FIRST REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB.

ADOPTED AT A MEETING HELD

JANUARY 18, 1871.

CROYDON:
PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE.

1871.

FIRST REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 18, 1871.

CROYDON:
PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE.

1871.

OFFICERS AND COMMITTEE

FOR THE YEAR 1871.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

JOHN WICKHAM FLOWER, F.G.S., &c.

Honorary Secretary:

HENRY LONG, M.Q.M.C.

(90, High Street, Croydon).

Committee:

JOHN BERNEY, F.R.M.S.
WM. REEVE COOPER
HENRY LANCHESTER, M.D.
G. F. LINNEY
GEORGE PERRY
HENRY STRONG, M.D.
FREDERICK WEST, Jun.

REPORT OF THE COMMITTEE.

In presenting their First Report, the Committee of the Croydon Microscopical Club feel great pleasure in congratulating the members on the prosperity and success of the Club. Since the highly interesting Inaugural Meeting took place—only about nine months ago—the number of members has increased to 116, and although during that time the Club may have contributed little of original discovery to microscopical science, one addition, at least, has been made to the list of the *fauna* of the neighbourhood, and some new and interesting objects have been prepared and exhibited by its members. The Monthly Meetings have been well attended, and the interest evinced by the members generally, and the progress made by many of them in the delicate manipulation of preparing and mounting microscopic objects are very encouraging.

The Papers read have been of a high class, and their authors have, in every instance, imparted the results of their own personal investigations so pleasantly and clearly as to secure the earnest attention of their hearers.

In accordance with a suggestion made by the President, the members generally have exhibited at the meetings objects illustrative of the paper read during the evening; and the Committee have reason to believe that this systematic method of working has been advantageous to the members, and a great assistance to the lecturers.

The Excursions arranged during the summer recess were made scientifically profitable to those who participated in them by the permission given to the Club, by gentlemen of position in the neighbourhood, to inspect their beautiful grounds in search of natural objects of interest; and especially agreeable by the hospitable and kind entertainment accorded by those gentlemen to their visitors.

The Committee have also to express their satisfaction with the eminent success of the *Soirée* held at the Public Hall, on the 23rd of November last; an entertainment which not only afforded the members and their friends an evening's enjoyment, but which obtained for the Club the most gratifying public recognition. The display of microscopes and objects of interest in science and art by the members themselves, was such as would have been creditable to any of the most important provincial societies in this country; and the generous assistance cordially given, at the cost of no small personal inconvenience, by a large number of gentlemen well known in connection with similar societies in London, rendered the exhibition one which elicited the hearty commendation of all who were present.

At a meeting, held at the residence of the President, before the Inauguration of the Club in April last, it was resolved and embodied in the rules, that the Annual General Meeting should be held on the third Wednesday in January; the first report of the Committee refers therefore to the proceedings of only nine months. Satisfactory as is the retrospect of that period, the Committee hope that, in the year now entered upon, the Club may be progressively prosperous. that an increasing number of members may take part in the monthly meetings, and that by exhibiting objects, and otherwise promoting the interest of the Club they may assist in extending its usefulness.

ABSTRACT OF PROCEEDINGS.

1870–71.

The following are the subjects which have been introduced, and the Meetings, Excursions, &c., that have taken place :—

April 6th, 1870.—The Inaugural Meeting was held in the Public Hall. There were present :—the Rev. J. B. Reade, F.R.S., President of the Royal Microscopical Society; Dr. Bowerbank, one of the founders and an early President of that Society; James Glaisher, Esq., F.R.S., its past President; Professor Rolleston, F.R.S.; Frank Buckland, Esq., H.M. Inspector of Fisheries; Robert Hudson, Esq., F.R.S.; the Rev. Thomas Wiltshire, F.L.S., Secretary of the Palœontographical Society; Dr. Millar, F.L.S., and Captain Tyler, F.L.S., members of Council of the Royal Microscopical Society; W. Marshall Hall, Esq., F.G.S.; Robert W. Fuller, Esq., President of the Croydon Chamber of Agriculture; and other gentlemen.

The President, Mr. Henry Lee, F.L.S., delivered the following address :—

Gentlemen.—Two months ago I had no expectation that a Microscopical Club would, by this time, be established in Croydon. I had, indeed, thought of such a society for the last three years, and had consulted with gentlemen now present as to the possibility of our bringing together in this manner a few brother naturalists and microscopists; but we feared that the number of those in the district feeling an interest in these subjects was too small to enable us successfully to carry out our project; and we felt that unless we had good reason to believe that our contemplated little society would have permanent vitality, it would be better to wait patiently for an opportunity of commencing it under more favourable circumstances. That opportunity has now arrived; and, as the origin of our Club may at some future time be a subject of interest to those who come after us, I feel much pleasure in recording that we are indebted to Mr. Henry Long for having, by his advertisement in the *Croydon Chronicle*, addressed to "Microscopists and others," elicited a more general expression of a desire to join in the study of microscopical science than any of us had previously supposed to exist in our town and neighbourhood. We commence with upwards of 80 members. Amongst them are three Fellows of the Royal Society; four fellows of the Linnean Society; three Fellows of the Geological Society (one, our treasurer, a very distinguished one), and several Fellows of the Royal Microscopical Society, and members of the Quekett Microscopical Club. We have also with us almost all the medical men of Croydon, and of the other members I know not of one who has joined us from any other motive than a real desire to pursue and encourage the study of microscopy and natural history. Of this hopeful band of workers you have unanimously elected me the first President, and I shall never cease to consider it one of the most gratifying honours that could have been bestowed on me by a select body of my fellow-townsmen. I confess that now I see the important proportions the Club is assuming, I feel the grave responsibility that rests on me. We have amongst us, it is true, a few experienced microscopists; but the majority of you are, I believe, about to take your first step in this path of science, and are looking chiefly to me for advice and guidance. Although I see the magnitude of the work before me, I do not fear for the result if my health continue good, and if I have your sincere, united, and warm-hearted co-operation. It will be my duty and pleasure to use for our mutual benefit, any influence or experience I may possess through my connection with other scientific societies; and I will most gladly assist each and all of you to the best of my ability, and in any way in my power. There should be no selfish secrecy in science, and I congratulate myself on the opportunities that will be afforded me of passing on to others, as well as I am able, the instruction and encouragement I have received from many highly-valued and distinguished friends (some of whom are here to-night), and of thus proving to them my gratitude for their kindness in the manner which I know will please them best. But let me impress it upon you that the responsibility rests not only on myself and the committee, but upon every individual member. It is necessary not only to be persevering in study, but also that we should cultivate the geniality of disposition, and good fellowship with each other, which conduce so much to the pleasantness of a Club like ours. I hope to see existing amongst us a kindly feeling and *esprit de corps* which will cause us to think it no trouble to help a fellow-member in his work, or to personally assist in promoting the welfare of the Club. There are two dangers which, more than all others, are likely to assail us. I think it right to caution you against them at the very outset: and I hope you will not be offended if I speak to you of them frankly. The first is the possibility that in a country town like this, party feeling, and professional, social, and other jealousies may be imported into the Club, tending to the formation of cliques, and engendering a disastrous want of unity. When you come here, shut the door upon all such feelings, and leave them out in the street; they will soon be tired of waiting for you, and you will in time be able to go home without them. And if, in the discussion of scientific subjects, opinions should not always coincide, let us remember that, in the words of my old friend Mr. Perigal:—

> Experiment should be our guide;—
> Let, when we differ, none decide;
> But each exert his zeal and sense
> In search of further evidence,
> Till overwhelming facts bring out
> The truth so plain that none can doubt.
> Where pride and prejudice abound
> The truth is never to be found.

—The second danger to which I alluded is that present ardour may cool down into future apathy. I trust that this will not occur to any great extent: I cannot, of course, expect that all will be equally persevering; but I promise you that the committee will do everything they can to make our meetings cheerful and attractive, and to infuse spirit into our work. The ordinary meetings of the Club will be held once a month, when a short paper will generally, but not necessarily, be read, which will form the prominent subject of discussion and illustration during the evening. Those of us who have microscopes and lamps will be expected to bring them, and also any objects or preparations likely to elucidate the paper to be read; those who have no suitable objects will be provided with them by the reader of the paper, or from my own, or some other member's cabinet. Besides these ordinary meetings, the committee hope to be able to offer to those who desire to become acquainted with intricate methods of illumination, &c., requiring nicety of manipulation, opportunities of forming a class for that purpose under a gentleman well qualified to teach them; and I, myself, shall be happy to give to those who need it, similar instruction in the various methods of mounting and preparing microscopic objects. The interchange of ideas and experience amongst ourselves is one of the advantages we anticipate; but I am inclined to encourage a very liberal extension of this principle; and, therefore, I intend, with the sanction of the committee, to propose to the authorities of congenial provincial societies a reciprocity of visiting and other privileges between their members and our own. To those who have not yet purchased instrumen ts let me say that a costly microscope is not absolutely necessary. The great Ehrenberg, Leeuwenhoek, and others made their observations and discoveries with object glasses far inferior to those sold by our opticians with their cheap "Students' Microscopes;" and, therefore, as a soldier's prowess in warfare depends not so much on the size of his weapon as on his stoutness of heart, coolness of head, and strength of arm, your progress in science will depend less on the perfection of your instruments than on your patience in research and your power of observation. It will greatly add to your own pleasure and knowledge, as well as to the public benefit, if, without discarding objects of general interest, you devote your attention to some particular subject, and I hope that we may, in this way, contribute to a systematic knowledge of the Natural History of the district. I shall be able to say more to you on this topic when I have become better acquainted with your individual tastes and predilections :—

> To him who, in the love of Nature, holds
> Communion with her visible forms, she speaks
> A various language;

—and each of you will quickly be led, almost unconsciously, in a different direction; but I can promise you from experience that as, armed with your microscopes, you pass into the hitherto Unseen Kingdom of the infinitely little, no matter by what road you enter it, you will find yourselves in a land of surpassing beauty; and, as you become acquainted with its nations and tribes, and see in their construction and in that of their habitations all the contrivances of the human engineer anticipated and excelled, you will be constrained to admit that One Great Architect of the Universe planned and designed and made them all; and as the astronomer bows his head in reverence before the sublime majesty of Him who created and maintained worlds beyond worlds, and systems beyond systems, dimly seen in the far distances of space, you, as microscopists, will recognise Him as being "Maximus in minimis"; greatest in His smallest works.

Mr. Lee having introduced the visitors,—

Dr. Bowerbank, F.R.S., assured the meeting that he considered it to be a very high honour to be permitted to be present on such an occasion as this. He had never attended an inauguration of a new Natural History or a new Microscopical Society, where there was such a goodly show of members as he now saw before him. And when he looked back as far as the year 1828 and recollected that at that period there were only four achromatic microscopes in existence, and but one of those was accessible to scientific men, and that one was in his possession; when he contrasted the very limited means then at their disposal with those now at their command, as exemplified by the splendid array of beautiful instruments which he saw on the table before him; when he recollected the paucity of information which was then among them, and the wonderful improvements which had since been effected, enabling the science of miscroscopy to be pursued with pleasure and delight, he was proud to be in conjunction with his friends to the right and to the left of him, to whose scientific researches we were indebted for the growth of knowledge, the spread of intelligence, and the supply of interesting subjects for microscopical research. Their worthy President had, that evening, ventured to caution the members of the Club against growing apathetic in their pursuit of science. He trusted that this was not likely to occur. He had been engaged for 40 years and more in microscopical observations, and he must say that he loved his microscope as dearly now as he ever loved it; he was now as much delighted with the new things he saw as he was in the days of his youth; and in pursuit of his microscopical investigations, the ordinary cares and anxieties of the world were forgotten. He entered into his studies with a delight which he could hardly explain to his hearers, but which he hoped they would all experience in their turns. The learned doctor then narrated an interesting anecdote of one of his microscopical researches, in which he discovered, by the aid of Tully's beautiful microscope the valves in the dorsal vessels of the *Ephemera*, which were distinctly visible, and he saw them performing their functions of pumping the blood and sending it through the arteries. This discovery was such a delight to him that he called in his scientific friends, who having seen it, induced him to publish the result of his examination. He did so, but the eminent naturalist, M. Geoffroi de St. Hilaire, of Paris, ventured to question the authenticity of the account; he said it was possible to see the blood, but the valves were beyond even the power of the microscope to discover. A medical student in Paris, who knew the speaker well, vouched that he would not publish and send forth to the world anything unless he had good and undoubted authority for his statements. The great French naturalist was invited to an inspection. He (the speaker) had fortunately secured a beautiful specimen to show him. Mons. de St. Hilaire sat down to look through the instrument. He had hardly gazed at the object an instant when he uttered an exclamation of astonishment; but he never moved his eye from the microscope, until at length the insect made a plunge and escaped; and then he threw up his arms and exclaimed "Magnifique!" and he (the speaker) was delighted that he had succeeded in removing the doubts which had arisen in that great man's mind. Now this insect was a familiar object to them all. They would find it in every dirty little pond in the commons around their neighbourhood, and an examination of its wonderful structure would amply repay them for the trouble of procuring it. Such studies as those would be a source of delight to them which all the cares of the world could not deprive them of. If they followed out the rules which Mr. Lee had placed before them, he ventured to say that in times to come they would look back with pleasure and delight to the efforts he had made to form them into a Microscopical Society. He cordially agreed with the observations of his friend the President, with regard to the organization of this Society. He had heard it casually remarked that they proposed at first to make their annual subscription 5s., but he would advise them not to begin with a strain of economy. Let them have such a beginning as would offer a fair opportunity of organising themselves with a resonable income, and not with a sum which was likely to restrict their operations, or tend in any way to cramp their efforts. He had to express the deep pleasure he felt in being amongst them on this occasion, and he hoped he should be spared to come and see them again when they were in full working condition. He trusted that they would pursue the goodly rule which had been successful in other societies, namely, let every member take up some subject for himself, and carry it out earnestly and rigidly. Such was the wonderful variety in minute natural history, that new objects were continually presenting themselves; and although a host of men had examined one particular object, a new observer might probably discover something which had escaped their attention; and he strongly advised that the new discovery should be recorded, maturely considered by frequent observation, and when that was done, that it should be published to the world. If this course were pursued, the Croydon Society would rise to a high degree of reputation. He concluded by wishing it a thorough success in its undertaking.

