 18	Ba, R, Mu.

XXIX. CUCURBITACEÆ. GOURD FAMILY.

[Climbers with tendrils.]

Bryonia dioica	Bryony	May 31	Bj.

XXX. CRASSULACEÆ. STONECROP FAMILY.

[Herbs. Ls thick and fleshy. S 3 to 20. P 3 to 20. St 3 to 20, perigyn.]

Cotyledon Umbilicus .	Pennywort		
Sedum Rhodiola . . .	Rose-root Stonecrop		
„ Telephium . .	Orpine „		
„ album	White „ . .	July 21	Mu, Ro, T.
„ acre	Biting „ . .	June 14	R.
„ rupestre . . .	Rock „		
Semper-virens tectorum	Houseleek		

XXXI. RIBESIACEÆ. CURRANT FAMILY.

[Shrubs.]

Ribes Grossularia . . .	Gooseberry	Mar. 15	B, C, Ra.
„ rubrum	Red Currant		
„ nigrum	Black Currant	May 4	*G.W.H.*

XXXII. SAXIFRAGACEÆ. SAXIFRAGE FAMILY.

[Small Herbs. Calyx in 4 or 5 lobes. P 4 to 5. St 5 or 10, perigyn.]

Saxifraga hypnoides . .	*Cut-leaved Saxifrage* . .	June 5	E, Wj.
„ granulata . .	Meadow „ . .	May 7	*G.W.H.*
„ tridactylites .	Rue-leaved „		
„ umbrosa . .	London Pride		
Chrysoplenium oppositifolium	Golden Saxifrage . . .	Feb. 17	C.
„ alternifolium	„ „ . . .	Mar. 4	B, C, Ra.
Parnassia palustris . .	Grass of Parnassus		

XXXIII. UMBELLIFERÆ. UMBELLATE FAMILY.

[Herbs with hollow stems. Fl reg., in umbels, mostly white. Calyx 5-toothed. P 5, unequal. St 5, epigyn., springing from a thick fleshy disk.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Sanicula europæa . . .	Wood Sanicle	May 18	B, C.
Apium graveolens . .	Celery	July 21	Mu, Ro, T.
" nodiflorum . .	Procumbent Celery . .	July 15	T.
Sison Amomum . . .	Hedge Sison		
Ægopodium Podagraria	Goutweed	May 30	M.
" Petroselinum	Common Parsley		
Carum segetum	Caraway		
" Carvi	"		
Pimpinella Saxifrage . .	Burnet Saxifrage . . .	July 21	M, Ro.
" magna . .	Greater Burnet Saxifrage		
Œnanthe fistulosa . .	Water Dropwort . . .	July 2	Ba, R, Mu.
" pimpinelloides	Parsley "	July 4	B, C, Mu.
" Phellandrium .	Fine-leaved "	July 7	Ba, R, Mu.
Æthusa Cynapium . .	Fool's Parsley	June 23	R.
Silaus pratensis . . .	Pepper Saxifrage . . .	June 20	B, R, S, Ro, T.
Angelica sylvestris . .	Wild Angelica	July 25	T.
Pastinaca sativa . . .	Parsnip	June 6	B, C.
Heracleum Sphondylium	Cow Parsnip	May 9	B, C, L.
Scandix Pecten . . .	Shepherd's Needle . . .	April 22	Ra.
Conopodium denudatum	Earth Nut	May 18	B, C.
Chærophyllum temulum	Rough Chervil	May 22	Ra.
" sylvestre	Wild "	Mar. 11	B.
" Anthriscus	Burr "	April 8	B, C, Ra.
Caucalis nodosa . . .	Knotted Hedge Parsley		
" Anthriscus . .	Upright " " . .	June 5	Tj.
Daucus Carota	Carrot	June 30	B, C.
Conium maculatum . .	Hemlock	June 19	B, C.
Smyrnium Olusatrum .	Alexanders	April 3	*G.W.H.*

XXXVI. ARALIACEÆ. IVY FAMILY.

[Climbing Shrubs.]

Hedera Helix	Ivy	Oct. 4	*G.W.H.*

XXXVII. LORANTHACEÆ. MISTLETOE FAMILY.

[Parasitic Shrubs.]

Viscum album	Mistletoe	Feb. 17	B, C, Ra.

XXXVIII. CORNACEÆ. CORNEL FAMILY.

[Trees or Shrubs.]

Cornus sanguinea . . .	Dogwood	June 17	B, C, L.

2. MONOPETALOUS FLOWERS.

A. Ovary Inferior.

(Orders XXXIX to XLIV.)

XXXIX. CAPRIFOLIACEÆ. HONEYSUCKLE FAMILY.

[Shrubs or Herbs. Calyx in 4 or 5. Corolla 4- or 5-cleft. St 4 to 5 on the corolla.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Adoxa Moschatellina	Moschatel	Mar. 11	M.
Sambucus nigra	Elder	May 25	M.
Viburnum Lantana	Wayfaring Tree	May 9	M.
„ Opulus	Guelder Rose	June 12	Wj.
Lonicera Periclymenum	Honeysuckle	June 20	B, M, R, S, L. Ro.

XL. STELLATÆ. BEDSTRAW TRIBE.

[Herbs with square stems. Ls in whorls. Calyx and corolla in 4 or 5. St 4 or 5 on corolla.]

Galium Cruciata	Crosswort	May 4	B, C.
„ verum	Yellow Bedstraw	July 4	B, C.
„ palustre	Marsh „	June 30	*C.I.G.*
„ uliginosum	Bog „	July 2	Wj.
„ saxatile	Rock „		
„ Mollugo	Great Hedge Bedstraw	June 30	B, C.
„ Aparine	Cleavers	May 31	E, H.
Asperula odorata	Woodruff	April 14	B, C.
„ cynanchica	Squinancywort	July 4	B, C.
Sherardia arvensis	Field Madder	May 10	R.
Centranthus ruber	Red Valerian		

XLI. VALERIANEÆ. VALERIAN FAMILY.

[Herbs. Calyx minute. Corolla 5-lobed. St 3 on corolla.]

Valeriana officinalis	Great Valerian	July 27	B, R, W, L.
„ dioica	Marsh „	July 5	B, C, R, Ro, A.
Valerianella olitoria	Lamb's Lettuce		
„ Auricula	„ „		

XLII. DIPSACEÆ. TEASEL FAMILY.

[Herbs. Fls in heads. Calyx 4-lobed, enclosed in an involucre. Corolla 4-lobed. St 4, on corolla.]