The Rev. J. B. Reade, F.R.S., President of the Royal Microscopical Society, having been called on by the Chairman, said he sincerely congratulated the meeting on the establishment of the Croydon Microscopical Club, and was especially glad to find that the Society possessed such an excellent President as his well-known friend, Mr. Lee, and that he presided over such an intelligent body of men. It would have been impossible to inaugurate the Society 30 years ago, under similar circumstances, because men's minds were not at that period trained to see the importance of the work. What a difference had been made in microscopical research during the last 30 years! Although many of them might never have belonged to a Microscopical Society, it was almost impossible for them not to be aware, through the medium of the press, of what had been done and was still being done in the subject of microscopical research. He thoroughly endorsed the remarks made by Mr. Lee at a recent meeting of the Croydon Farmers' Club, where his health was proposed as the future President of this Club. Mr. Lee then said that the microscope was "the ploughshare of science, and by its means the superficial crust of ignorance had, in many places, been broken up, burying, at the same time, the surface-grown weeds of error." He could bear practical testimony to the literal truth of those observations from his own experience, for he had farmed his own glebe. Having found that the man in whose possession it was, grew more weeds than seeds, he thought it would be better if he took the cultivation of his land into his own hands. His microscopical, as well as chemical examination of the nature of the soil produced results which, in effect, doubled the value of the living, and enabled him to sell for a good sum 20 acres for the erection of an asylum, of which his friend, Dr. Millar, was the first physician. He, therefore, thought that the intelligent farmers in this neighbourhood might derive assistance from consulting the members of the Croydon Microscopical Society, in order that they might carry on, with greater financial benefits, their farming operations. The speaker then mentioned what he described to be a very curious fact as illustrating the value of microscopical research. By collecting on an ordinary glass slide some of the ammonia arising in the form of vapour from a manure heap, he found that this valuable nutritive agent escaped in such large quantities that the portion which remained in the manure was really less than that which had evaporated. He mentioned the circumstance to Liebig, and told him that the quantity of wheat which was grown was in proportion to the quantity of ammonia in the manure. He told Liebig he would give him all the corn he grew, if Liebig would teach him to grow all the corn he lost. To guard against the escape of ammonia, he poured upon the dung-heap a large quantity of diluted sulphuric acid. He thought this was a hint which their agricultural friends would take the opportunity of profiting by. The rev. gentleman then read an extract from a letter from Mr. G. Hankey, Secretary of the Microscopical Society of Illinois, acknowledging the kindly feeling which existed in England towards kindred societies established in distant parts of the earth, and he expressed a hope that by associating themselves with the different societies in this neighbourhood and elsewhere the members of the Croydon Club would form a bond of union and good fellowship which it would not be easy to sever, and that great good would result from the formation of this Club, at the inaugural meeting of which it was his privilege to be present.

Mr. James Glaisher, F.R.S., was next called upon by the President, and offered some words of advice which he said were founded upon his experience as the President of the Blackheath Microscopical Society, and some others. He would say to every one of the members present—Never withhold any of your experiments because you think others have seen them. He would urge particularly upon the meeting, if they should find anything they were not acquainted with, not to withhold it, but bring it to their Club, and submit it to their President and fellow-members, and thus give to him and them a part of the enjoyment which would arise in pursuing a microscopical investigation. A great mistake had arisen in some societies by members withholding the results of their experiments because they imagined they were not new or original. So boundless was the field for microscopical objects, and so infinite were they in their variety, that there was ample work for them to do, and every work done served as an additional link to the chain of knowledge which they all hoped to see perfected. He trusted that a great success would attend this Society. All it wanted was earnestness among its members, and under the guidance of their respected President, he was certain that that earnestness would come. Societies of this kind tended to increase the love of man for his fellow-men, and that this might be the case with the Croydon Microscopical Society was his earnest hope. Mr. Glaisher concluded by thanking the President for his kindness in inviting him to be present at the Inaugural Meeting of this Club.

Mr. Frank Buckland was the next speaker. He said that one of the first lessons he read at school was "Eyes and no eyes; or the art of seeing." That lesson had always been strongly impressed on his mind, and he would urge upon the members of this Society to neglect no opportunity of observation, for it was certain they could not use their eyes too much. Sir Thomas Mitchell, when visiting the gold fields of Australia, appeared not to have employed the precious gift of close observation to so great an extent as he might have done; for it was recorded of him that he slept, night after night, upon a bed of gold, and yet he never saw the gold. Another instance had been published to the world, of a shepherd who sat down to watch his sheep on an old stone, which was nothing less than a nugget of gold, worth £20,000, but he did not see it. Therefore it was evident that there was some advantage in using their eyes. In conclusion he wished the Croydon Microscopical Club every success, and he firmly believed that non-success was an impossibility under the guiding hand and fostering care of its excellent president.

The Rev. Thos. Wiltshire addressed the meeting, and recommended that the Club should divide itself into sections, and form a botanical section, an entomological section, a mineralogy section, &c. If the latter supplied themselves with small hammers and went about splitting flints, they would find, after dipping the small particles of flint in water and submitting them to the microscope, something which would amply repay them for their trouble. Or let some of them take a blade of grass, and see what they would find; or catch some small insects and subject them to the microscope; in any or all of these pursuits he ventured to say they would gain much useful knowledge; and whatever they took in hand, let them do as their Canada balsam would to their fingers, "stick to it."

Mr. Hudson, Dr. J. Millar, Captain Tyler, Mr. Marshall Hall, Mr. R. W. Fuller, and Professor Rolleston, successively addressed the meeting, the last-named gentleman demolishing a theory, which was at one time propounded, that microscopy was of no use to a surgeon. He was informed that several surgeons were members of this Society, and he pointed out, in an unanswerable manner, how the microscope may be employed as a useful aid in the diagnosis of certain diseases.

Mr. Lee then made the following concluding remarks:— Never has a provincial Society received at its outset such encouragement as ours has. It lays upon each of us increased obligations to make it a success; for the celebrated men to whom we have listened to-night will, I know, watch our progress with interest. Let us take care that we do not disappoint them. I am sure you will wish me to convey to them your most cordial thanks for having thus taken us by the hand; on my own part I take this opportunity of expressing to them my warmest gratitude for this and their constant kindness to myself.

Mr. Whitling, F.R.C.S., moved, and Mr. Hayward seconded a vote of thanks to Mr. Lee for having accepted the

Presidency of the Club, and for having provided for it so gratifying an inauguration. The resolution having been carried by acclamation, the meeting terminated.

April 12th, 1870.—The following opticians exhibited microscopes and apparatus:—Messrs. Ross, Beck, Ladd, Baker, Crouch, Collins, Moginie, Stanley, and Bailey.

The President directed the attention of the members to the specialities of the different exhibitors, and a vote of thanks was passed to them for their kindness in responding to the invitation that had been sent to them to give the members of the Club an opportunity of examining and comparing their various instruments.

May 4th, 1870.—"On Flint and its Organisms," by Mr. J. W. Flower, F.G.S.—The author defined flint as a mineral or pure earth, one of the simple ingredients which go to make up the fabric of the earth, as well as of many of the plants and animals which dwell upon it; and flint nodules as "concretions of siliceous particles now compact and crystalline, but once in a viscid, pulpy and, as he believed, fluid state." He could not accept as entirely correct the suggestion of Dr. Bowerbank that all flint was originally sponge, although sponges have a wonderful affinity for flint, and flint for sponges. After a masterly description of the geology of the neighbourhood of Croydon, and the various conditions and forms in which flint is found there; namely, first, in its normal condition as originally deposited in the body of the chalk; 2nd, as the round flint pebbles of the Addington Hills and Croham Hurst; 3rd, as the green-coated sub-angular flints, very little rolled; 4th, in the form of large blocks or nodules of coarse flint, a good deal weathered and worn but not much rolled; and 5th, as the flint gravel on which the town of Croydon is chiefly built, Mr. Flower explained the agencies by which the flints in these distinctly different conditions had been brought into the positions in which they now lie, and the order of succession in which they had been deposited. Referring to the organisms found imbedded and preserved in flint, he remarked that as flint is a concretion formed in the chalk itself, it can only contain organisms common to the chalk, although many which have perished in the chalk have been preserved in the flint. Each of the before-mentioned deposits must have had a date and history of its own, and would have, like the region or zone of chalk in which it was imbedded, its own peculiar fauna; and the impression derived by him from his own investigations was that there was a decided difference between them. The organic remains included in these nodules and pebbles become therefore, a valuable and interesting subject for microscopical research, since, when carefully examined, they cannot fail to afford additional evidence of the great palæontological changes that occurred during the deposit of the chalk, a deposit extending over such vast periods that it transcends all power of human calculation to form a conjecture, much less an approximate estimate of its duration.

The Lecturer exhibited a variety of specimens, some of the most interesting of which were examples of flint enveloping flint, flint fractured and mended again, and echinoderms partly or wholly filled with flint, and the excess running over.

An interesting discussion followed, in which Mr. Whittaker (of the geological survey of England), Captain Tyler, and the President took part.

The President exhibited some fossil oysters, recently dug up in Waddon New-road, from a depth of about 16 feet, apparently from a bed of sand similar to that, containing fossil oysters, which exists at Reading and other places.

The following donations were announced:—"Smith's Diatomaceœ," 2 vols., and Mr. Richard Beck's work on "The Achromatic Microscope," by Messrs. R. and J. Beck; "The Transactions of the Quekett Microscopical Club," by its Secretary; Mr. Richter's "Photograph of Pond-life," by Mr. Curties; and by the Rev. J. B. Reade, F.R.S., President of the Royal Microscopical Society, his Address to that Society, Feb. 9th, 1870, in which he related the origin of the Microscopical Society of London. The following gentlemen were elected Members of the Club:—Dr. C. W. Philpot; Messrs. C. B. Pollard; C. Newton; T. R. Edridge, J.P.; G. F. Linney; W. H. Snelling; T. Bindley; J. Holmes; H. W. Whiffen; G. Whiffen; W. B. Tarrant; S. Baker; W. H. Olley; B. H. Ridge; W. Drummond; and the Revds. D. Long and G. R. Roberts.

May 14th, 1870.—Many of the members (amongst whom were the President and Treasurer) met at Carshalton station and fraternized with an excursion party of the Quekett Microscopical Club, who came from London to explore the Wandle and its tributaries, in search of fresh water organisms. The portion of the stream which flows through Mr. Cressingham's garden was first visited, and although he was not at home admission was courteously given. The party next examined the lake in

16

the grounds of the Rev. Dr. Barrett, who gave them a most cordial welcome and hospitable reception, insisting on their entering his house and partaking of refreshment. Dippings were next taken from the water in Beddington Park, and then the wayfarers adjourned to the "Plough," at Beddington, in the hope of obtaining tea, &c. The host, Mr. Watkinson, was, however, unprepared to entertain so large a party, so they were obliged to walk on to the "Greyhound," Croydon, where Mr. and Mrs. Budden provided a plentiful meal of bacon and eggs, cold beef, tea, &c., and the Londoners afterwards returned to town by the 8.17 train. The general opinion was that the water of the Wandle is very unproductive of microscopic treasures, probably owing to the rapidity of its current.

May 28*th*, 1870.—The members of the Club were invited by J. W. Flower, Esq., F.G.S., to visit his grounds at Park Hill. He had provided two cart loads of the rounded flints of the neighbourhood, as material to be cracked and searched for the microscopic organisms known to be abundantly contained in them. Many interesting specimens of fossil foraminifera, corals, sponge structure, &c., were found. The amateur stone-breakers were not allowed by their hospitable entertainer to languish for want of refreshment, for the popping of champagne corks was frequently heard above the sound of the geological hammers. Professor Rupert Jones, F.G.S.; Mr. W. Whittaker, F.G.S.; and Dr. Barrett, of Carshalton, were amongst the visitors.

June 11*th*, 1870.—An Excursion to Mitcham Common. A fair variety of "pond life" was obtained.

July 30*th*, 1870.—By the kind invitation of Henry W. Peek, Esq., M.P., a number of the members of the Club visited his beautiful grounds at Wimbledon. Mr. Peek accompanied them round the domain and through the admirably-arranged greenhouses and hot-houses, filled with rare and choice plants. After taking dippings, &c., from the lakes and ponds in the grounds, in some of which *Plumatella repens* was found in abundance, and examining an excellent entomological collection belonging to Mr. Skinner, an *employé* on the estate, the visitors sat down to a handsome banquet, laid out for them in the orangery. Mr. Peek further encouraged the Club by consenting to be proposed as a member of it. The excursionists returned to Croydon by the 8.5 train, much gratified by their visit and the generous manner in which they had been entertained.

September 21*st*, 1870.—A MEETING FOR CONVERSATION AND THE DISPLAY OF OBJECTS.—There was a good attendance of members, with their microscopes, and many interesting Natural History specimens were exhibited.

The PRESIDENT distributed to the members present some mud, containing Foraminifera, dredged from Vigo Bay, and some leaves of Onosma, shewing stellate scales; and referred to the loss the Club had sustained by the death of so promising a member as Mr. Alfred Haward.

October 5*th*, 1870.—The PRESIDENT received at his residence, in the afternoon, and again in the evening, several members of the Club who desired instruction in preparing microscopic objects. Various materials were mounted in their presence in balsam, fluid, and dry cells, and the different processes were clearly explained, and their simplicity demonstrated.