Dipsacus sylvestris	Common Teasel	Sep. 27	*G.W.H.*
„ pilosus	Small „		
Scabiosa succisa	Devil's-bit Scabious		
„ Columbaria	Small „	July 15	Ro.
„ arvensis	Field „	July 2	Wj.

XLIII. COMPOSITÆ. COMPOSITE FAMILY.

[Herbs or Shrubs. Fls in a dense head on receptacle, surrounded by involucre. No Calyx. Corolla funnel-shaped. St 5, on corolla, united by the anthers.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Eupatorium cannabinum	Hemp Agrimony . . .	July 21	Mu, Ro, T.
Aster Linosyris . . .	Goldilocks		
Solidago Virga-aurea. .	Goldenrod		
Bellis perennis	Daisy	Jan. 24	B, S.
Filago germanica . . .	Cudweed	July 18	R.
„ gallica	Narrow Cudweed		
Gnaphalium sylvaticum	Wood „		
Antennaria margaritacea	Pearl Antennaria		
Inula Helenium . . .	Elecampane		
„ Conyza	Ploughman's Spikenard		
„ dysenterica . . .	Fleabane	Sept. 27	*G.W.H.*
„ Pulicaria	Small Fleabane		
Chrysanthemum Leucanthemum	Dog Daisy	May 27	R.
„ segetum . .	Corn Marigold		
„ Parthenium .	Feverfew Chrysanthemum		
Matricaria inodora . .	Feverfew	July 28	T.
„ Chamomilla .	Camomile	July 18	Ba, R, Mu.
Anthemis Cotula . . .	Stinking Mayweed . . .	July 23	B, C.
„ arvensis . .	Corn Camomile		
Achillea Ptarmica . .	Sneezewort		
„ Millefolium . .	Yarrow	July 2	B, C.
Tanacetum vulgare . .	Tansy	July 25	T.
Artemisia vulgaris . .	Mugwort	Sept. 27	*G.W.H.*
Tussilago Farfara . . .	Coltsfoot	Feb. 11	S.
„ Petasites . .	Butterbur	Mar. 15	S.
Senecio vulgaris . . .	Groundsel	Jan. 24	M.
„ sylvaticus . .	Wood Groundsel		
„ aquaticus . . .	Marsh Ragwort . .	Sept. 27	*G.W.H.*
„ Jacobæa . . .	Common „ . .	July 25	T.
„ crucifolius . .	Narrow-leaved „ . .	July 15	B, C, Ro.
Arctium Lappa . . .	Burdock	July 5	Mu, Ro, T.
Serratula tinctoria . .	Sawwort		
Carduus Marianus . .	Milk Thistle		
„ nutans . . .	Musk „	July 4	B, C.
„ acanthoides . .	Welted „	June 5	B, M, S.
„ pycnocephalus .	Slender „		
„ lanceolatus . .	Spear „	July 18	Ba, R, Mu.
„ palustris . . .	Marsh „	June 12	Wj.
„ arvensis . . .	Creeping „	July 1	B, C.
„ eriophorus . .	Woolly „	July 15	*G.W.H.*
„ pratensis . .	Meadow „		
„ acaulis . . .	Dwarf „	July 14	B.
Carlina vulgaris . . .	Carline „		
Centaurea nigra . . .	Black Knapweed . . .	July 21	Ro.
„ Scabiosa . .	Scabious „ . . .	July 2	B, C, Ro.
„ Cyanus . .	Cornflower		

Genus. Species.	*English Name.*	*Date.*	*Record.*
Tragopogon pratensis .	Goat's Beard	June 13	Ml, Wl.
Helminthia echioides .	Ox-tongue		
Picris hieracioides . .	Hawkweed Picris . . .	July 21	Mu, Ro, T.
Leontodon hispidus . .	Common Hawkbit . . .	June 28	Wj.
,, autumnalis .	Autumnal ,, . . .	June 20	B, R, S, L, Ro.
Hypochœris radicata .	Cat's Ear	June 3	B, C.
Lactuca muralis	Wall Lettuce	July 18	B.
Sonchus arvensis . . .	Corn Sow Thistle . . .	July 18	Ba, R, Mu.
,, oleraceus . . .	Common ,, . .	April 25	R.
Taraxacum Dens-leonis .	Dandelion	Jan. 24	M.
Crepis taraxicifolia . .	Beaked Crepis	June 3	B, C.
,, virens	Common ,, ...	May 24	E, Bj.
,, biennis	Rough ,, ...	May 18	C.
Hieracium Pilosella . .	Mouse-ear Hawkweed .	June 3	B, C.
,, murorum . .	Wall ,, . .	June 5	E.
,, aurantiacum .	Orange ,,		
Cichorium Intybus . .	Succory	July 18	*A. S. O.*
Lapsana communis . .	Nipplewort	July 1	C.

XLIV. CAMPANULACEÆ. BELL-FLOWER FAMILY.

[Herbs. Calyx and corolla 5-lobed. St 5, on ovary.]

Campanula glomerata .	Clustered Bell Flower .	July 15	B, C, Ro.
,, Trachelium	Nettle-leaved ,, ,,		
,, rapunculoides	Creeping ,, ,,		
,, rotundifolia .	Harebell	July 15	B, C, Ro.
,, hybrida . .	Corn Bell Flower . . .	July 15	*G. W. H.*

MONOPETALOUS FLOWERS.

B. Ovary Superior.

[Orders XLV to LX.]

XLV. ERICACEÆ. HEATH FAMILY.

[Low Shrubs. Ls rigid, evergreen. Calyx and corolla in 4 or 5. St 8 to 10.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Calluna vulgaris . . .	Ling	Sept. 19	*G.W.H.*
Monotropa Hypopitys .	Bird's Nest		

XLVI. PRIMULACEÆ. PRIMROSE FAMILY.

[Herbs. Fl reg. Calyx and corolla 4 to 7 lobes. St 4 to 7, on corolla.]

Primula veris	Cowslip	Mar. 18	M.
,, vulgaris . . .	Primrose	Feb. 17	M.
,, elatior	Oxlip		
Lysimachia vulgaris . .	Yellow Loosestrife		
,, Nummularia	Creeping Jenny	July 18	Ba, R, Mu.
,, nemorum .	Moneywort	May 26	B, C, M, L, Ro
Anagallis arvensis . .	Scarlet Pimpernel . . .	July 2	B, C.
,, tenella . . .	Bog ,,		
Samolus valeriandi . .	*Brookweed*	July 21	Mu, Ro, T.

XLVII. LENTIBULACEÆ. BUTTERWORT FAMILY.

[Marsh Herbs.]

Pinguicula vulgaris . .	Butterwort	June 17	B, C, L.
Utricularia vulgaris . .	Bladderwort		

XLVIII. OLEACEÆ. OLIVE FAMILY.

[Trees.]

Fraxinus excelsior . .	Ash	June 5	B, C, R.
Ligustrum vulgare . .	Privet	June 12	R.

XLIX. APOCYNACEÆ. PERIWINKLE FAMILY.

[Trailing Herbs.]

Vinca major	Greater Periwinkle . . .	Feb. 17	B, C, Ra.
,, minor	Lesser ,, . . .	Feb. 24	B.

L. GENTIANACEÆ. GENTIAN FAMILY.

[Herbs. Calyx and corolla 4 to 10-lobed; St on corolla.]

Erythræa Centaurium .	Centaury	July 15	C, B, Ro.
Gentiana Amarella . .	Autumn Gentian . . .	Sept. 19	*G.W.H.*
,, campestris . .	Common Gentian . . .	Sept. 19	*G.W.H.*
Chlora perfoliata . . .	Yellowwort	July 15	C, B, Ro.
Menyanthes trifoliata .	Buckbean	June 17	B, C, L.
Limnanthemum nymphæoides	Water Gentian	July 25	T.

LII. CONVOLVULACEÆ. CONVOLVULUS FAMILY.

[Twining Herbs. S 5 in two rows. Corolla 4 or 5 lobes. St 4 or 5, on corolla.]

Convolvulus arvensis .	Small Bind Weed . . .	June 29	B, C, L, T.
,, sepium . .	Great ,, . . .	July 16	Ba, R, Mu.
Cuscuta europæa . . .	Greater Dodder		

LIII. BORAGINEÆ. BORAGE FAMILY.

[Rough Herbs. Fls in spikes. Calyx and corolla (reg.) in 5. St 5, on corolla. Fr 4 nutlets.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Echium vulgare	Viper's Bugloss	June 27	S.
Pulmonaria officinalis	Lungwort		
Lithospermum arvense	Corn Gromwell	June 3	B, C.
" officinale	Gromwell	July 21	Mu, Ro, T.
Myosotis palustris	True Forget-me-not	June 27	R, W.
" repens	Creeping "		
" sylvatica	Wood "		
" arvensis	Field "	April 7	B, C, Rc.
" collina	Early "	April 25	Ra.
" versicolor	Changing "	May 26	M.
Anchusa semper-virens	Green Alkanet		
Lycopsis arvensis	Small Bugloss		
Symphytum officinale	Comfrey	April 8	M.
Borago officinalis	Borage		
Cynoglossum officinale	Hound's-tongue	July 5	B, C, R, S, Ro.

LIV. SOLANACEÆ. NIGHTSHADE FAMILY.

[Herbs. Calyx 4 or 5 lobes. Corolla 5 lobes. St 5 on corolla. Fr a berry with several seeds.]

Hyoscyamus niger	Henbane	June 6	*G.W.H.*
Solanum Dulcamara	Bitter Sweet	June 12	S.
" nigrum	Black Nightshade		
Atropa Belladonna	Deadly "	June 20	B, R, S, L, Ro, T.

LV. OROBANCHACEÆ. BROOMRAPE FAMILY.

[Leafless root parasites. Flowers brownish.]

Orobanche major	Great Broomrape		
Lathræa squamaria	Toothwort	Mar. 15	S.

LVI. SCROPHULARINEÆ. FIGWORT FAMILY.

[Herbs. Fls irreg. Calyx and corolla in 4 or 5, irreg. St 2, 4 or 5. Fr 2-celled capsule.]

Verbascum Thapsus	Common Mullein		
" nigrum	Black "		
Linaria vulgaris	Yellow Toad Flax	July 7	*G.W.H.*
" minor	Lesser "	July 21	Mu, Ro, T.
" Cymbalaria	Ivy-leaved "	April 7	Ra, S.
" spuria	Round " "		
Scrophularia nodosa	Knotted Figwort	June 3	B, C.
" aquatica	Marsh "	June 5	C, R, S, Ro.
Mimulus luteus	Monkey Flower		
Digitalis purpurea	Foxglove		
Veronica spicata	Spiked Speedwell		
" serpyllifolia	Thyme-leaved "	May 10	St, Tj, Bj.
" officinalis	Common "	June 5	B, C, R, S, Ro, T, Wj.
" Anagallis	Water "	July 2	Wj.
" Beccabunga	Brooklime "	May 24	E.
" montana	Mountain "		
" Chamædrys	Germander "	April 8	M.
" hederæfolia	Ivy-leaved "	Mar. 8	B.
" agrestis	Procumbent "	April 7	Rc.
" Buxbaumii	Buxbaum's "	Feb. 7	M.
" arvensis	Wall "	May 26	Mi.

Genus. Species.	*English Name.*	*Date.*	*Record.*
Bartsia Odontites	Red Bartsia	July 20	*C.I.G.*
Euphrasia officinalis	Eye-bright	June 27	B, L.
Rhinanthus Crista-galli	Yellow Rattle	May 23	S, Ro.
Pedicularis palustris	Marsh Lousewort	May 18	B, C.
„ sylvatica	Common „		
Melampyrum pratense	Cow Wheat	July 21	Mu, Ro, T.

LVII. **LABIATÆ. LABIATE FAMILY.**

[Herbs with square stems. Fls irreg. in whorls. Calyx tubular, 2-lipped or in 5. Corolla hypog. 2-lipped. St 2 or 4 on corolla. Fr 4 one-seeded nuts.]

Salvia verbenaca	*Wild Sage*	July 18	R, Mu.
Lycopus europæus	Gipsywort	July 18	Ba, R, Mu.
Mentha rotundifolia	Round-leaved Mint		
„ piperita	Pepper „		
„ aquatica	Water „	July 21	Mu, Ro, T.
„ sativa	Whorled „	July 15	*G.W.H.*
„ arvensis	Field „		
Thymus Serpyllum	Thyme	June 17	B, C, L.
Origanum vulgare	Marjoram	July 25	*G.W.H.*
Calamintha Acinos	Basil Thyme	July 15	B, C, Ro.
„ officinalis	Common Calamint		
„ Clinopodium	Wild Basil	July 14	C, B.
Nepeta Glechoma	Ground Ivy	Mar. 11	B.
Prunella vulgaris	Self Heal	June 20	Ro.
Scutellaria galericulata	Common Scullcap	July 18	R, Ba, Mu.
„ minor	Lesser „		
Marrubium vulgare	White Horehound	July 28	*G.W.H.*
Stachys Betonica	Betony	July 16	Ro.
„ sylvatica	Hedge Woundwort	June 12	Wj.
„ palustris	Marsh „	July 18	Ba, R, Mu.
„ arvensis	Corn „		
Galeopsis Ladanum	Red Hemp Nettle	July 21	Mu, Ro.
„ Tetrahit	Common „		
Ballota nigra	Black Horehound	July 4	B, C.
Lamium amplexicaule	Henbit Dead Nettle		
„ purpureum	Red „	Jan. 28	B.
„ album	White „	Jan. 24	B, C.
„ maculatum	Spotted „	May 7	B, C, R.
„ Galeobdolon	Yellow „	Mar. 18	M.
Teucrium Scorodonia	Wood Germander	July 15	C.
Ajuga reptans	Bugle	May 7	S.