October 19*th*, 1870.—" ON SILICEOUS ANCHORING SPONGES," by Mr. HENRY LEE, F.L.S., President.—Mr. LEE exhibited some fine specimens of *Hyalonema*, *Euplectella*, and *Pheronema*, from his own cabinet, and from those of Dr. Bowerbank and Mr. W. S. Kent, of the British Museum, with microscopic demonstrations of their structural anatomy; and gave a succinct summary of the widely-differing opinions which had been held concerning each of them, and of the many points relating to them, which, independently of their extreme beauty, rendered them of the greatest interest. Commencing with *Hyalonema*—the "glass-rope sponge"—Mr. Lee said that within the last six years, so little was known of it, that many persons believed it to be an artificial production of the Japanese, akin to their spurious specimens of fabricated mermaids. The microscope having proved it to be a natural organism, it quickly became a "bone of contention" amongst celebrated naturalists. A perfect specimen presented the appearance of a mass of dried sponge, from which sprang from 20 to 50, or even more, flinty spicules of the length of 12 inches, more or less. These long spicules were twined spirally on each other like the strands of a loosely-twisted rope, and around them, for about half their length, was generally wrapped a membranous-looking envelope, studded with polyp-like excrescences. Professor Max Schultz described the sponge as the base or root from which sprang *upward* the long glassy spicules essentially belonging to it; and the membranous crust, with its excrescences, as a zoanthoid polyp which was in the habit of attaching itself parasitically to it. Dr. Bowerbank agreed with Max Schultz in supposing the long "glass-rope" to be an intimate portion of the *basal* sponge, but believed that the so-called "polyp-heads," instead of being attached parasitically, were, in reality, the oscules of the sponge itself. The opinion of Dr. J. E. Gray had been that the "glass-rope" was a coral formed by the enveloping polyps, and that the sponge had nothing to do with its construction, but merely grew parasitically upon the supposed coral. From time to time the question had cropped up, and had given rise to animated discussion, not to say hot controversy, which of these three theories was the correct one, until Professor Loven turned the whole thing and former ideas of it also, "topsy-turvy," and asserted that the position, during life, of that which had always been looked upon as the *basal* sponge was at the top of the "glass-rope," which, instead of growing upwards, really struck downwards into the mud at the sea bottom, like the roots of a plant. Dr. W. B. Carpenter had said that the discoveries made in the expedition referred to had satisfied Professor Wyville Thompson and himself that the sponge and the long spicules were, as Max Schultz averred, portions of the same organism, and that the "coral-forming polyps" of Dr. Gray—the "oscules" of Dr. Bowerbank—were zoanthoid polyps, which generally attached themselves to the "glass-rope" of *Hyalonema*, but which were by no means confined to it alone, as Professor Thompson said he had himself found them on other substances, and had also found *Hyalonema* entirely free from the polypoid investment. Mr. Lee then described the beautiful *Euplectella* (Alcyoncellum of Quoy and Gaimard), sometimes called "Venus's Flower Basket," the first specimen of which brought to this country was sold to the British Museum for £30; for examples of which he and Dr. W. B. Carpenter gave, three years ago, £5 each, and which were now so plentiful that they could be obtained for five shillings or less. Mr. Lee also exhibited and described the new sponge, *Pheronema Grayii*, the discovery of which, he said, was closely connected with the Croydon Microscopical Club. One of the gentlemen who were Mr. Lee's guests at the opening of the Club in April last, was Mr. Marshall Hall, owner of the schooner yacht "Norna," who earnestly invited Mr. Lee to accompany him on a dredging expedition to the coast of Portugal. Unable to accept the invitation himself, Mr. Lee induced him to enlist for this delightful work Mr. Kent, of the British Museum, a rising and promising young naturalist; and amongst the new and rare organisms which were the result of the expedition, were ten specimens of a sponge possessing a remarkable similarity to the *Holtenia* found by Dr. W. B. Carpenter in the North Sea, and which Mr. Kent named, in compliment to his chief—Dr. J. E. Gray—*Pheronema Grayii.* Mr. Lee said that having carefully examined the structure and spicules of this beautiful and supposed new sponge, and compared them under the microscope with similar preparations of *Holtenia Carpenteri*, he had arrived at the conclusion that the new species could not be maintained. It was certainly a strongly marked variety; and, therefore, he would refrain from positively stating in public his firm opinion that the two were identical until it had been confirmed by Dr. Bowerbank and Mr. Kent himself, to whom he had just communicated it. The character of the sea-bottom on which the sponges were found, and the organisms associated with them, opened before us a vast subject for investigation. The peculiar interest of these dredgings was that animals were found which carried us back to remote geological periods; and that conditions of temperature were observed which led one to see the possibility of the contemporaneous existence of species which had hitherto been supposed to have succeeded each other after the lapse of long periods of time, and in consequence of great changes in the physical geography of the localities in which they were found. The white mud which was brought up from the greatest depths reached, contained globigerina, foraminifera, siliceous sponges, and other organisms which were known to have abounded in the chalk period; consisted, in fact, of all the constituents of chalk, both in its materials and in its continuance of the great types of the cretaceous fauna. From this was argued that, over certain areas which, from their great depth, had never been elevated above the sea level, and on which the temperature had remained unaltered, the deposit of chalk had never ceased, and that we might now be living in the true cretaceous epoch—a startling announcement, deserving most serious consideration and vigorous discussion by geologists.

Amongst the objects of interest distributed to the members for mounting were—leaves of *Hippophae Rhamnoides*, by the President; *Foraminifera* from sponge sand, by the Secretary; and Microscopic Fungi, by Mr. Bennett.

Messrs. Henry W. Peek, M.P., H. P. Stephenson, and A. B. Drummond were elected members of the Club.

November 16*th*, 1870.—"ON MOSSES," by Mr. GEORGE PERRY.—After directing attention to the Mosses as a highly-interesting subject for the study of the microscopist—from the beauty of their structure, the brilliancy of colour in some of them, and their concealed mode of growth and development—Mr. Perry proceeded to explain their physiology. Having no flowers, he said, nor apparent sexual organs, they have been placed amongst the Cryptogamia from their hidden manner of reproduction; but the microscope has enabled botanists to trace certain organs which apparently act in a somewhat similar manner to the stamens, or anthers and pistils of Phœnogamous, or flowering plants. The reader then described the mode of growth of the spore-cell, its cap and operculum, and the peristome, or fringe of teeth, with which the latter is surrounded, and which is a beautiful object for the microscope. This series of teeth is very sensitively hygrometric; and, after the falling off of the operculum, opens in dry weather, apparently to allow the rays of the sun to ripen the spores contained in the capsule, whilst a passing cloud, or a moist atmosphere causes it immediately to close and shield its precious contents. It is probable, also, that this hygrometric quality assists in the dispersion of the spores. Mr. Perry described the nature of these spores, which form the great difference between mosses and flowering plants; that one spore of a moss plant may be the parent of many plants, whilst in the flowering plant one seed can only produce one plant. Alluding to their wide dispersion over the earth, there being hardly any part of the known world where mosses are not found, Mr. Perry showed how they have their value in preparing for higher orders of vegetation, and how, as in the case of Sphagnum or Bog Moss, and others which exist only in water, they act as fillers-up of pools of water, and by the decay of their lower portions, form beds of peat, which in the future may become valuable for fuel. The number of species at present known is about eight hundred, of which nearly four hundred have been found in the British Isles.

"On a New Locality for *Trocheta Subviridis*, a Rare Land Leech," by Mr. Henry Lee, F.L.S., President.—Mr. Lee said—"In February, 1869, I published in '*Land and Water*' my identification as *Trocheta subviridis* of certain land-leeches sent to the office of that paper by an observant resident in the neighbourhood of Horsham, Sussex, and in the May number of the '*Annals and Magazine of Natural History*,' Mr. Gedge, of Cambridge, mentioned having found a memorandum in his note-book of his having received some from the same place, about the same date. As *T. subviridis* had been considered a doubtful British species, the communication was considered interesting, and some correspondence followed. I have now the pleasure of announcing that I have found *Trocheta subviridis* abundant in another locality, namely, on the Beddington sewage-irrigation farm of the town of Croydon; and I am informed that this leech is also to be found on the other irrigation land belonging to this town at Norwood. The experiences of naturalists have differed respecting the capability of *Trocheta* of living for any length of time completely immersed in water. It may, therefore, be interesting if I record that I found it in about six inches of water, at the bottom of the great ditch which conveys the Croydon sewage on to the estate before it flows over the land, and that during the three weeks that have since elapsed, it has lived and thriven in a bowl of water with two minnows."*

Guano, containing diatoms, was distributed to the members by Mr. George Cooper, M.R.C.S.

Messrs. W. E. Rogers; B. R. Taylor; E. Ewart; C. E. Leeds; and E. C. Oswald were elected members of the Club.

November 23*rd*, 1870.—The Soiree at the Public Hall.—This brilliantly successful entertainment was not only attended by the principal families of Croydon and the neighbourhood, but also by several persons of distinction, among whom may be mentioned the Japanese Ambassador and his secretary, who appeared to take a deep interest in the large variety of objects brought under their notice. Three tables extended along the entire length of the room, leaving of course, sufficient space for the visitors to promenade, and examine the numerous object of interests which were presented for their inspection. Each table was covered with green baize, on which the instruments were displayed. That in the centre was reserved for members of the Royal and Linnæan Society, the Royal Microscopical Society, the Quekett Microscopical Club, and the Old Change Microscopical Society. The tables to the right and left of the centre were reserved for makers of optical instruments, of whom a large number greatly contributed to the success of the *soirée* by their exhibition of about 75 microscopes. The tables around the sides and end of the hall were occupied by the members of the Croydon Microscopical Club.

* At the date of issue of this report (three months after the above account was given) the leech is still alive and in good condition, having been kept in water all the time in Mr. Woodward's room at the British Museum.—H. Lee.

The following are the names of some of the gentlemen who kindly contributed to the enjoyment of the company:—

Mr. H. J. Slack, the Rev. T. Wiltshire, Capt. Tyler, Drs. Mundie, Matthews, Giffard, and Murie; Messrs. Loy, P. J. Butler, W. L. Freestone, Quick, W. T. Rabbits, Charters White, W. S. Kent, C. Stewart, Stephenson, Suffolk, Francis, Piper, Thomas, and Brown.

The manufacturers who exhibited were, Mr. T. Ross, 53, Wigmore-street, Cavendish-square; Messrs. Murray & Heath, 69, Jermyn-street, S.W.; Mr. C. Baker, High Holborn; Mr. Moginie, 35, Queen's-square, London; Messrs. R. & J. Beck, 31, Cornhill; Mr. Charles Collins, Great Portland-street; Mr. James Swift, 43, University-street, Tottenham Court-road; Mr. J. W. Bailey, 162, Fenchurch-street; Mr. W. F. Stanley, London Bridge, and Mr. Edmund Wheeler, of 48, Tollington-road, Holloway.

The members of the Croydon Microscopical Club who exhibited, were Mr. H. Lee, Mr. J. W. Flower, Drs. Carpenter, Strong, Adams, Owen, and Philpot; Messrs. John Berney, A. B. Drummond, H. Lee, jun., H. Long, E. F. Jones, A. Bennett, G. Perry, F. W. Gill, T. Bindley, A. Crowley, G. Manners, George Purser, K. McKean, Fred. West, jun., G. N. Price, J. S. Johnson, E. B. Sturge, H. Ashby, A. Stevenson, Thomas Cushing, Henry Evans, C. W. Hovenden, Cooper, Ridley, Skinner, N. L. Austen, and T. Tritton.

Mr. Ridley and Mr. Cooper (coachman and gardener to Mr. Ridsdale, of "The Elms," Coombe-lane, Croydon), exhibited six cases of English butterflies, and insects of the beetle tribe, most artistically arranged; and Mr. Skinner (carpenter on the estate of W. H. Peek, Esq., M.P.), several cases, the designs forming the Prince of Wales' feathers, with the motto "Ich dien," and two crowns traced in small beetles. These cases were deservedly admired by the company.

A large number of curious and valuable articles were exhibited, amongst which may be noticed contributions by the President, by Mr. J. W. Flower, Dr. Carpenter, Mr. N. L. Austen, and Mr. W. J. Wilson.

In addition to six microscopes, Mr. Lee exhibited specimens of *Euplectella* (Siliceous sponge) and the Portuguese Bird's Nest Sponge (*Pheronema Grayii*); a case of Chinese insects; a chess-board, each square representing a different snow crystal as seen through the microscope, made by the daughter of Waterhouse Hawkins, Esq.; fossil and recent

Nautilus; a pearl oyster from whence a pearl, in size about the circumference of a shilling had been cut, which was sold for £1,000; a medallion of Professor Ehrenberg, presented by him to Mr. Lee; two magnificent pictures, representing the "Fresh Water Fishes of Great Britain," and the "Game Birds of Great Britain," exquisitely painted by Mr. H. L. Rolfe, who also exhibited two baskets of Scotch trout and a sea trout, the casts of which were prepared by Mr. Frank Buckland, the natural appearance of the fish being due to Mr. Rolfe's clever pencil. Mr. Lee also exhibited Abyssinian trophies, curious malformations of lobsters' claws, a cube of glass, an inch and a-half thick, pierced in a zig-zag direction by the electric spark; some curious South Sea fishing tackle; egg of Python, laid at the Zoological Society's Gardens; a fine cast of a baby porpoise; the head of a hake; a beautiful model, in copper, of a 28 gun frigate; a handsome and valuable vase, by Wedgewood, with sculptured floral decorations—a magnificent work of art; and a carved nautilus shell, with the Royal Arms and the Great Britain steam ship engraved thereon, and inscriptions commemorative of that vessel's first voyage across the Atlantic.

Mr. J. W. Flower exhibited a number of flint implements, some of which were of polished stone, from Norway, France, and England; and many fossil teeth of Mastodon, rhinoceros, &c., and tusks of elephant.

Dr. Carpenter exhibited fossils from the chalk hills, near Croydon; fossils in flint from this neighbourhood; a fossil lobster from Waddon cottage estate; oysters, from Brimstone Barn; shells from the chalk and fossil bones of animals from the phosphate beds, Potton, Bedfordshire.

Mr. N. L. Austen shewed three remarkably fine heads, with gigantic spreading antlers, of deer, shot by himself in Norway in September and October last; a horn of rhinoceros, mounted in silver; a knobkerri, a weapon used by the Zulu Kaffirs; and other curious articles. Mr. W. J. Wilson's contribution consisted of a copy, in bronze, of the equestrian statue, erected to the memory of Marcus Aurelius.

A tasteful display of statuary was kindly lent by Messrs. Candy and Gibbs; a variety of plants by Dr. Strong and Mr. F. West; and some choice ferns by Mr. J. H. Ley. Mr. Townly supplied a grand piano, by *Erard*, and during the evening a selection of music was played by

* The Committee fear that the list in their possesion is incomplete; and therefore hope that exhibitors whose names may not appear, will kindly excuse unintentional omission.

Mrs. Mendham and Mr. Hemming (organist of St. Matthew's church) who kindly gave their services on the occasion. The refreshments offered by the Club to their guests were satisfactorily supplied by Mr. Biddell, of High-street.

December 21*st*, 1870.—"ON SOME VEGETABLE STRUCTURES RECENTLY DISCOVERED IN THE LOWER COAL BEDS AT HALIFAX, BY MR. W. CARRUTHERS, F.L.S., OF THE BRITISH MUSEUM. —Mr. CARRUTHERS, referring to a visit to Halifax, in company with Mr. Lee and two other scientific friends, and to a large series of coal fossils found there, described the difference between the calcareous concretions in the shale beds, locally known as "bawmpots," and the similar concretions in the coal itself, known as "coal-balls." These balls were portions of the original vegetables which had been seized by the infiltrated carbonate of lime before decomposition. They exhibited, therefore, the very materials of which the amorphous coal in which they occur was formed, so preserved as to enable one to determine their structure and affinities. He shortly described the great divisions of the vegetable kingdoms; and dwelt at length on the vascular cryptograms, to which section the plants of our coal-measures chiefly belong. The first group of these plants referred to were the ferns, represented in the flora of Britain by herbaceous forms, but which in warmer regions assumed the habit and size of trees. Ferns were remarkably abundant in the roof-shales of the coal seams, but hitherto very imperfect data for their systematic affinities had been obtained. The discoveries he was describing were therefore highly valuable and important. Mr. Carruthers next described the sporangia and spores found in the "coal-balls," and shewed, by a comparison with recent ferns, that their affinities were with the filmy ferns. Only two species of true arborescent ferns had been detected in carboniferous strata; the species seemed to have been herbaceous, and either terrestrial or epiphytic. The recent horsetails were represented by an interesting group of arborescent plants—the *Calamites;* but whilst the modern Equisetœ were humble plants with hollow-jointed stems, and whorls of teeth for leaves, these had woody stems of considerable height and true leaves, but the fruits remarkably agreed in size and appearance with the ancient and modern ferns, even to the possession by the spores of hygrometric elaters. The difference, in fact, could not be considered as of more than generic importance. The "club-mosses" of Britain were a group of low, generally creeping plants, belonging to two genera, the one characterised by having only one minute kind of spores called "microspores," and the other having these and very much larger ones, called "macro-spores." The carboniferous lycopods were huge trees, sometimes 80 feet high, and having stems six to eight feet in circumference. They belonged to several genera, which were separated from each other by the character and arrangement of the leaf-scars, but the recent discoveries had shown that their fruits exhibited the difference which was seen in the living plants. The cones were larger in the fossil, but the size of the two kinds of spores agreed exactly in the recent and modern forms.

The President announced, with painful regret, the death of the Rev. J. B. Reade, F.R.S., President of the Royal Microscopical Society. He related how the members of the Club had seen at their opening meeting the noble and venerable face of his dear old friend, beaming with benevolent satisfaction at the commencement of such a movement in Croydon, and how the deceased chief of English Microscopists had constantly interested himself in the success of the Club, and even so recently as the date of the Soirée, on the 23rd ult., had warmly expressed his pleasure at its success.

It was unanimously resolved that the President be requested to communicate to Mrs. Reade the sincere regret with which the members of the Club had heard of the loss of so kind and disinterested a friend.

Mr. Lee also mentioned the decease, since the last meeting, of two other well-known Microscopists, Mr. Thomas Ross, the eminent optician, and Mr. Farrants, one of the early members of the Microscopical Society of London.

Notice was given from the chair that at the next meeting, on the 18th of January, the election of officers would take place, and that an amendment in the rules would be proposed to the effect that two additional members be placed on the committee. The ballot then took place for Messrs. John Drummond, A. Ridsdale and C. Rutley, who were duly elected members of the Club.

January 18*th*, 1871.—The Annual General Meeting.—The President having communicated to the members present, a portion of an interesting letter from Mrs. Reade, in acknowledgment of the vote of sympathy and condolence with her on the death of her amiable husband, the late venerable President of the Royal Microscopical Society; the Secretary read the report of the Committee and that of the Treasurer.

Mr. PURVIS moved, Mr. F. WARREN seconded, and it was resolved—

That the report of the Committee be received, approved, and entered on the minutes; and that it be printed and distributed to the members.

—Both the mover and seconder expressed their great satisfaction with the admirable manner in which the Club was conducted, and the small expenditure by which such important results had been achieved. Mr. Warren added that the liberality of the President and Committee in giving their valuable assistance and support to kindred institutions in the town, deserved the warmest approbation of every one, and that to his personal knowledge the public exhibition by the members, of their instruments and objects, had excited in many "outsiders" a taste for the microscope, amongst whom was his own son, for whom he had bought a microscope, and whom he hoped soon to see a member of the Club.

Mr. LEE having called on the meeting to confirm an alteration in the rules of which notice had previously been given, namely, that the number of the Committee should be increased from five to seven, the alteration was unanimously sanctioned.

Mr. LEE then rose and addressed the meeting as follows:—Gentlemen,—In the few remarks which you will expect me to address to you at this the first of our Annual Meetings, I shall limit myself to a review of the past, and my views respecting the future of our Croydon Microscopical Club. In my inaugural address I recounted its early history, and laid before you an outline plan of the course I thought it advisable that we should follow. Let us see to what extent we have carried out our intentions, and how far we have progressed towards the attainment of the object we then set before us. I regard our Club as a select body of friends and neighbours brought together, firstly, by the sympathy engendered by community of inclination for an intellectual pursuit, and a desire to associate with men of similar tastes; secondly, by the yearning for a more intimate knowledge of the works and workings of Nature, which inevitably arises in the minds of a certain proportion of educated and thoughtful men, but which is often intuitive, and may be surprisingly developed in those who have had no such privileges in their youth; and thirdly, by the hope of our becoming an association of painstaking naturalists and microscopists, who should occasionally be able to contribute some new fact or observation to the Treasury of Science. I believe these were the motives which brought us together, and I am glad to be able to express to you my unqualified satisfaction with the degree in which our just expectations have been fulfilled. Our intercourse with each other has been most cordial and agreeable; old friendships have been drawn closer, and new ones made fast by

> The secret sympathy,
> The silver link, the silken tie

of congeniality of taste that binds us together. At our monthly meetings all unnecessary formalities, all affectation of deep learning, all assumption of superiority of knowledge by one member over another, have been avoided; and there has been an undeviating readiness on the part of each to impart the result of his experience for the benefit of all. I am especially gratified by the perseverance that has been shown by a large number of the members in bring their microscopes to our meetings. The display of interesting objects, and the conversation it gives rise to respecting their preparation and mounting, is an important feature in our proceedings; and the facility thus afforded for the illustration of the papers read, by the exhibition of the organisms, &c., described, is an advantage which cannot be too highly estimated. I am proud to tell you, gentlemen, that in this particular our Club excels every similar Society with which I am acquainted. I need not say that I desire to see this custom steadily persisted in, and I hope that other members who possess microscopes will not allow a trifling personal inconvenience to interfere with their bringing them to our meetings, remembering that each one of a fraternity like ours should feel pleasure in performing the duty of contributing to the general stock of information and enjoyment. The papers read have been so interesting as invariably, I believe, to make you wish they were longer; and I cannot but congratulate you on having had amongst our lecturers two such eminent men as our treasurer, Mr. Flower, and Mr. Carruthers, of the British Museum. I have the promise of papers in the future from other gentlemen equally well known in other departments of science, and I am sure that you will know how to appreciate such valuble assistance. But I should like to have more frequently brought before us unassuming but practical communications from our members themselves—like that by Mr. Perry, "On Mosses,"—and to encourage conversational discussions of difficulties encountered in mounting objects, and other such matters, in order that beginners may be benefitted by the experience of those amongst us who have long since overcome many of the obstacles which impede the success of the novice. In their Report, the Committee have alluded to the excursions which were organised during the past summer. I have every reason to believe that we shall be able to make arrangements for a series of excursions to take the place of our ordinary meetings through the period of our recess this year, which shall be equally pleasant, and even more profitable from a scientific point of view. Our *Soirée*, on the 23rd of November last, was, as the Committee have reported to you, a great success, as showing what our Club could do for itself, and the sympathy it enjoyed of older Societies, and scientific friends in London. It met with universal commendation, and raised the Club greatly in public estimation. I have no doubt that if it be decided that the Exhibition shall be an annual one, the sale of tickets will, in future, nearly, if not quite, repay the expenses. The drain upon our resources by the cost of our first entertainment of this kind was so great as to hinder our carrying out a wish which I have entertained, that a few useful books on the microscope and the preparation of objects should be purchased out of the Club funds for the use of the members. The consideration of this subject is reserved for discussion by the more numerous Committee whom you will presently elect. I mentioned in my opening address that I intended, with the sanction of the Committee, to propose to the authorities of congenial provincial societies a reciprocity of visiting and other privileges between their members and our own. I have unofficially taken preliminary steps towards obtaining those advantages, but I have felt that I could make no formal proposals on the strength of what we expected to achieve, but that they must be accompanied by a statement of what we have already done. The report which you have ordered to be printed furnishes me with the necessary credentials. The cultivation of friendly feelings and intercourse with other societies established for purposes similar to ours, especially in our town and neighbourhood, is a policy with which I distinctly identify myself and to which I shall firmly adhere. Science, Literature, and Art, are natural allies, and although a doubt has been expressed on the point, I am sure that we cannot do wrong in giving all the help we consistently can to the School of Art, and to the Literary Institution under whose roof we both meet. And now I come to a point of great importance in its influence upon the usefulness of our studies to ourselves and others ; I refer to the systematizing of our work. I am satisfied with what has been done during our first year, but it is time that each of us began, in conjunction with others of similar tastes to follow up with a distinct purpose some particular subject. The purpose should be the more complete knowledge of our local Natural History, and the subjects which I would especially indicate to you, as not difficult, are entomology, botany, microscopic palœontology, and pond life. I communicated to you, on a former occasion, my friend Mr. Wilson Saunders's suggestion that we should unite with the Holmesdale Club at Reigate, in the botanical sections; and I shall shortly ask those who are interested and able to help in the four subjects I have named, to confer with me respecting the organisation of co-operative work upon them. I have seen so much skill and ingenuity displayed by many of our members in preparing and mounting objects, and so much latent talent in this direction, that I have determined to offer a prize to be presented at our next Annual Meeting, for the best series of six dozen mounted objects. The variety, novelty, and scientific value of the specimens, difficulty of preparation, and neatness of manipulation will be taken into consideration. The competitors must be amateurs and members of of the Club; the judges will be two members of the Council of the Royal Microscopical Society; and the prize will be a cabinet, designed by myself to contain all the necessary apparatus for the mounting of microscopic objects, and of the value of £5. I conclude with the assurance of the happiness I have experienced in associating with you all during the past year; and with the hope that, encouraged and assisted by our fellow members, and stimulated by their approbation and example, we may be able, during the year which is to come, to maintain and increase the attractions and usefulness of our Club.

Mr. Alfred Crowley then addressed the meeting, remarking that the progress of the Club from the first had been to him a source of pleasurable wonder. He wished to give full credit to the Committee and other officers; they were an excellent team, admirably driven. In most Societies the management devolved upon the Secretary and one or two members, and the President was generally an ornamental personage, elected on account of his local influence, or because he had a handle to his name; but he had no hesitation in saying that Mr. Lee was the mainspring of the Club. It was he who, by his personal friendship with eminent scientific men, enabled it to take so high a position, when it was inaugurated; it was to his exertions that the success of the *Soirée* was attributable; and it was well known to every gentleman present, that the minutest details of the business of the Club received his careful attention; and that almost every measure adopted for the advancement of its interests, was initiated by him. He was the "right man in the right place," and he had great pleasure in proposing a resolution :—

That the thanks of the members be given to the President for his exertions on behalf of the Club from its commencement, and for the Address which he has just delivered; and that he be requested to allow the latter to be printed with the report.

Mr. E. F. Jones seconded the motion, and confirming the opinion of Mr. Crowley, said that he could himself testify to the urbanity and kindness of the President in affording all possible information and guidance to members who applied to him for advice.

The motion was put by Mr. Flower, and carried by acclamation.

Mr. Lee acknowledged the compliment, and warmly eulogised the conduct of the Committee. He reminded the members of the proofs of interest taken in the success of the Club by their distinguished treasurer, Mr. Flower, and also paid a high compliment to the secretary, Mr. Long. That gentleman, he said, from the day when, by his advertisement in the papers, he had sounded the "assembly" which brought them together, had taken a most active interest in the welfare of the Club. He devoted a great deal of time and thought to its affairs, and his entirely gratuitous duty was performed methodically and well. Of the clear and concise manner in which he drew up the minutes of their meetings, they could themselves judge. He desired to thank the officers and committee for the support he invariably received from them.

Cordial votes of thanks to the Treasurer and to Mr. Long were then proposed by Mr. G. N. Price, seconded by Mr. John Berney, and carried with demonstrations of hearty applause.

The President, Treasurer, Secretary, and Committee were re-elected, and the names of Mr. G. Perry, Mr. G. F. Linney, and Mr. F. West, jun., were added to the committee; one of the three having been nominated to fill the vacancy caused by the lamented decease of Mr. Haward.

Messrs. J. M. Eastty, J.P., E. Marshall, H. Noakes, P. S. Punnett, and J. Radley, were elected members of the Club.

The following Members have exhibited Microscopes, &c., at the monthly meetings:—

Ashby, H.; Austen, N. L.; Bennett, A.; Berney, John; Bindley, T.; Carpenter, Dr.; Cooper, G.; Crowley, A.; Crowley, P.; Cushing, T.; Drummond, A. B.; Evans, H.; Flower, J. W.; Gill, F. W.; Haward, A.; Hovenden, C. W.; Johnson, J. S.; Jones, E. F.; Lee, H.; Lee, H., jun.; Long, H.; Manners, G.; Mc'Kean, K.; Owen, Dr.; Perry, G.; Philpot, Dr.; Price, G. N.; Purser, G.; Radley, G.; Spencer, G. J.; Stevenson, A.; Strong, Dr.; Sturge, E.; Tritton, T.; West, F.; West, F., jun.; Wood, J. D.

TREASURER'S REPORT, DECEMBER 31st, 1870.

Receipts.

	£	s.	d.
To Cash received, viz.—			
Members' Subscriptions	52	0	0
Sale of Soirée Tickets	12	10	0
	£64	10	0

Payments.

	£	s.	d.
Printing	2	14	6
Stationery, Books, &c.	1	1	9
Postages	1	3	0
Advertisements	1	6	4
Hire of Lamps, and purchase of six ditto	0	18	6
Hire of Hall and Rooms	5	1	6
,, Tables for Opticians' Night	0	9	0
Expenses of Soirée	34	13	2
Balance in hand	17	2	3
	£64	10	0

J. W. FLOWER, *Treasurer.*

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct.

J. S. JOHNSON,
GEO. F. LINNEY, } *Auditors.*

CROYDON MICROSCOPICAL CLUB.

RULES.

OBJECTS OF THE CLUB.

The Club is constituted for the mutual help of its members; for the discussion of subjects connected with, or dependant upon Microscopical research; for the exhibition and exchange of Microscopic Objects and Preparations; and for the promotion of the study of Microscopy and Natural History generally.

MANAGEMENT OF THE CLUB.

The business of the Club shall be conducted by the President, Treasurer, and Hon. Secretary (*ex officio*), and seven other members—three to form a quorum. Two of the Committee shall retire every year, but shall be eligible for re-election at the Annual General Meeting.

MEMBERSHIP.

1.—Every candidate for membership shall be proposed by two or more members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the Form appended. The certificate shall be read from the chair, and the candidate therein recommended ballotted for at the following meeting—three black balls to exclude.

2.—The Annual Subscription shall be 10s., payable in advance on the 1st of January, and no person shall be entitled to the privileges of the Club until his subscription has been paid.

3. Distinguished men may be elected Honorary Members of the Club, provided they do not reside within the district; such honorary and corresponding members shall not be subject to any of the expenses of the Club, and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall by their merit satisfy the committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any member from the Club, the same shall be done by a resolution of the committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the members present shall vote for such member's expulsion, he shall no longer be considered a member.

7.—Any member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the member by whom he is introduced, in a book to be kept for that purpose.

ORDINARY MEETINGS.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at eight o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other time as the committee may appoint.

2.—The ordinary course of proceedings shall be as follows :—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.

II.—The names of candidates for membership shall be read, and the ballot for the election of members shall take place.

III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the members present at any ordinary meeting shall elect a chairman for that evening.

4.—No paper shall be read which has not received the sanction of the committee ; and, whenever it is possible, early notice of the subject of the papers to be read shall be given by the secret ary to the members. No paper shall exceed fifteen minutes in the actual reading, unless by the especial permission of the chairman.

BUSINESS MEETINGS AND ELECTION OF OFFICERS.

1.—The accounts of the Club shall be audited by two members appointed at the ordinary meeting in December. No member of the committee shall be eligible as an auditor.

2.—At the same meeting notice of the annual meeting in January shall be given from the chair, and the nomination of members for election as officers for the ensuing year shall be announced.