LVIII. VERBENACEÆ. VERVEIN FAMILY.

[Herbs.]

Verbena officinalis	Common Vervein		

LIX. PLUMBAGINEÆ. THRIFT FAMILY.

[Shrubby Herbs.]

Armeria plantaginea	Plantain Thrift		

LX. PLANTAGINEÆ. PLANTAIN FAMILY.

[Herbs. Ls without a stalk, tufted. Fls spikes.]

Plantago major	Great Plantain	June 3	B, C.
„ media	Hoary „	June 19	R.
„ lanceolata	Ribwort „	April 14	W.

3. APETALOUS FLOWERS.

A. With Calyx, without Corolla.

(Orders LXII to LXIV.)

LXII. CHENOPODIACEÆ. GOOSEFOOT FAMILY.

[Weedy Herbs. Fls small, clustered in spikes. Perianth in 5. St 5.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Chenopodium album . .	White Goosefoot . .	July 15	*G.W.H.*
„ rubrum .	Red „		
„ urbicum .	Upright „ . .	July 21	*G.W.H.*
„ murale .	Nettle-leaved „		
„ Bonus Henricus	Good King Henry . . .	June 27	B, R, L.
Atriplex patula	Common Orache		

LXIII. POLYGONACEÆ. DOCK FAMILY.

[Herbs with swollen joints. Fls small; panicles. Perianth in 5. St 5 to 8.]

Rumex crispus	Curled Dock	July 1	Ml, Wl.
„ obtusifolius . .	Common „	July 10	R.
„ Hydrolapathum	Water „	July 18	Ba, R, Mu.
„ conglomeratus .	Clustered „		
„ maritimus . . .	Golden „		
„ Acetosa . . .	Common Sorrel	May 26	B, C, R, S, L.
„ Acetosella . .	Sheep's „ . . .	May 31	H.
Polygonum Fagopyrum .	Buckwheat	July 15	Mu, T.
„ aviculare .	Knot Grass	July 11	R, Mu.
„ Convolvulus	Black Bindweed		
„ Bistorta . .	Snakeweed		
„ amphibium .	Amphibious Bistort . .	July 18	R.
„ Persicaria .	Persicaria	July 25	T.
„ lapathifolium	Pale Bistort		

LXIV. THYMELEACEÆ. DAPHNE FAMILY.

[Shrubs.]

Daphne Mezereum . .	Mezereon Daphne . . .		
„ Laureola . . .	Spurge Laurel	Feb. 7	B, C, Ra.

APETALOUS FLOWERS.

B. WITH NEITHER COROLLA NOR CALYX.

(Orders LXVIII to LXXIV.)

LXVIII. EUPHORBIACEÆ. SPURGE FAMILY.

[Shrubs or Herbs with milky juice. Fls in involucre, diœcious. Perianth 3- or 4-lobed or wanting. St variable.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Euphorbia Helioscopia .	Sun Spurge	April 8	Ra.
„ platyphyllos .	Broad „		
„ Peplus . .	Petty „	July 11	*G.W.H.*
„ exigua . . .	Small „	July 19	R.
„ Lathyris . .	Caper „		
„ Esula . . .	Leafy „		
„ Amygdaloides	Wood „	April 1	B, C.
Mercurialis perennis . .	Dog's Mercury	Jan. 24	B.
Buxus sempervirens . .	Common Box	May 4	B, C.

LXX. CALLITRICHINEÆ. WATER STARWORT FAMILY.

[Aquatic Herbs. Minute fls.]

Callitriche aquatica . .	Water Starwort	July 18	Ba, R, Mu.

LXXI. URTICACEÆ. NETTLE FAMILY.

[Herbs. Ls rough or stinging.]

Urtica urens	Small Nettle		
„ dioica	Common „	May 26	B, C, R, L, T, Mi.
Parietaria officinalis . .	Pellitory-of-the-wall . .	July 18	R.
Humulus Lupulus . .	Hop		

LXXII. ULMACEÆ. ELM FAMILY.

[Trees.]

Ulmus montana	Wych Elm	Mar. 4	B, C.
„ campestris . .	Common Elm	Mar. 6	B, C.

LXXIII. AMENTACEÆ. CATKIN FAMILY.

[Trees or Shrubs. Fls in catkins, diœcious.]

Alnus glutinosa	Alder	Mar. 15	B, C, Ra.
Betula alba	Birch	May 4	M.
Carpinus Betulus	Hornbeam	June 3	R.
Corylus Avellana (Fem.)	Hazel Nut	Jan. 28	B, C.
Fagus sylvatica	Beech	May 20	M.
Quercus Robur	Oak	May 26	B, C, R, Mi.
Salix fragilis	Crack Willow	May 6	B, C.
„ alba	White „	May 21	B, C, Ra.
„ amygdalina	Almond „	May 14	*G.W.H.*
„ purpurea	Purple „		
„ viminalis	Osier „	May 7	*G.W.H.*
„ Caprea	Sallow „	Mar. 21	B, C, Ra.
„ aurita	Round-eared Willow . .	Mar. 21	B, C, Ra.
Populus alba	White Poplar		
„ nigra	Black „	June 5	R.

LXXIV. CONIFERÆ. PINE FAMILY.

[Trees with resinous juice.]

Pinus sylvestris	Scotch Fir	June 3	R.
Juniperus communis . .	Juniper	June 5	B, C, R, S, Ro.
Taxus baccata	Yew	April 8	Rc.

II.—MONOCOTYLEDONS.

[Plants with one seed-leaf. Leaves usually parallel-veined, radical and sheathed at base. Flowering parts in threes.]

1. PETALOID FLOWERS.

A. Ovary Superior.

[Orders LXXV to LXXIX, LXXXV, LXXXVI.]