3.—An annual meeting of the Club shall be held, in the place of the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the committee on the affairs of the Club, and the balance-sheet, duly signed by the auditors, shall be read.

4.—No permanent alteration in the rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or addition must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

CROYDON MICROSCOPICAL CLUB.

Mr.

of

being desirous of becoming a Member of this Club, we beg to recommend him for Election.

(on my personal knowledge.)

This Certificate was read 187

The Ballot will take place 187

NOTE.—The foregoing Rules were adopted at a general meeting of the original members of the Club, held on the 16th of March, 1870, when the following gentlemen were elected as officers and members of the committee :—

President—MR. HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer—MR. JOHN WICKHAM FLOWER, F.G.S., &c.

* *Hon. Sec.*—MR. HENRY LONG.

Committee—

MR. JOHN BERNEY, F.R.M.S.; MR. WILLIAM REEVES COOPER; MR. ALFRED HAWARD; DR. HENRY LANCHESTER; DR. HENRY J. STRONG.

* Communications to be addressed to the Hon. Sec., 90, High Street, Croydon.

LIST OF MEMBERS.

Adams, T. R., M.D., Ottoman Villas, St. James's-road.
Ashby Henry, St. James's-road.
Austen, Nathaniel Lawrence, F.L.S., F.Z.S., "The Acacias," Pitlake
Baker, Samuel, Montague Villa, Lansdowne-road.
Baldiston, Frederick, Hanover Villa, Lansdowne-road.
Berney, Edward, M.R.C.S., 73, High-street.
Berney, John, F.R.M.S., 61, North-end.
Bennett, Arthur, 101, High-street.
Bevis, Charles, 1, St. John's Villas, Waddon-road.
Bindley, T., St. Peter's-road.
Blake, W. J., Duppas Hill-terrace.
Bonus, Charles, Oakwood House, Sydenham-road.
Carpenter, Alfred, M.D., 113, High-street.
Cleaver, H. A., M.R.C.S., 40, North-end.
Combs, George, Warehousemens' and Clerk's School, Russell-hill.
Cooper, George, M.R.C.S., 4, George-street.
Cooper, W. R., Addiscombe-road.
Corden, George, 53, High-street.
Crowley, Alfred, Bramley Oaks, Bramley-hill.
Crowley, Philip, Waddon House.
Cushing, Thomas, 1, Manilla-terrace, Albert-road.
Dix, T. H., 36, High-street.
Drummond, Arthur B., Derby-terrace.
Drummond, John, 76, North-end.
Drummond, William, 2, Sydenham-road.
Eastty, J. M., J.P., Wellesley House, Wellesley-road.
Edridge, T. R., J.P., The Elms, High-street.
Evans, Henry, Bramley-hill.
Ewart, Earnest, Edwin Villas, Mayday-road.
Farmer, R. J., M.Q.M.C, Railway Incline, London-bridge.
Fisher, F. D., Bank Villa, Selsdon-road.
Flower, John, Fairfield-road.
Flower, John Wickham, F.G.S., &c., Park Hill House.
Fuller, R. Jarvis, Bishop's-road, Duppas-hill.
Gibson, John, Canning Lodge, Addiscombe-road.
Gill, F. W., M.Q.M.C., 6, Bedford Villas, Dingwall-road.

Grundy, Charles, Outram Villa, Outram-road, Addiscombe.
Hackshaw, R., Swansea Villa, Elgin-road.
Haddock, Roland, 64, High-street.
Hales, Edward, 27, The Waldrons.
Holmes, John, 3, Sydenham-road.
Hopgood, James, Clapham-common.
Horniman, W. H., 41, London-road.
Horsley, Henry, M.R.C.S., 24, North-end.
Hovenden, C. W., Clifton Lodge, Selhurst-road, South Norwood.
Hovenden, R., Clifton Lodge, Selhurst-road, South Norwood.
Hudson, Robert, F.R.S., J.P., &c., Clapham-common.
Jaquet, Rev. J. H., B.A., Selsdon-road.
Johnson, Cuthbert W., F.R.S., Waldronhyrst, The Waldrons.
Johnson, J. S., M.R.C.S., 105, High-street.
Jones, E. F., St. Germain Villas, Forest-hill.
Lanchester, Henry, M.D., Encombe Villa, Lansdowne-road.
Latham, Baldwin, Whitgift Lodge, Wellesley-road.
Lashmar, Charles, M.D., 63, North-end.
Lee, Henry, F.L.S., F.G.S., F.R.M.S., &c., The Waldrons.
Lee, Henry, jun., The Waldrons.
Leeds, C. E., Selhurst-road, South Norwood.
Linney, G. F., Friends' School, Park-lane.
Long, Rev. D., Bramley-hill.
Long, Henry, M.Q.M.C., &c., 90, High-street.
Lowndes, Edwin, 120, High-street.
Major, C. W., Cromwell House, Duppas-hill-terrace.
Manners, George, F.S.A., F.L.S., The New Terrace, Lansdowne-road.
Marshall, Edward, M.R.C.S., Mitcham.
Mc'Kean, Kenneth, jun., Tower House, The Waldrons.
Muggeridge, T. Benjamin, Upper Addiscombe-road.
Muggeridge, W. H., Upper Addiscombe-road.
Nation, W. J., M.Q.M.C., 1, Clifton Villas, Thornton-road.
Newton, Charles, Crossland Villa, Broad-green.
Noakes, Henry, 3, Tenterden-terrace, Queen's-road.
Odling, William M. B., F.R.S., &c., &c., Sydenham-road.
Olley, W. H., 4, Savage Gardens, Tower-hill.
Oswald, Edward Charles, The Palace.
Owens, Henry, M.D., 6, Sutherland Villas, Selhurst-road.
Page, Joseph, 5, Ebenezer-terrace, Parson's-mead.
Paget, Peter, St. James's-road.
Peek, W. H., M.P., Wimbledon House, S.W.
Perry, George, Park-lane.
Philpot, Charles, M.D., 6, Sydenham-road.
Pollard, C. B., 4, St. John's-grove.
Price, G. N., St. Peter's-road.

Punnett, P. S., "Wintons," Park Hill-road.
Purser, George, Wallington, Carshalton.
Purvis, William, Dingwall-terrace, Dingwall-road.
Radley, Joseph, 36, Park-lane.
Reid, George, 3, Athol Villas, St. James's-road.
Ridge, Byron, 91A, Church-street.
Ridsdale, A., The Elms, 8, Upper Coombe-street.
Roberts, Rev. G. R., The Limes, High-street.
Rogers, W. Ed., Shaftesbury Cottage, Lansdowne-road.
Roper, A. G., M.R.C.S., 57, North-end.
Rowland, W. H., High-street.
Rutley, Charles, The Oaks, Warrington-road.
Snelling, W. H., Selhurst-road, South Norwood.
Spencer, G. J., The Grange, Sutton-common, Sutton.
Spencer, John, M.Q.M.C., The Grange, Sutton-common, Sutton.
Stanley, W. F., "Stanleybury," Albert-road, South Norwood.
Stephenson, H. P., The Hermitage, Warrington-road.
Stevenson, Albert, Oak Hill-road.
Steele, Joseph, L.D.S., M.R.C.S., George-street.
Strong, H. J., M.D., North-end.
Sturge, Edward, The Waldrons.
Sutherland, William, M.D., George-street.
Tarrant, W. B., Park-hill.
Taylor, B. R., Ravenswood.
Tritton, Thomas, 2, Clifton Villas, Selsdon-road.
Twentyman, Alfred, Fairfield House, Addiscombe-road.
Warren, Francis, Ailsa Villa, Wellesley-road.
Waterman, George, South-end.
West, Frederick, The Waldrons.
West, Frederick, jun., The Waldrons.
Whiffin, G., Bramley-hill.
Whiffin, H. W., The Limes, Park Hill-road.
White, Rev. John, M.A., Penge.
Whitling, Henry Townsend, F.R.C.S., High-street.
Wood, J. D.

F. BALDISTON, PRINTER, NORTH END, CROYDON.

SECOND REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 17, 1872.

CROYDON:

PRINTED BY JESSE W. WARD, "ADVERTISER" OFFICES, KATHARINE STREET.

1872.

SECOND REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 17, 1872.

CROYDON:
PRINTED BY JESSE W. WARD, "ADVERTISER" OFFICES, KATHARINE STREET.

1872.

OFFICERS AND COMMITTEE

FOR THE YEAR 1872.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

JOHN WICKHAM FLOWER, F.G.S., &c.

Honorary Secretary:

HENRY LONG.

Committee:

J. BERNEY.	GEO. PERRY.
W. R. COOPER.	H. J. STRONG. M.D.
G. F. LINNEY.	H. LANCHESTER, M.D.
GEO. MANNERS.	PHILIP CROWLEY.

REPORT OF THE COMMITTEE.

The SECOND ANNUAL MEETING of the Croydon Microscopical Club was held at the Public Hall, on Wednesday, 17th January, 1872, Henry Lee, Esq., President, in the chair. The minutes of the last meeting having been read and confirmed, Mr. A. R. Jacobs and Mr. Robert Hingston were balloted for, and duly elected members, and the following gentlemen were nominated for election at the next meeting:—Mr. C. Penley, Mr. H. W Petherick, Mr. Edwin Fogg, and Mr. R. J. Dickens.

The PRESIDENT announced that the Club was honoured b the presence of Mr. John Keast Lord, the distinguished traveller and naturalist.

The HON. SECRETARY then read the following report :—

In presenting their Second Annual Report, the Committee are glad to be able again to congratulate the Members on its continued prosperity and increasing success. The number of Members is now 120. During the past year one Member has been removed by death, and ten have resigned on quitting this neighbourhood. Sixteen new Members have been elected, leaving an increase in the present number of five over that of last January.

The Monthly Meetings continue to be well attended. Able and interesting Papers have been read, several of which have been contributed by Members of the Club. The advantage of having the Papers read well illustrated by microscopic objects becomes more and more apparent, and a good display of miscroscopes and objects before and after the lecture is also appreciated as an agreeable portion of the proceedings of each evening. As an additional incentive to Members possessing microscopes to bring them to the Meetings for the general benefit, and in order to prevent their being unnecessarily inconvenienced by doing so, the Committee have authorized the purchase of additional lamps, and have provided for their being always trimmed and ready for use.

A few excursions were arranged during the recess, and were greatly enjoyed by those who availed themselves of them, but it is felt that this branch of the Club's operations is capable of considerable development, and that the appointment of an Excursion Committee is desirable for this purpose.

The Committee refer with pleasure to the great success that attended the Soirée held at the Public Hall on the 8th November last. The number of tickets sold considerably exceeded that of the previous year, thus proving the growing popularity of the Club in Croydon.

At the Annual Meeting last year the President kindly announced his intention to give a "mounting cabinet," of the value of £5, as a prize to any Member of the Club—an amateur—who, at a given date before the next

Annual Meeting, should exhibit the best six dozen microscopic slides of his own mounting.

The Committee hope that the generons intention of the President has accomplished the object he had in view, viz., "By promoting a healthy competition amongst the Members to give an incentive to many to advance themselves in this interesting and important branch of microscopy."

The state of the Club's finances is highly satisfactory. There is a balance in the hands of the Treasurer of £38 17s. 10d. The Committee therefore feel justified in expending, firstly, £10 in the purchase of books of microscopy and natural history, and, secondly, £5 on a cabinet, to contain a collection of microscopical objects. They trust that the additions to the Library will lead to an increased demand by Members for the loan of books, and that they and others will, by presents of slides, assist the Committee in forming a collection of mounted objects now that a suitable cabinet has been provided for their reception.

Treasurer's Report for the Year ending December 31st, 1871.

Receipts.

	£	s.	d.
To Balance in hand	17	2	3
,, Sale of Soirée Tickets	18	12	6
,, Croydon Literary and Scientific Institution ...	1	1	0
,, Subscriptions	57	10	3
	£94	5	9

To Balance brought down ... ... £38 17s. 10d.

Expenditure.

	£	s.	d.
Hire of Rooms...	5	9	6
Printing Reports	9	12	6
Postages	1	7	10
Advertising and Printing	1	10	8
Hire of Cab	0	5	0
Stationery, &c.	0	5	8
Attending to Lamps	0	13	0
Mr. Franklin	0	3	0
Expenses of Soirée	36	0	9
Balance	38	17	10
	£94	5	9

(Signed) J. W. FLOWER, *Treasurer.*

We, the undersigned, having examined the above Accounts, and the vouchers relating thereto, hereby certify that they are correct.

(Signed) J. S. JOHNSON, THOS. CUSHING } *Auditors.*

It was proposed by Mr. E. F. JONES, seconded by Mr. J. S. JOHNSON, and resolved that the Report be adopted, printed, and circulated amongst the Members.

It was moved by Dr. LANCHESTER, seconded by Mr. P. CROWLEY, and unanimously carried, that Henry Lee, Esq., J. W. Flower, Esq., John Berney, Esq., and Mr. Henry Long be re-elected to the offices of President, Treasurer, Librarian, and Hon. Secretary respectively.

It was moved by Mr. J. S. JOHNSON, seconded by Mr. E. B. STURGE, and resolved that the rule as to the management of the Club be altered by the substitution of *nine* Committee-men for seven.

It was moved by Mr. J. BERNEY, seconded by Dr. STRONG, and carried, that the second paragraph in the Rules under the head of "Business Meetings and Election of Officers" shall in future stand thus :—"At the same meeting, notice of the Annual Meeting in January shall be given from the chair," and that the third paragraph, instead of "when the election of officers for the ensuing year shall take place," shall in future stand thus—"when the nomination and election of officers shall take place."

It was moved by Mr. E. F. JONES, seconded by Mr. E. B. STURGE, and carried, that Messrs. J. Berney, W. R. Cooper, G. F. Linney, Geo. Perry, Dr. Strong, Dr. Lanchester, Philip Crowley, and Geo. Manners form the Committee for the current year.

Votes of thanks were then accorded to the President, Treasurer, Librarian, and Hon. Secretary, and to Mr. J. Berney for kindly undertaking the duties of Secretary during Mr. Long's illness.

The competitors for the President's prize were Mr. J. Berney, Mr. C. W. Hovendon, Mr. J. S. Johnson, and Mr. K. McKean.

The judges were Captain Tyler, F.L.S., and Dr. Millar, F.L.S., whose reports, awarding the prize to Mr. Berney, were then read.

The President presented the cabinet to Mr. Berney, and to each of the unsuccessful competitors he also presented a case of instruments used in the dissection of microscopical objects.

ABSTRACT OF PROCEEDINGS,

1871.

February 15th, 1871.—Henry Lee, Esq., President, in the chair. Mr. Harry Townend was balloted for and duly elected.

Dr. Strong read a paper "On Bone Structure," taking as the heads of his subject, 1st, the appearance seen in ordinary transverse and longitudinal sections of bone; 2nd, the varieties of bone, and in what they differ; 3rd, the development of bone, how it is formed, how nourished, and finally its chemical composition.

In the discussion which followed,

The President remarked that microscopical comparison of the size, form, and proportionate number of bone cells, and the canaliculi radiating from them, had been productive of very important results in contributing to our knowledge of some of the remarkable animals which existed on the earth in former ages. As an example of this he would mention that about the year 1845 Professor Owen read a paper before the Geological Society, on some *Ornitholites* (fossil remains of birds) from the chalk, the bone especially described being a portion of the humerus of a (supposed) longi-pennate bird. Subsequent discoveries of similar bones led Dr. Bowerbank to believe that these so-called bird-bones were those of the great flying reptile, the Pterodactyl. By one of those strange coincidences of thought which not unfrequently happen in scientific investigation, Professor Quekett was also impressed with their similarity, and he and Dr. Bowerbank—neither of them aware of the experiments which the other was pursuing—determined upon a close microscopical examination of the structural peculiarities of the bones, in the hope of eliciting some characters, which would, in conjunction with their external forms, point out with some degree of certainty the class of animals to which these remains in reality belonged. They arrived independently at the same conclusion—that the bones of birds, reptiles, fishes, and mammals, each possess marked peculiarities which furnish a means of deciding disputed relations of obscure and difficult tribes of existing animals, as well as of ascertaining the true relations of such palæontological remains as it might be otherwise difficult or impossible, from their dilapidated condition, to refer to their real position amongst animals.

In illustration of Dr. Strong's paper, Mr. Lee also exhibited the head of a boy's thigh bone, which had come away from the patient after three years' suffering from scrofulous disease of the hip-joint, and a large portion of the shaft of the tibia of another boy, whose leg was injured by a kick whilst playing at football. In both cases a most successful cure had been effected under the surgical care of his friend, Dr. Wm. Price, of Margate.

A paper was read by Mr. THOS. CUSHING, entitled, "NOTES ON THE POLARIZATION OF LIGHT WITH A BRIEF ACCOUNT OF THE METHODS OF EMPLOYING IT IN CONNECTION WITH THE MICROSCOPE." The author stated that he had prepared this paper, at the request of the President, in order to explain to the members of the Club a new arrangement of polarising apparatus, being one which had attracted considerable attention at the conversazione of the Croydon School of Art last month. Before proceeding, however, to describe the mechanism of this ingenious contrivance, Mr. Cushing thought it would be desirable to point out some of the various modes of polarising light in order to render the description of this apparatus more clear and intelligible. He then explained that the term polarisation was, at the suggestion of Sir Isaac Newton, given by the celebrated Huyghens to certain peculiarities possessed by rays of light which, having passed through crystals of Iceland Spar, or other double refracting media, acquired properties which were supposed to bear some analogy to those possessed by the opposite poles of a magnet. But whether this term is the best designation of the phenomena which is known as polarised light or not, it is clear that rays modified by the above and various other modes of treatment do present, as it were, sides on which they can be again reflected, and others on which they cannot. He then passed on to describe in general terms the method of polarisation by single refraction pointing out numerous substances, and the particular angles at which they polarise light, and stated his belief that even some metallic substances which are said to be incapable of polarising light have to some extent that power. The ordinary polarising apparatus supplied as an adjunct to the microscope was shown to consist of two Nicol's prisms, not that two are necessary to polarise light—as this is done by a single prism of this construction—but because the second prism is necessary to ascertain that the light has been polarised in passing through the first. Hence the second is termed an analyzer. In the microscope the polarising prism is invariably fixed under the object while the analyzer is always placed above, but it has the choice of two positions, one just above the objective, and the other above the eye piece. Each position has its peculiar advantages and disadvantages, and must therefore be determined in each case according to the requirements of the observer. If on looking through the microscope, when the polarising apparatus is attached, the field should appear dark it will be found that by rotating one of the prisms through 90 degrees or a quarter of a revolution it will become light, and if the rotation be continued the light and dark fields will alternate at every 90 degrees. When this is the case it is clear that the light has been polarised in its passage through the first prism. The well known phenomena of colour produced by the action of crystallised bodies on polarised light are described by Brewster as being "the most splendid within the whole range of optics." The production of those beautiful colours in some objects, and with which we are all more or less familiar, is brought about by the interposition of a single plate of selenite between the polariser and the object which is the form of apparatus most common in use. Other arrangements were described, such as that of "Darker's," in which three selenite plates are mounted in such a way that either one, two, or three can be employed at pleasure, each being capable of independent rotation, but without any mechanical contrivance for so doing, and by combining these selenites in various ways numerous colours together with their complimentary tints can be produced. "Hislop," whose labours among microscopic crystals suggested to him the necessity of having some mechanical means by which the adjustment of the selenites as well as their rotation could be effected, contrived what he has called his "Analysing Selenite Stage," in which the selenites can be mechanically rotated either singly or in combination, but at the same speed. This plan is most undoubtedly an improvement upon Darker's. But shortly after this came Field, with his "Ratio-Micro-Polariscope," so called from the fact of the selenites moving in a fixed ratio to one another; his aim being to reduce this mode of observation to something like a systematic method, and which his apparatus is well calculated to do; but as it is very elaborate and costly, and therefore beyond the reach of ordinary observers it is not likely ever to come into frequent use. The last arrangement to which I will call your attention is that which was the more immediate object of this paper. It was devised by Mr. Carl Becker, who is well known for his great skill in designing and constructing instrumental appliances for physical research, after having seen the much more complicated one of Field's. It combines the chief advantages of the latter with extreme simplicity and compactness. The selenites in this arrangement are each mounted in a circular toothed ring of the same diameter and number of teeth, and which are graduated and numbered on the horizontal faces in order to enable the observer to set the axes of the selenites in any desired position; these are all enclosed in a cylindrical metal box in which they revolve with perfect freedom. One end of this box terminates in a fitting for the under stage of the microscope, whilst the other carries a Nicol's prism which has an independent rotary motion. There are two openings on opposite sides of this box, one for adjusting the selenites, and the other to receive a differential pinion which gears into all the selenite rings at the same time, and is actuated by means of a small milled head. If this milled head is turned round, it will be seen that all the selenites are being rotated at the same moment, but with unequal velocities, and by the aid of this ingenious contrivance it will be found that the most beautiful combinations of colour are produced, and will go on varying until the axes of the selenites return again to their normal position, which will of course depend upon the relation between the numbers of the pinion and the teeth of the selenite rings. Mr. Cushing illustrated his paper with carefully made drawings of all the polariscopes he described, and at the close presented to the Club a treatise, by Chas. Woodward, Esq., F.R.S., entitled "A Familiar Introduction to the Study of Polarised Light." After a few remarks from the President, the unanimous thanks of the Club were accorded to Dr. Strong and Mr. Cushing for their interesting papers.

March 15th, 1871.—Henry Lee, Esq., President, in the chair. The following gentlemen were balloted for and duly elected Members:—Mr. W. H. Beeby, Mr. J. S. Crowley, and Mr. W. T. Loy.—The PRESIDENT presented the Club with "The Preparation and Mounting of Microscopical Objects," by Davies, and "The Collector's Hand-book of Algæ." He also announced that since the last meeting three new Microscopical Societies had been formed, viz.:—the Sydenham and Forest Hill, the Margate, and the South London Microscopical and Natural History Society.

Mr. J. S. JOHNSON, M.R.C.S., read a Paper "ON A MICROSCOPICAL EXAMINATION OF THE OYSTER," which he illustrated by numerous anatomical preparations.

A lengthy discussion followed, during which the PRESIDENT stated his belief that the Oyster did not produce more than one spat in a year, and although they might, from unfavourable circumstances, be stopped from breeding during a whole season, they certainly would not spawn at all that year. With regard to the scarcity of oysters, it was caused by atmospheric and climatic influences, which it was impossible to account for. Oysters bred just as freely as ever they did, but the young ones did not adhere, and that was why we felt the loss. At Herne Bay, in June, the year before last, the sea was so thickly impregnated with young oysters in their swimming condition that a great number might be taken up by merely dipping the blade of a knife into the water. During that month the nights were very cold, and, believing that a low temperature, among other things, prevented the development of the fry, he and Mr. Frank Buckland deposited some of them in a vase of sea-water. On reducing the temperature by inserting a piece of ice, he found that the young oysters sank to the bottom of the vessel, but on withdrawing the ice, and restoring the water to its previous temperature, they revived and came again to the surface. From experiments he had made at Herne Bay, he believed that there was only one species of Ostrea. He had obtained some of the large coarse-shelled Welsh oysters, and, on putting them into the experimental oyster beds, he found that in course of time they formed new growth of shell, identical with that of the true native. He had also placed American oysters in the same beds, but the growth of the shells had not been sufficiently marked to be conclusive.

A cordial vote of thanks was passed to Mr. Johnson for his interesting lecture.

April 19th, 1871.—Henry Lee, Esq., President, in the chair. The following gentlemen were balloted for and duly elected :— Mr. Henry Moore, jun., and Mr. John Rickett.—Dr. BRAITHWAITE, Vice-President of the Quekett Microscopical Club, delivered a lecture "ON MOSSES, WHERE THEY ARE TO BE FOUND, AND HOW THEY ARE TO BE PRESERVED." He pointed out that there were 9,000 different species of mosses in the world, of which 540 were to be found in our own country. In all places where there was a constant moisture, either locally or atmospherically, mosses would be found on trees, garden walls, thatched roofs, on rocks, or beside streams. Some were of an opposite character, preferring a scorched soil, hence they were frequently to be found on gipsy encampments. One family of mosses flourished in decaying animal matter, another on old leather, such as discarded shoes, and a third even on old hats. In selecting mosses for the herbarium, it would be preferable to secure fruit-bearing specimens, keeping such species separate on a piece of numbered paper, and recording in a note-book the details respecting it for further reference. When travelling, and it was inconvenient to prepare the specimens at once, they should be spread out on the floor to dry; for, if packed close in a bag while in a damp state, they would mildew and spoil. When it was wished to prepare their specimens after having thus preserved them, it would be necessary to soak them in water, which would free the roots from soil, and the plants would expand and become as fresh as when first gathered. It was best to form them into moderately flat tufts. Some of the leaves should be removed for microscopical examination, and mounted in glycerine jelly. Dr. Braithwaite exhibited numerous specimens from his own herbarium. For each family he had provided a sheet of cardboard, for each genus a sheet of coloured paper, and for each species a sheet of drawing-board. A minute description of the anatomy of mosses, and the important part they play in preparing the soil in many places for higher orders of vegetation, brought this interesting lecture to a close, when a hearty vote of thanks was unanimously accorded to Dr. Braithwaite.

The President and the following Members exhibited microscopic objects in connection with the lecture :—Messrs. J. Berney, F. W. Gill, G. N. Price, F. West, jun., G. Manners, E. F. Jones, J. S. Johnson, K. McKean, G. F. Linney, C. W. Hovenden, A. Bennett, H. Long, J. Radley.

Mr. W. F. Stanley exhibited a new collecting stick for pond life.

May 17th, 1871.—Henry Lee, Esq., President, in the chair. The following gentlemen were balloted for and duly elected :—Mr. W. Ingram, Mr. J. Rhodes, and Mr. J. Woodward.

The PRESIDENT announced that Mr. J. Berney had kindly consented to take the office of Librarian to the Club, and that Members would have the opportunity of changing their books at Mr. Berney's house, North End, any time between ten in the morning and six in the evening.

Mr. JOHN BERNEY read a Paper "ON THE MOUNTING OF MICROSCOPIC OBJECTS," after which Mr. W. H. ROWLAND read the following Paper "ON THE GREAT BUSTARD :"—"In any society where natural history is the subject for discussion, and in any part of England, though the magnificent bird upon which I shall presume to speak this evening may not have been an inhabitant of the particular district in which we may be assembled, I can hardly imagine any bird which could be more fitting for notice than the "Great Bustard." It is, at the present day, one of the birds protected by the Game Laws of England, though with little reason, for few of us who increase the revenue by the taking out of game certificates have even heard of the bird in its natural state, still less have shot at or even seen one. That the bird was formerly located in several parts of England, and on my native Wiltshire Downs, is certain ; and there is, on Salisbury Plain, an inn called 'The Bustard,' to remind us that such a bird was once the pride of the country. The circumstance of having, in 1856, become myself the owner of a genuine specimen of this noble bird, has enabled me to obtain statistics relating to it, which the knowledge gained by an intense love of a sport which I enjoyed for many, many years before I settled down to hard work in this town, would never have assisted me to acquire. The species is so very nearly extinct in this country that we must borrow largely from what has been already written, because there is no opportunity for comment from personal observation, and I mention this at starting that I may not lay myself open to the charge of pirating the treatises of men who have noted anything which they could glean once in ten or twenty years about this bird, and recorded it for their brother naturalists. Even the late Mr. Yarrell, in a paper which he wrote for, and read before the Linnæan Society in 1853, prefaced it with the remark that the particulars relating to the habits of the Great Bustard, supplied to him by kind friends, would, he thought, be sufficiently interesting to be communicated —the great scarcity, or rather the then rare occurrence of the bird in this country affording but few opportunities for observation. This being the case in 1853, when that accomplished naturalist read his paper, what is to be said nearly twenty years later? But even in these days occasional specimens have occurred, as was the case with my bird in 1856. Since then, however, there has, I believe, been no specimen captured until the winter of this year when two fine birds—a male and female—were taken near to the old haunts on Salisbury Plain. 'The disappearance in our own time,' says a writer in *Fraser's Magazine*, in 1854, 'of the Great Bustard from the British catalogue of animal life is a striking illustration of the encroachment of enclosures. The game birds of England shy the face of their common enemy, the sportsman, and in their natural state test what the *Field* newspaper once described as 'the intellect of man against the instinct of the animal;' and those of us who know the habits of the game birds and game animals of this country have seen how largely the instinct of the animal prevails over the intellect of the most cute sportsman. But to return to the subject before us, I should observe that the Great Bustard was a bird of sufficient mark to be noted so far back as the year 1512, and in the 'Northumberland Household Book' of that year, and from which I have an extract, bustards are mentioned. In the 'Household Book' and privy purse accounts of the Lestranges of Hunstanton, in 1578, is entered 'a reward to Baker for bringing two young bustards,' and item— a bustard and a hernsewe 'killed with ye crosbowe;' and in a feast given in the Inner Temple Hall, in the year 1555, bustards figured at 10s. each,—a large sum, it is said, in those days, when pheasants were 4s.; Turkey chicks, 4s.; partridges, 1s. 4d.; plovers, 6d.; pigeons, 1s. 6d.; larks, 8d.; woodcocks, 7s. 8d.; and snipes, 2s. a dozen. The bustard continues to be occasionally noted on, in 1611 and 1622, and is described as—

> The big boan'd bustard then, whose body bears that size,
> That he against the wind must runne, ere he can rise.