LXXV. TYPHACEÆ. BULRUSH FAMILY.

[Reed-like Herbs.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Typha latifolia	Bulrush	July 1	*G.W.H.*
Sparganium ramosum .	Branched Bur-reed . .	July 18	Ba, R, Mu.
„ simplex . .	Simple „		

LXXVI. AROIDEÆ. ARUM FAMILY.

[Herbs.]

Arum maculatum . . .	Lords and Ladies . . .	May 4	B, C.
Acorus Calamus . . .	Sweet Flag		

LXXVII. LEMNACEÆ. DUCKWEED FAMILY.

[Floating plants.]

Lemna trisulca . . .	Ivy-leaved Duckweed .	May 14	Ba, R, Mu.
„ minor	Lesser „ .	May 14	Ba, R, Mu, Ro.
„ polyrrhiza . . .	Greater Duckweed . .	July 18	Ba, R, Mu.

LXXVIII. NAIADEÆ. PONDWEED FAMILY.

[Floating plants.]

Potamogeton natans . .	Pondweed	July 21	T.

LXXIX. ALISMACEÆ. WATER-PLANTAIN FAMILY.

[Water-plants. Ls broad net-veined. Perianth in 6. St 6 to 7.]

Butomus umbellatus . .	Flowering Rush . . .	July 18	Ba, R, Mu.
Sagittaria sagittifolia .	Arrowhead	July 18	Ba, R, Mu.
Alisma Plantago . . .	Water Plantain	July 1	Ba, R, Mu.
Triglochin palustre . .	Arrowgrass	June 20	B, R, S, L, Ro.

B. Ovary Inferior.

[Orders LXXX to LXXXIV.]

LXXX. HYDROCHARIDEÆ. FROGBIT FAMILY.

[Aquatic Herbs. Perianth 3 to 6 parts. Diœcious.]

Hydrocharis Morsusranae	Frogbit	July 18	Ba, R, Mu.

LXXXI. ORCHIDACEÆ. ORCHID FAMILY.

[Herbs, with knob-like roots. Fls spikes or racemes. Perianth in 6, irreg. St 1 or 2, imperfect.]

Epipactis latifolia . . .	Broad Helleborine		
„ palustris . .	Marsh „		
Cephalanthera grandiflora	Large „	June 5	M, R.
Listera ovata	Twayblade	May 27	B, C, M, R, S, Ro.
Neottia Nidus-avis . .	Bird's-nest Orchid . .	May 26	S.
Orchis Morio	Green-winged „ . .	May 6	S.
„ ustulata . . .	Dwarf „ . .	June 5	J.
„ mascula . . .	Early Purple „ . .	April 21	M, Ra.

Genus. Species.	*English Name.*	*Date.*	*Record.*
Orchis maculata . . .	Spotted Orchid . . .	June 5	B, C, M, R, Ro, T, A, J.
,, latifolia . . .	Marsh ,, . . .	June 17	L, B, C.
,, pyramidalis . .	Pyramidal ,, . . .	June 27	B, R, S, L.
Habenaria bifolia . . .	Butterfly ,, . . .	June 5	B, M, R, Ro, A, J.
,, conopsea .	Fragrant ,, . . .	June 27	D.
,, viridis . .	Frog ,, ...	May 27	B, C, M, R, Ro.
Herminium Monorchis .	Musk ,, . . .	July 1	*G.W.H.*
Ophrys apifera . . .	Bee ,, . . .	June 27	B, R, W, L, T.
,, muscifera . .	Fly ,, . . .	May 26	R, Mi.

LXXXII. IRIDEÆ. IRIS FAMILY.

[Herbs.]

Iris Pseudacorus . . .	Yellow Flag	June 5	C, R, S, Ro.

LXXXIII. AMARYLLIDEÆ. DAFFODIL FAMILY.

[Bulbous Herbs.]

Crocus Vernus	Purple Crocus		
Narcissus Pseudonarcissus	Lent Lily	Mar. 21	B, C, Ra.
Galanthus vivalis . . .	Snowdrop	Feb. 17	*G.W.H.*

LXXXIV. DIOSCORIDEÆ. YAM FAMILY.

[Climbing plants.]

Tamus communis . .	Black Bryony	June 5	B, C, M, R, Ro.

LXXXV. LILACEÆ. LILY FAMILY.

[Herbs. Fls large. Perianth 6 in two circles. St 6. Ovary superior.]

Paris quadrifolia . . .	Herb Paris	April 16	B, C, R, S, Ro, A.
Polygonatum multiflorum	Common Solomon's Seal	May 19	*G.W.H.*
,, officinale .	Angular ,, ,,	May 19	C.
Convallaria majalis . .	Lily-of-the-Valley . . .	May 19	C, L.
Ornithogalum umbellatum	Star of Bethlehem		
Scilla nutans	Wild Hyacinth	April 1	B, C.
Allium vineale	Crow Garlic	July 18	Mu.
,, ursinum . . .	Common ,, ...	April 1	B, C.
Colchicum autumnale .	Meadow Saffron		

LXXXVI. JUNCACEÆ. RUSH FAMILY.

[Stiff herbs. Ls cylindrical or grass-like. Fls small and dry. Perianth in 6. St 6. Ovary superior.]

Juncus communis . . .	Common Rush	June 3	C.
,, glaucus	Hard ,, ...	June 12	B, R, S.
,, articulatus . .	Jointed ,, ...	July 21	Mu, Ro.
,, obtusiflorus . .	Obtuse ,,		
,, *compressus* . .	*Fruited* ,, ...	July 25	T.
,, tenuis	Slender ,,		
,, bufonius	Toad ,, ...	July 11	*G.W.H.*
Luzula pilosa	Hairy Wood Rush . . .	Mar. 21	B, C, Ra.
,, campestris . .	Field ,, ...	April 1	C.

2. GLUME-BEARING FLOWERS.

LXXXVIII. CYPERACEÆ. SEDGE FAMILY.

tiff herbs. Solid stems. Ls with entire sheaths. Fls in green or brown spikelets, with glumes.]

nus. Species.	*English Name.*	*Date.*	*Record.*
smus compressus . .	Broad Blysmus	July 1	*G.W.H.*
irpus palustris . . .	Marsh Scirpus	July 1	Ba, R, Mu.
.. lacustris . . .	Lake „	July 25	T.
.. sylvaticus . .	Wood „	June 23	T.
Eriophorum polystachion	Cotton Grass	June 17	C, L, B.
Carex leporina	Oval Sedge		
remota	Remote „ . . .	July 4	Mu, Ro, T.
paniculata . . .	Panicled „		
vulpina	Fox „ . . .	June 3	C.
cæspitosa . . .	Tufted „ . . .	May 28	*G.W.H.*
acuta	Acute „		
præcox	Early „		
pilulifera . . .	Pill-headed „		
tomentosa . . .	Downy „ . . .	June 5	M, S.
filiformis . . .	*Slender* „ . . .	June 20	R.
hirta	Hairy „ . . .	June 5	T.
flava	Yellow „ . . .	June 17	C.
distans	Distant „ . . .	June 12	*G.W.H.*
panacea	Carnation „ . . .	May 4	B, C.
glauca	Glaucous „ . . .	May 7	B, C.
sylvatica . . .	Wood „ . . .	May 26	C.
strigosa	Thin-spiked „ . . .	May 14	*G.W.H.*
Pseudocyperus .	Cyperus „		
pendula	Pendulous „ . . .	May 7	B, C.
ampullacea . .	Bottled „ . . .	June 20	R.
paludosa . . .	Marsh „ . . .	April 3	C, Ro.

LXXXIX. GRAMINEÆ. GRASS FAMILY.

[Herbs. Stems hollow except at nodes. Ls with split sheaves. Fls with glumes. St 3 usually.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Milium effusum . . .	Wood Millet Grass . .	June 20	R, S, Ro.
Anthoxanthum odoratum	Vernal ,, . .	May 9	B, C.
Phalaris canariensis . .	Canary ,,		
Digraphis arundinacea .	Reed ,, . .	July 18	Ba, R, Mu, T.
Phleum pratense . . .	Timothy ,, . .	July 18	Ba, R, Mu.
Alopecurus agrestis . .	Slender Foxtail Grass		
,, pratensis .	Meadow ,, ,,	May 9	B, C, Mi.
,, geniculatus .	Marsh ,, ,,	July 1	*G.W.H.*
Agrostis alba	*Fiorin Grass*	July 15	B, C, R.
Avena fatua	Wild Oat		
,, pratensis . . .	Perennial ,,		
,, flavescens . . .	Yellow ,, ...	June 3	B, C.
Arrhenatherum avenaceum	False ,, ...	June 29	B, C.
Holcus lanatus	Common Holcus . . .	June 20	B, R.
,, mollis	Soft ,, . . .	July 16	R.
Hordeum sylvaticum .	Wood Barley	June 28	R.
,, pratense . .	Meadow ,, ...	July 1	Ba, R, Wl.
,, murinum . .	Wall ,, ...	July 9	*G.W.H.*
Agropyrum repens . .	Couch Grass	July 18	R, Mu.
Lolium perenne	Rye ,, ...	June 12	R.
,, temulentum . .	Darnel		
Brachypodium sylvaticum	Slender False Brome . .	July 21	Mu, T.
,, pinnatum	Heath ,, ,,		
Bromus erectus	Upright Brome	June 24	B, Wl.
,, asper	Hairy ,,		
,, sterilis	Barren ,, ...	June 28	C.
,, mollis	Soft ,,		
,, *arvensis*	*Field* ,, ...	July 15	*G.W.H.*
Festuca ovina	Sheep's Fescue	June 13	R, Ml, Wl.
,, elatior	Meadow ,,		
Dactylis Glomerata . .	Cock's-foot	June 23	R, Wl.
Cynosurus cristatus . .	Dog's-tail	May 30	Ro.
Briza media	Quaking Grass	June 5	Bj, Mo.
Poa aquatica	Reed Meadow Grass . .	July 18	R, Mu.
,, fluitans	Floating ,,		
,, annua	Common ,, ...	Jan. 24	B, C.
,, *compressa*	*Flattened* ,, ...	June 28	R.
,, pratensis	Smooth ,, ...	June 11	Wl.
,, trivialis	Roughish ,, ...	May 31	R, Ro.
,, nemoralis	Wood ,, ...	June 24	Wl.
Catabrosa aquatica . .	Water Catabrosa	July 18	Ba, R, Mu.
Melica nutans	Mountain Melick		
,, uniflora	Wood ,, ...	May 26	B, C.

CRYPTOGAMS OR FLOWERLESS PLANTS

[No stamens or pistils or true seeds. Fruit—spores contained in spore-cases in the substance of the plants.]

XCIII. EQUISETACEÆ. HORSE-TAIL FAMILY.

[Herbs, with jointed stems, whorl of scale-like leaves at joints.]

Genus. Species.	*English Name.*	*Date.*	*Record.*
Equisetum Telmateia .	Great Horse-tail . . .	May 21	M.
,, arvense .	Field ,, . . .	April 3	B.
,, palustre .	Marsh ,, . . .	June 17	B, C.

XCIV. FILICES. FERN FAMILY.

[Tufted herbs. Spore-cases usually under the fronds.]

Ophioglossum vulgatum	Adder's Tongue		
Polypodium vulgare . .	Common Polypody . .	Mar. 21	B, C, Ra.
,, Phegopteris	Beech Fern		
,, calcareum .	Mountain Polypody . .	May 27	B, C, R, Ro.
Aspidium aculeatum . .	Prickly Shield Fern . .	June 5	B, C, R, Ro.
,, angulare . .	,, ,, ,,		
,, Felix-mas . .	Male Polypody	May 19	C.
,, spinulosum .	Broad ,,		
Asplenium Filix-fœmina	Lady Fern		
,, Trichomanes	Common Spleenwort		
,, Adiantum-nigrum	Black ,,		
,, Ruta-muraria	Wall Rue	April 8	Ra.
Scolopendrium vulgare .	Hart's Tongue	Feb. 25	M.
Ceterach officinarum .	Scaly Fern	May 16	M.
Pteris aquilina	Bracken	May 4	B, C.

Geological Section

President, C. I. Gardiner, Esq.

Working Members.

Burrard.	Neame, T.
Krauss.	Stuart, A. M.
Neame, P.	Young, R. P.

The collecting this year has been done chiefly on the long excursions, though some members have done some work on other occasions. The weather, however, was not exactly of the nature to make fossil-hunting in the Lias brick-pits particularly clean work. When one has to wallow about in greasy clay, one prefers to go to clean limestone quarries from which one does not carry away pounds of material on one's boots and trousers. Burrard, Krauss and Neame, P. were perhaps the most successful of those who came on many excursions, while Neame, T., who was prevented from coming on most of the excursions, did excellent work when he did come.

The system of having explanatory sections of the districts visited proved a good one, as members of the Section were better able to understand what beds they were working at, and also were able to compare the beds seen on different excursions with one another.

Ornithological Section

President, E. A. Menneer, Esq.

Working Members.