—and so on, very rarely till 1800, when we are told that, as we enter on the present century, the increasing scarcity of the species becomes apparent, and the instances of the capture of the bird are carefully noted. In that year a hen bustard was shot on Salisbury Plain, which measured from tip to tip of the wings full six feet, and upwards of three feet from the point of the beak to the extremity of the tail; and a friend of mine informs me that there is still living in Wiltshire (at Tilshead) an old man of 75 years of age, who well recollects his father keeping a bustard in confinement. The bird was formerly hunted with greyhounds, and so captured, before it was enabled to take flight, but, when it did fly, it is reported not to have alighted again within a distance of seven or eight miles. Young ones, too, were frequently taken by sheep dogs upon the downs before they were capable of flight, and the eggs were eagerly sought after, half a guinea being no unusual price for a single egg. The flesh, too, was held in high esteem, and in 1771 it was perhaps the more so, because it was not so very easy to come at. The male bird, but not the female, has a peculiar formation called a 'julor pouch,' in which it can take and retain, as much as seven pints of water. This is assumed to be for its own consumption in places distant from water, and by some it has been supposed to be for the purpose of supplying the female bird with water when she is sitting. It is, however, doubtful whether the bustard requires water at all, and the theory of its supplying the female bird when she is sitting is probably erroneous, for it is believed that when the cock bird has performed the portion allotted him by nature he leaves the hen to bring up her little family (of three or two, for the bustard lays not more than three eggs, and more usually only two) without any assistance from him, and, like our turkeys of the present day, he is not admitted into the society of the female after she has once begun to lay her eggs. Mr. Yarrell, in 1843, notes that a female bustard had been shot, a few days before, upon an open plain between Helston and the Lizard Point. He says it is the first instance of the capture of the Great Bustard in Cornwall, and the last instance known to us of the existence of this noble species in Great Britain. Thirteen years later, viz., in January, 1856, I became the owner, by purchase, of a genuine specimen of this bird, which was caught (as is recorded in the 2nd vol. of Yarrell's 'British Birds') by a little boy, who saw it at the edge of a turnip field, in the daytime, within a mile of the town of Hungerford, in Berkshire. The bird and the boy had a short fight, but the bird, having a broken leg, was worsted in the fray, and, being dragged along by its wing to a barn, was there killed. No other instance is known of a male bird (though I have an indirect idea about a female) having been taken since my bird, till this last winter (again fifteen years since the former specimen was noted), when two were shot in Wiltshire, one male and the other female. Mr. Yarrell doubted, rather, the existence of the jular pouch, and he was very vexed with Mr. Leadbeater, who had my bird to preserve, that he did not give him an opportunity to examine the neck. I am told, however, as a fact, that this pouch was very visible in the male bird shot this winter, and that it held six pints of water. The weight of the male birds seems to have varied from 28lbs. to 13½lbs., which was the weight of my bird; that of the last one was 16lbs. The colour of the bird is a clay brown, the feathers being barred with black; the head and the upper part of the neck a greyish white, and in a full-grown male bird a tuft or plume of about seven inches in length on the head; the tail feathers are tipped with white, and the bird is altogether a very handsome fellow indeed. The young, at a month old, are said to be covered with a buff-coloured 'down,' barred upon the back, wings, and sides with black. There are, or there were, specimens of the bird in the Zoological Gardens, in the Regent's Park. In a plate of Domesticata, however, the length of their age is so reduced that it seldom exceeds two or three years, and they never have shown any inclination to breed in confinement. The English specimens are fast becoming, if indeed they have not become, extinct, and with them the recollection of sport known only to past generations. The birds taken last winter (and probably my specimen of 1856) were, I believe, migratory birds, and therefore the value attached to them, as one of the ancient game-birds of the country, ceases to some extent. I have endeavoured to obtain a specimen of the Great Bustard to exhibit to the Club this evening, and for that purpose have visited both the Mr. Ward, in Vere Street, and Mr. Ward, in Wigmore Street, but neither of them, even amongst their splendid collections, have any specimen or skin of the Great Bustard. Our meetings, hitherto, have been occupied by learned Papers (too learned for some of us), subjects connected with microscopy, and I venture to hope that one evening, or part of an evening, as this has been, devoted occasionally to natural history, and to discussions upon that very interesting and instructive subject, will add materially to the popularity of our already popular Club.

The PRESIDENT exhibited a bustard's egg, besides which there was a case containing two stuffed specimens of the bird on the table. These birds, however, Mr. ROWLAND informed the Club, were foreign.

A Member said he was under the impression that there was a Great Bustard shot in Suffolk some six years ago.

Mr. ROWLAND thought that was a hen bird the gentleman was alluding to. Only lately, two hens had been seen, no doubt, migratory. It was a singular thing that so few cock birds were ever seen now, and doubtless it was owing to their being very scarce, or keeping away from this country.

The PRESIDENT said the capture of the Great Bustards in this country had been announced in *Land and Water* lately, but their sex was not stated. He continued that Mr. Linney had mentioned to him the discovery of a rare British plant in the neighbourhood of Croydon.

Mr. G. F. LINNEY, at the request of the President, addressed the meeting with regard to the discovery. The plant in question, the *Claytonia Perfoliata*, was found by one of his school-boys not far from Carshalton.

Mr. E. B. STURGE stated that the *Claytonia Perfoliata* was of American origin. A specimen had been found, about three weeks back, near Addiscombe.

The PRESIDENT said he was sure they were all wishful for him to give the thanks of the Club to those gentlemen who had been kind enough to read Papers that evening. In the course of his remarks, he said that neither Mr. Rowland or any one else need fear that the Club would discourage discussion on natural history subjects. He then adjourned the ordinary meeting until September, and, in the meantime, he hoped they would have excursions together.

September 20th, 1871.—Alfred Carpenter, Esq., M.D., in the chair. Mr. Alex. D. Taylor was balloted for and duly elected.

Mr. G. F. LINNEY read a Paper "ON LAND AND FRESH WATER SHELLS." The author described the apparatus with which the conchologist should be equipped for collecting, showed how to prepare specimens for the cabinet, explained the various methods of arranging a collection, and pointed out the favourite haunts of many kinds of snails in the immediate neighbourhood of Croydon.

October 25th, 1871.—Henry Lee, Esq., President, in the chair. The following gentlemen were balloted for and duly elected:—Messrs. Frederick Clarke, J. Corbet Anderson, Howard Nalder, J. J. Gill, H. M. Klaassen, J. C. Sigsworth, and the Rev. R. Rodolph Suffield.

The PRESIDENT announced that in the absence of Mr. H. Long, who was ill, Mr. John Berney had kindly offered to undertake the duties of Hon. Secretery.

Mr. GEORGE DOWKER, F.G.S., read a Paper "ON FRESH WATER POLYZOA."

THE SECOND ANNUAL SOIREE of the Club was held in the Public Hall, Wednesday, November 8th, 1871.

Deputations were sent by the following Societies:—The Royal Microscopical, Quekett, Linnean, Geological, Old Change, South London, Forest Hill, Margate, and Holmesdale.

The following Members of the Croydon Microscopical Club exhibited:—Dr. Owens, Dr. Strong, Messrs. J. Berney, J. H. Ley, F. West, jun., K. McKean, W. H. Snelling, J. C. Sigsworth, C. W. Hovenden, W. R. Cooper, G. Perry, G. F. Linney, H. Noakes, J. S. Johnson, G. Manners, and the President.

Mr. FRANK BUCKLAND exhibited the celebrated Japanese "Nondescript Monster," and a bottle containing a rat, preserved in spirits, whose history was somewhat singular. It had pushed its head through a ham-bone, and, being unable to extricate itself had lived for many months with this novel collar round its neck. Attached to the bottle were the following lines written by Mr. Henry Lee:—

THE RAT WITH A BONE COLLAR.

Of the host of queer things my friend Buckland's collected,
If the queerest of all were by some one selected,
It would certainly be the remarkable rat
Who's been "poking his nose into this and to that."
Like the noted "Sir Thomas" of glorious Tom Ingoldsby,
Whose fair lady Jane grieved so little to single be,
And who—(worthy old broad-rimmed-spectacled Squire),
When riding his hobby, got drowned in the mire,
And (sad to relate) became food for the fishes,
For the eels were seen wriggling out of his breeches—
Like Sir Thomas, I say, this four-legged thief,
By his poking and prying at last came to grief.
One night he was routing about in a dust-bin,
Into which a tired servant-of-all-work had just been
Throwing the scraps from the evening meal,
When he came upon something he thought he would steal;
'Twas a slice from the joint the Parisians call "jambon,"
And just in the midst was a section of ham-bone.
He devoured the meat, and then set to work
To gnaw at this section of thigh-bone of pork.
He thought the soft centre so juicy and nice,
That he greedily ate his way through in a trice;
Popped his head through the ring whilst enjoying the marrow,
But found, to his horror, the hole was so narrow
That there wasn't the ghost of a chance of removing it,
For the set of his ears prevented his moving it,
And that spite of his struggling and kicking "like bricks,"
He never could hope to get out of his fix.
He began to reflect on his painful position,
And to moralize o'er his unhappy condition.
Said he—"I've been foolish, indeed, I must own,
In supposing I merely had *collared* a bone;
For, now it's too late, I unhappily see
That a Tartar I caught—'twas the bone *collared* me.
A *rasher* thing, surely, I never attempted,
Than when by that *rasher* of ham I was tempted."

MORAL.

Every tale has a moral—even a rat's,
So, young bachelors, listen, and take off your hats;
Don't "bone" anyone's collars; I further advise you,
If any young lady bewitchingly eyes you,
Don't fall deeply in love—it's a serious thing
To find yourself o'er head and ears in a ring.

The Rat (loquitur).

Mr. Buckland, your honour,—it's all very fine
For you folks to make game of misfortunes like mine,
And to publish my story, and tell ev'ry one of it,
But excuse me for saying, I can't see the fun of it.
There's yourself, now; you tell them you're anxious to see
Just for how long a time a poor critter like me
Can exist with this tight thing around his carotid,
With a chronic sensation of being garotted.
All the chaps in your office are jeering, alas! at me;
The editor comes, and he looks through his glass at me.

There's young Mr. A. comes taking a sketch
That's so painfully like me (the hardened young wretch)
That I shuddered the instant I turned and caught sight of it,
Whilst the others who looked at it laughed and made light of it;
Then that fellow "H. L." comes and perpetrates rhyme
With a cruelty almost amounting to crime;
He really deserves to be sent to a jail
For extracting a moral from out of my *tale!*
When he might have been proving himself better bred
If from this horrid ring he'd extracted my head.
So, grant me a boon, and by promptness enhance it;
Instead of attempting my cure with the lancet,
And fomenting my wounds, take the back of a knife,
Crack the bone and release me—I'll thank you for life.

November 15th, 1871.—Henry Lee, Esq., President in the chair.

Mr. George Perry read a Paper "On Hairs and Scales on the Leaves of Plants."

December 20th, 1871.—Henry Lee, Esq., President, in the chair. Rev. W. Ready was balloted for and duly elected.

Mr. Thos. Cushing and Mr. J. S. Johnson were appointed to audit the Club accounts.

The President gave notice of a proposal to increase the number of the Committee from seven to nine.

Mr. W. Saville Kent, F.Z.S., gave a lecture "On Fresh Water Infusoria."

THIRD REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 15, 1873.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, NORTH END.

1873.

THIRD REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 15, 1873.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, NORTH END.

1873.

OFFICERS AND COMMITTEE

FOR THE YEAR 1873.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

JOHN WICKHAM FLOWER, F.G.S., &c.

Honorary Secretary:

HENRY LONG, M.Q.M.C.

(90, High Street, Croydon.)

Committee:

JOHN BERNEY, F.R.M.S.
ALFRED CARPENTER, M.D.
WILLIAM REEVE COOPER.
PHILIP CROWLEY.
G. F. LINNEY.
GEORGE MANNERS, F.S.A.
GEORGE PERRY.
HENRY J. STRONG, M.D
FREDERICK WEST, Jun.

REPORT OF THE COMMITTEE.

The THIRD ANNUAL MEETING of the Croydon Microscopical Club was held in the Reading-room, at the Public Hall, on Wednesday evening, January 15th, 1873, H. Lee, Esq., President, in the chair. The minutes of the last meeting having been read and confirmed, Mr. G. Rigby, of Wellesley-road, and Mr. W. F. Blockey, of Tower House, London-road, Croydon, who had been proposed as members, were balloted for, and declared to be unanimously elected. Mr. Robert Brodie, of George-street, Croydon, and Mr. Marston Allsop, were nominated for election at the next meeting.

THE COMMITTEE'S REPORT.

Mr. H. LONG, the hon. secretary, read the following report of the Committee :—

In presenting their Third Annual Report, the Committee of the Croydon Microscopical Club feel great pleasure in again congratulating the Members on the encouraging success and increasing prosperity of the Club. Since last January, 24 new members have been elected, and the number now in the Club is 135, showing an increase of 18 over the number of last year, although there have been five withdrawals, and the Committee regret the removal of one member by death.

The good attendance of members at the Monthly Evening Meetings has been fully maintained. A great variety of interesting objects have been exhibited, and, in most instances, these have been prepared and mounted by the exhibitors, showing the great proficiency they have attained in this branch of delicate manipulation ; and it will be observed, by the following list of Papers read, that the majority of them have been by members of the Club :—

February 21st.—Dr. CARPENTER on "Adulteration of Food, detected by the Microscope."

March 20th.—Dr. TIDY on "Polarised Light."

April 17th.—N. L. AUSTEN, Esq., on "The Nesting of the Eagle Owl in Croydon."

May 15th.—HENRY LEE, Esq., on "The Microscopy of a Fishmonger's Shop."

September 18th.—A. D. TAYLOR, Esq., on "Micro-lepidoptera."

October 19th.—E. F. JONES, Esq., on "The Formation of Orbs" ; and D. E. GODDARD, Esq., on "Rolling Stones."

November 20th.—G. PERRY, Esq., on "The Dispersion of Seeds."

December 18th.—ARTHUR ANGELLL, Esq., on "Chalk Foraminifera;" and D. E. GODDARD, Esq., on "Cleaning Polycistina."

In order to carry out more systematically the excursions arranged to take place during the summer recess, it was thought advisable to have an Excursion Committee; and although by this arrangement some improvement in the attendance of members at excursions was noticeable, still it would be more encouraging to the Committee to see a larger number avail themselves of the opportunity thus afforded for combined out-door work.

The following is a list of the Excursions undertaken, and the dates on which they took place:—

June 19th.—Quekett Club Annual Excursion and Dinner at the "Swan," at Leatherhead.

June 29th.—Excursion to Addington Park.

July 13th.—Excursion to Caterham Junction, to meet the Quekett Microscopical Club.

August 24th.—Excursion to Gatton Park.

The Committee have pleasure in referring to two plants, the *Juncus Capitatus* and *Juncus Pygmæus,* both new to the British Flora, discovered in Cornwall, during the past year, by Mr. Beeby, a member of the Club. Also to the discovery last summer, on Mitcham Common, by the same gentleman, and Mr. A. Bennett, another member of the Club, of *Ænanthe Lachenalii,* a plant quite new to this district.