Egleston, V.
Griffith, N. O.
Heywood, J.
Lemon, B. B.
Milton, F.
Ramsay, G. H.
Startin, G.
Vaudrey, R. H. M.
Woodiwiss.

The membership of this Section was very large, thirty-nine boys belonging. The above, however, were the working members.

The prize in this Section is given to the member who gives up at the end of the year a notebook containing the best observations on bird-life and bird-habits. It was awarded to G. H. Ramsay this year. Some of his observations are printed below.

NATURE NOTES

By G. H. Ramsay.

April 5. Wild duck's nest in an old willow-tree which overhung a stream near Coombe Hill. The drake flew when I was within twenty yards of the nest, but the duck remained on the nest till I knocked the tree trunk, after which she flew off very excitedly. I found a slight hollow at the top of the tree, in which were five eggs of a pale-green colour. There was no sign of a built nest.

April 8. Robin's nest situated in the ivy at the back of a house. The nest was composed of leaves and lined with hair and feathers. The eggs were five in number. Their ground colour was white and covered with red spots. The eggs were hatched and the young thrived for about a week, but during a frost all perished.

April 22. Redshank's nest near Coombe Hill. The nest was just a hollow in the grass with a very few pieces of grass laid at the bottom. It was placed in a meadow in grass about six inches in height, which overhung the nest and almost hid the eggs from view. There were three eggs; their ground colour was of a creamy-green thickly spotted with dark brown, thickest on the larger end. The nest of this bird is very seldom found in this district.

April 28. Visited the redshank's nest again about 6.30 p.m., in the hopes of getting near enough to the bird to see it closely. The hen-bird was sitting, and the cock was very close at hand. They both took fright before I got within fifty yards of them. They flew round in a circle of about a quarter of a mile radius two or three times, continually making a piercing screech. They then disappeared. I again found the nest, which was not easy owing to the bad light. There were now four eggs.

April 29. Robin's nest. The same pair whose young perished with the cold. I saw the hen-bird go into an outhouse in the same garden as before with a straw in her mouth; I looked for a nest, but could see no trace of one. I looked two days later and found a finished nest, on the third day there was one egg. They laid four eggs and hatched them all.

May 6. Sand-martin's nest. I found about six nests with eggs, all the nests were about an arm's length back in the bank of the Severn. They contained about an average of two eggs per nest. It was rather early for martins.

May 7. Greater Whitethroat's nest building in a bed of nettles at the side of the road. I found a second nest about twenty yards further along. The nests were from about nine inches to a foot off the ground.

May 7. The plover fields at Coombe Hill were under water owing to the overflow of the Severn. The birds had all disappeared except about five or six pairs, which, more by luck than good management, had built their nests on higher ground than the rest.

May 10. Redstart's nest in a hole in the side of an old willow-tree. It was composed of cow's hair and lined with horsehair and feathers. There was one egg of a light blue colour, slightly thicker than and not quite as long as a hedge-sparrow's. There was no bird in sight, but the nest was clearly that of a redstart.

May 14. Tree-creeper's nest. I saw the bird on the side of a willow by a stream. I followed the bird along the stream for about fifty yards, and watched it fly to a large dead elm with ivy on it, which was also dead. The nest was between the thick branches of the dead ivy and the trunk of the tree. The nest was composed of soft bark and lined inside with feathers and a few pieces of horsehair. There were seven eggs, white in colour, with red and brown spots mostly on the larger end. The eggs are very like those of a wren, but the spots are larger.

May 16. A friend found a nightingale's nest. He heard the bird and watched it for an hour, at the end of which time he was rewarded by seeing the bird go into the bottom of a briar-hedge. He could not then find the nest, and was walking away when the bird flew out at his feet, and he found the nest in a heap of dry sticks and dead leaves. He then showed me where it was. I did not wonder at his not being able to find it. The leaves which composed the nest were the same as those which covered the ground. There were five eggs of an olive-green colour; one egg had dark brown spots on one end.

May 20. Tree-pipit's nest. I watched the birds for half an hour, and eventually found the nest, wonderfully concealed in the grass on a little slope, where the ground was rough and the grass fairly long. The nest was made of fine grass, and lined with a little hair; and green moss, evidently to match the surrounding foliage, was placed on the side of the nest. The eggs were five in number, and of a dark purple colour, with a few darker blotches of the same colour.

May 23. Tree-pipit's nest with four eggs. Purple variety, in bank at side of a stream in tuft of grass.

May 25. A bullfinch's nest in a briar-bush near Leckhampton Church. The eggs were of a very peculiar species; they were perfectly white with a few stray brown spots. One egg was pure white. I left the eggs alone, not being perfectly certain that they were really bullfinch's, and waited near by till the birds returned. After seeing them I was reassured, and thought I had found something quite unique. I wrote to the *Field*, and they informed me that they were not at all common but sometimes found.

May 25. Nuthatch's nest in an ash-tree with a hollow knot sticking out of the trunk. There was no formed nest, but just dry pieces of leaf filling half the hollow. The eggs were seven in number, white in ground colour, covered with rich brown spots. I had been hammering at the hole for nearly a minute when the bird flew out, making a loud, scraping screech.

May 25. Shrike's nest in a thorn-bush. The nest was rather like a well-made blackbird's nest. A friend passed it by. I thought I might as well feel in it, and found five shrike's eggs. They were pink with light brown spots. The eggs were of an oval shape, not like some which are nearly circular.

June 3. Green woodpecker's nest found on May 23. Tapped tree a foot below entrance-hole, and water gushed out. I then tapped it a foot farther down, and more water came out. I then felt in the hole, and found several smashed eggs and one very stained, unbroken one, all the usual shine had gone, and it was a dull brown.

June 4. Tree-sparrow's nest in a barn. The eggs were unmistakeably tree-sparrow's, of a dark brown colour and four in number.

June 4. Yellow-hammer's nest with five eggs, with hardly any dark lines on as usual, but only pink spots and blotches.

June 7. Flycatcher's nest in the side of an ash-tree on a clump of small branches. There were four flycatcher's eggs and a cuckoo's. I watched the birds fly round and round the tree about a dozen times, and did not find the nest until one of them swooped down right on to it, and up again. The cuckoo's egg was very dark at one end, but comparatively light at the other. There was almost a circle of large spots round the larger end of the egg.

June 18. Cuckoo's egg in sedge-warbler's nest. There were also four sedge-warbler's eggs. The nest was in a small bush on the side of a country lane. I found a nest of the same kind containing a cuckoo's egg last year, not thirty yards farther up the road, in the same kind of bush.

June 18. Tree-creeper's nest in a piece of bark attached to the trunk of an old willow-tree. There were seven eggs, just like well-marked coletit's eggs. The nest was made of bark.

Some Ornithological Notes by a Member.

March 20. A robin's nest with eggs was seen in a bank in the Sandy Lane.

April 22. At Bentham, first noticed swallows, also saw whitethroat and willow-wren, and heard cuckoo.

May 4. Heard a nightingale at Leckhampton.

May 9 (Leckhampton) was the earliest date I found swifts, and *September* 12 (Shurdington) the latest date.

In *October* a small flock of herring-gulls were seen passing over the College grounds in a south-west direction, a rather unusual sight.

Photographic Section

President, C. E. Youngman, Esq.

Members.

Barker, N.
Bateman, H. H.
Becher, L. B. A.
Browne, M. G.
Cohen, B. J. B.
Cohen, E. C.
Darell, R. D. E.
Davis, F. G.
Dyce, A. G. H.
FitzHerbert, E. C. U.
Graham, E.
Gudgeon, G. F. C.
Hale, N. W.
Harford, H. H.
Harington, H. R.
Hart, N. S.
Heywood, J.
Hogg, D. McA.
Laming, C. H. R.
Lloyd, G. A.
Marsden, H.
Milton, F.
Momber, E. M. F.
Murray, A. C. G. O.
Neame, H.
Nicholls, T. B.
Paterson, Q. H.
Perkins, H. B.
Pitman, C. S.
Ritter, E. S.
Sharpe, G. C.
Spackman, P. G.
Studdy, R. F. B.
Tate, W. M.
Thursby, A. D.
Waterhouse, R.
Williams, H. F. F.
Woodhouse, G. S.
Woodhouse, H. L.
Woodley, F. S.
Young, R. P.

We have suffered this year more than usual by the leaving of the old hands, and by the falling away of some of those who are still here, but are putting (we will suppose) more work as they go up the scale into the regulation school business. Of the less experienced, not many have yet freed themselves from the bondage of the hand-camera; still there is good promise among them for another year.

The competition in the summer term for Mr. E. M. Joseph's prize was spoilt by coming just at that time when excitable people were trying to drop everything and run away. F. G. Davis's prints were carefully done, and were probably the best, but no prize was awarded. We ought to do better this year. The prize is for prints obtained by some more artistic process than the regular P. O. P.—bromide, platinotype, carbon, &c., and it is worth deliberately trying for. Those who can profit by printed help in their work should spend a shilling and some study on some good book of instructions, such as the *Barnet Book of Photography*, the *Watkins* or the *Ilford Manual*, or (for more detail) the *Practical Photographer* series.

The section prize for Lantern Slides went to H. Neame for some snow-scenes; not perfect, but good for a first attempt. R. P. Young was second, and had done a much greater quantity of work, but not with the same care and precision. Heywood and E. S. Ritter were the only other exhibitors, and the show would have been rather meagre without the contributions supplied by various masters who take an interest in photography: there is a good long list of them now, only it would seem that, unfortunately, the camera attracts just the busiest men on the staff, so that they cannot spend very much time on it. We had also a few slides from the collection of H. Nestor-Schnurmann, O.C.; a good idea: other O.C.'s, or intending O.C.'s, please note.

Members who are at all likely to be able to use them should have bicycles with them next summer, in case there comes a fine day and a good opportunity.

ANTS

On October 23, Mr. Briant lectured on 'Ants and their Ways.' After giving us an account of various ants, British and foreign, and their habits, he showed several living ants in front of the lantern so that their shadows fell on the screen. In this way were shown specimens of *Formica rufa* (the hill-ant), *F. flava* (the meadow-ant), *F. niger* (the garden-ant), *F. sanguinea* (the slavemaking-ant), *F. fusca* (the slave ant).

F. sanguinea is such a lazy animal, that when once it has exerted itself sufficiently to catch some slaves, it lives all the rest of its life in helpless dependence on them. If the slaves die, the slave-owners, having forgotten how to feed themselves, die shortly afterwards.

F. flava is the common brown ant one so commonly sees in walks across the country. A nest of this ant was purchased by the Society, and is now on view in the Museum.

Between two panes of glass earth has been placed, and the ants have made their nest there. There are chambers and passages connecting them to be seen. The nursery where the young are tended and fed by their nurses, the queen looked after by her attendants, the cemetery where the dead ants are buried, all these can be clearly seen. Driven about by ants are several small white animals which act the part of cows, for they are 'milked' and the milk given to the young ants.

The inhabitants want a little moisture occasionally, but no food during the winter months. During the summer months they are fed with a small quantity of honey once a week.

That such nests are not hard to start was shown by C. V. Thornton, who made a copy of the one got from Mr. Briant, and got some ants from near the College bath. When he put these in the prepared place they soon started arranging the nest, although he had no queen inside.

C. C. N. H. S. ACCOUNTS FOR 1903.

RECEIPTS.

	£	s.	d.	£	s.	d.
Balance brought forward . . .				30	19	10
1st Term. Ordinary members .	4	7	0			
Dark Room ,,	1	17	6			
				6	4	6
Outstanding Subscription .				0	1	0
2nd Term. Ordinary members	5	1	0			
Dark Room ,,	5	15	6			
				10	16	6
3rd Term. Ordinary members .	5	12	0			
Dark Room ,,	3	10	0			
				9	2	0
				£57	3	10

EXPENSES.

	£	s.	d.	£	s.	d.
Heaven, Dark Room				3	10	6
Williams & Norgate, *per* C. I. G.				3	7	6
Postage of Reports				0	2	1
Darter, Balance on Reports . .				1	15	0
Printing				0	15	0
Ornithological Section Prize (1902)				0	10	0
Newton & Co., Lantern Slides .				0	5	6
Cheque Book				0	1	0
Heaven, Dark Room				4	8	6
Excursions (5) Receipts . . .	16	3	6			
Ex's, Teas, &c. . . £10 12 0						
Garner . . £14 8 3						
	25	0	3	8	16	9
Swift & Son, *per* A. D. P. . .				1	0	0
Heaven, Dark Room				4	7	6
Formicarium, etc. *per* C. I. G. .				1	2	6
Lecture on 'Ants & their Ways'				1	11	6
Botanical Section Prize, *per* G. W. H.				0	9	0
Ornithological Section Prize .				0	10	2
Photographic Section Prize, *per* C. E. Y.				0	10	3
Balance in hand				24	1	1
				£57	3	10

R. M. TOWERS,
Hon. Treas.

Audited and found correct,
A. A. BOURNE.
February 16, 1904.