The Committee have the gratification of being again able to notice the great success of the *Soirée,* held at the Public Hall on the 27th November last, a success surpassing even that which had attended those of the two previous years, there being a larger display of microscopes and objects of great interest by members of the Club, without any falling off of valuable and kind assistance from members of the Royal Microscopical Society, the Quekett, the Old Change, the South London, and Forest Hill Microscopical Clubs. The large attendance and the increasing demand each year brings for admission cards, testify to the high appreciation of the evening by the public.

During the past year members have attended, as representatives of the Croydon Club, *Soirées* held in connection with the Quekett and South London Microscopical Clubs, and the assistance thus rendered has been acknowledged by those societies.

The Library. — The sum of Ten Pounds having been voted for the purchase of books, the Committee solicited from the members suggestions of the names of works likely to be serviceable to the Club, but as only two or three were sent in, no purchase has been made. The Committee have, however, received an estimate for the supply of several standard works. Five pounds was also voted for the purchase of a cabinet for holding mounted microscopic objects. This has been bought, and the cabinet is in the care of the Librarian, Mr. J. T. Berney, who will be pleased to receive, on behalf of the Club, presentations of slides.

Treasurer's Report, for the Year ending December 31st, 1873.

Receipts.

	£	s.	d.
By Balance in hand	38	17	10
,, Sale of *Soirée* Tickets	29	7	6
,, Members' Subscriptions	65	0	0
	£133	5	4

Payments.

	£	s.	d.	£	s.	d.
Hire of Rooms for Monthly Meetings				5	12	6
Advertising and Printing				4	18	6
Postages				1	11	0
Stationery				0	6	8
To Purchase of Cabinet				5	0	0
,, ,, Lamps				0	13	2
,, ,, Tables				3	10	9
Mr. J. Jones, attending to Lamps, and Oil for ditto				0	15	9
Sundries				0	11	8
Soirée Expenses.	£	s.	d.			
Printing and Advertising	6	14	8			
Admission Cards	2	2	0			
Messrs. Ridge & Son, Decoration of Stage	2	0	0			
Hire of Hall	3	8	0			
Ticket Collector, Attendants, and Police	0	17	6			
Refreshments	12	6	3			
Mrs. Mendham	1	1	0			
Hire of Piano	2	2	0			
Postages and Stationery	1	6	6			
Mr. Hodder, for Tables	7	2	10			
Hire of Lamps	1	3	6			
Carriage, Bill Posting, and Sundries	2	5	10			
				42	10	1
Balance in hand				67	15	3
				£133	5	4

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct.

K. McKEAN,
E. B. STURGE, } *Auditors.*

Mr. Martin—I beg to move the adoption of the report of the committee, and that it be printed and distributed to the members. It is merely a nominal duty, for it is a report of which all the members of the society must be proud. I notice, particularly, one fact with reference to the success of the *Soirée*, and that is, the sale of tickets realised £29, while in 1872, when the *Soirée* was quite a novelty, the amount was only £12. I think that shows there is a great increase of interest in the proceedings of the society out of doors. The motion, having been seconded by Mr. J. S. Johnson, was carried unanimously.

ELECTION OF PRESIDENT.

Dr. Carpenter rose and said — I have very great pleasure in rising to propose the re-election of Mr. Lee, as President of this Society. (Cheers.) If there is one thing that I am quite certain of it is that if Mr. Lee had not been resident in Croydon, the Microscopical Society would never have been the established fact it is. It is to him that we owe its great success. It is evident that it is very important that the prime mover of a society like this must, himself, be an authority, and must be well acquainted with those who are the great leaders of the particular science which a society like this is supposed to promote; and in electing Mr. Lee as our President, we gained the services of a gentleman who has been enabled, by his own personal energy, to influence others engaged in scientific pursuits. We have been able to secure his services, and with these services we have been enabled to command success. Without those services we should not have attained the high place which we now occupy, but probably would have dwindled down as other societies have done. Most certainly the society would not have reached the proud eminence which it has attained, for it now takes the foremost rank amongst those societies which are so well known near London. We may fairly say that we owe this to our President. I think, therefore, if he will consent to be our President during this, the fourth year of the existence of the Society, he will confer upon us a great honour and enable us to go on in the course we have now taken, and we shall be grateful to him for taking that office. (Cheers.)

Mr. Penley seconded the motion, which was carried unanimously.

The President—I need not say that I am exceedingly obliged to you for the cordial reception you have always given me, for the kind compliment paid me by Dr. Carpenter, and for the, if possible, greater one of your constant attendance and unvarying kindness. It has always been my endeavour to avoid, as much as possible, cold formalities at this Club. I have sought to cause it to be regarded as a meeting of friends who come here for mutual satisfaction, enjoyment, and learning, and you have done your part well in seconding my wishes and making it as successful as it has become. There was one part of Dr. Carpenter's remarks to which I should like to advert, although I do not intend to make any formal address. I do not think it is a healthy thing in a Club or Society of this kind to rest entirely, or so much as you have been good enough to do, upon one individual. It has always been a pleasure to me to see the various gentlemen on the committee take their own departments and work them, as they do, most thoroughly. But in addition to this, I would ask you who are likely to take a responsible position, to become able to fill my place, by endeavouring to increase your influence with Fellows of Scientific Societies and members of other clubs, who will be useful to our own by contributing papers, &c. I throw it out as my opinion that if members of the committee and others would join the Royal Microscopical Society, or the Quekett Microscopical Club, at the meetings of which they would enter into conversation with, and be brought in contact with, men who would come and help us here, they would increase and strengthen the outside influence of the Club. I think it is unadvisable that I or any man should monopolise for many years the position I hold. I hope that this time twelvemonths you will find a gentleman as my successor, who will be heartily welcomed by me; therefore I ask all who aspire to the office of President, then or in the future, to qualify themselves for it.

ELECTION OF TREASURER.

Mr. J. S. Johnson proposed the re-election of Mr. J. W. Flower as Treasurer for the ensuing year, remarking that he had no doubt that gentleman would well take care of the interests of the Club.

Mr. G. N. Price seconded the motion, which was carried unanimously.

ELECTION OF SECRETARY.

The President—I have now great pleasure in telling you that the present Secretary, although he finds the work hard and onerous, is willing to continue it for a term. You have to elect a Secretary, and under the circumstances I need not tell you what to do.

Mr. W. R. Cooper proposed that Mr. Henry Long continue in office as Secretary. He was sorry to mention, that amongst Mr. Long's arduous duties, was that of having to ask members for their subscriptions two or three times. He hoped the members would endeavour to assist the secretary in that respect.

Dr. Carpenter seconded the motion, which was carried unanimously.

Mr. Long, in acknowledgment, thanked the members for the indulgence they had manifested towards him in the discharge of his duties. He should endeavour to fill the office, not only to the satisfaction of the members, but also to the interests of the Club; and he would take this opportunity of acknowledging the kind and ready assistance which he had always received from the committee.

THE COMMITTEE.

The President—I am sorry to inform you that on the committee there has been one resignation—that of Dr. Lanchester—who finds it impossible to attend the meetings; but he will continue to be a member of the Club, and to give us his best assistance. The members of the committee have worked so thoroughly well together, the Club has so prospered under their care, and they are so well acquainted with their various duties, as shown by the late *Soirée*, that I have taken upon myself to advise that the former committee should be re-elected, and that we should substitute Dr. Carpenter's name for that of Dr. Lanchester.

Mr. A. D. Taylor then proposed the re-election of the committee, and that Dr. Carpenter be elected to the vacancy caused by the resignation of Dr. Lanchester.

Mr. J. Flower seconded the motion, which was carried unanimously.

Dr. Carpenter—I thank you heartily for your kindness in electing me a member of the committee. I have always felt a desire to belong to it. But as I was formerly much engaged elsewhere on Tuesday evenings, I could not attend on Wednesday evenings, not being able to spare time on both evenings; but partly on account of certain exposures which were made in this room in connection with the Microscopical Society, I was relieved of those duties on Tuesday evenings, and I shall now be very happy to devote what time I can, on Wednesday evenings, to the affairs of the Club.

A cordial vote of thanks was then passed to the Press of Croydon and neighbourhood, for its reports of the meetings of the Club. The President thanked the representatives of the Press present, personally, and requested them to convey to the editors of their respective journals the appreciation of the Club of the manner in which its proceedings had been chronicled and commented upon.

A vote of thanks to the President terminated the proceedings of the meeting.

It was announced that the next paper would be contributed by Mr. J. S. Johnson, and that the subject would be "The Organ of Respiration in some of the Invertebrate Animals."

Mr. Dix asked whether the committee had taken any steps respecting the balance in hand, which now amounted to a considerable sum?

The President said the subject was under the careful consideration of the committee, who would submit a proposition to the Club as soon as the arrangements were completed with regard to the new building adjacent. He might state, however, that it was contemplated to increase the Library, if it was found that the books already purchased were used by the members; and it was hoped that arrangements would ultimately be made for securing a Reading-room for the members, where they might have access, not only to scientific works, but also to suitable scientific magazines and other useful publications.

ABSTRACT OF PROCEEDINGS.

1872.

The following are the subjects which have been introduced, and the Meetings, Excursions, &c., that have taken place.

February 21*st*, 1872.—On "ADULTERATION OF FOOD, DETECTED BY THE MICROSCOPE," by ALFRED CARPENTER, M.D.—Amongst the visitors present were—Robert Hudson, Esq., F.R.S.; Col. Horsley, R.E., Treasurer of the East Kent Natural History Society; Latimer Clarke, Esq.; Buxton Shillitoe, Esq., F.L.S.; and J. C. E. Harting, Esq., F.L.S.

Dr. CARPENTER showed, in his paper, how the Croydon Microscopical Club might do much practical good in checking the evils which arise from adulterations of food. It is scarcely more than 30 years ago that the microscope was first brought to bear on this subject. Dr. Hassall has laboured in it so successfully that some forms of adulteration, common at one time, have now entirely disappeared. Yet many things, in regular use, are far from pure; and if in this town of Croydon it becomes known that there is a society of gentlemen who are determined to expose frauds of this kind, the practice of them will soon die out. Three of the things which are still much adulterated, are milk, sugar, and coffee. There are two simple ways of testing the purity of milk, viz., by the amount of cream given, and by its specific gravity. The quantity of cream should be proved by placing some of the new milk in a tube ten inches long, properly graduated. The cream, being lighter, rises to the top. This should be about 10 per cent. of the whole. At the same time the specific gravity should be tested by the lactometer, which ought to exhibit from 1·029 to 1·031. After a couple of hours any deposit, at the bottom of the tube, will show whether any foreign substance has been introduced, and the microscope will determine its character. Sugar may be taken as, perhaps, next in importance to milk in our diet. Of these, we have chiefly two kinds—cane sugar and grape sugar. The important point is to remember that grape sugar has only two-fifths the sweetening power of cane sugar, and an inferior feeding power.

To determine the difference between these, we use the polarimeter. If a ray of polarized light is passed through cane sugar, the plane of polarization turns to the right, while with a solution of grape sugar it is the reverse. In choosing a sugar, choose one with large crystals, and without much granular matter. If sugar contains much moisture, it should be rejected. Under the microscope, with low power, the crystals of cane sugar are seen to be six-sided oblique prisms, while the grape sugar exists in acicular tufts. In the latter, too, sugar mites are sometimes found; making the sugar unfit for use. To discover them, dissolve a teaspoonful of sugar in a wine glass full of warm water, and examine the deposit at the bottom of the tube. "Raw" sugars are much superior to refiner's "pieces," as the former contain much less grape sugar; though the "pieces" may be lighter in colour, they are of less dietetic value. Coffee is adulterated with roasted grain, raspings of loaves, stale sea biscuits, and the like. Chicory is also much used, and is itself adulterated; indeed, ground chicory can be bought at a cheaper rate than the dried root itself. Good coffee, when ground, if squeezed, should not form a cake; and if a spoonful is dropped into a tumbler of water, it ought to float on the top; if it sinks, it is bad. Many of the adulterations of coffee may be seen under the microscope. From the examination of the various samples obtained in Croydon, it does not appear that adulteration is very extensive.

Some discussion took place on the question of Mr. Kent's paper, on "Pond Infusoria," read at a previous meeting of the Club, in which Dr. Carpenter, Mr. J. S. Johnson, and others took part.

The President remarked that it was pleasant to see the Hon. Sec., Mr. Long, once more at his post, after his serious illness.

The following gentlemen were elected members of the Club:—Messrs. C. Penley, Horace W. Petherick, Edward Fagg, and Richard J. Dickens.

March 20*th*, 1872.—On "The Polarization of Light," by Dr. Meymott Tidy.—The lecturer described, in rapid summary, the various discoveries respecting polarized light, taking as his basis the undulatory theory. Referring to the strong analogy between light and sound, he stated that there appeared to be but one force pervading all nature; but this force takes various forms. After describing the constitution of a ray of light, the lecturer proceeded to deal with the subject of polarized light, enforcing his remarks by a large number of beautiful illustrations thrown on a screen by the oxy-hydrogen light.

In the discussion which followed, the PRESIDENT, Mr. STEWART, and Dr. CARPENTER took part; and the opinion was expressed that the polariscope would, in a short time, play a most important part in guiding medical men to a true diagnosis of various diseases, and in suggesting methods for their cure or alleviation.

Several members of the Club exhibited objects, with their microscopes, to illustrate the lecture.

The following gentlemen were elected members of the Club, viz.:—Messrs. John Moore, Daniel Watney, Peter Thrale, and Ralph Thrale.

April 17*th*, 1872.—On "THE NESTING OF THE EAGLE OWL IN CROYDON," by N. L. AUSTEN, Esq.—A pair of Eagle Owls kept in confinement, mated in January, 1871, and the first egg was laid on the 11th of February. The first nestling was hatched on the 22nd of March, and another about a week later. The young birds were carefully fed by their parents with rats, the male bringing the food, and the female tearing it up; the family usually ate seven or eight in the course of the day. The young owls obtained their plumage by the time they were two months old, and were able to fly up to their perches. The female of this young pair died in November, but the male is still in good health. The old birds again nested in the spring of 1872, but the eggs were addled. Mr. Austen has also a pair of the Little Owl *(Athene noctua)*, which have likewise nested in confinement. Mr. Austen also gave some interesting particulars of the native haunts of the Eagle Owl, and of visits which he has paid at different times to them in Norway.

At the close of the paper, Mr. BARTLETT, of the Zoological Gardens, gave an interesting account of the owls in the gardens, and of one which he had placed in the aviary with the peacocks for the purpose of catching mice. Mr. Bartlett, at the President's request, related an anecdote of the successful performance in the past few days of a surgical operation on a rhinoceros. The animal was suffering from ulceration of the nasal bone, produced by the growing in of the horn, and it became, therefore, necessary to cut off the horn. This, by great care, was successfully accomplished.

Votes of thanks to Mr. Austen and Mr. Bartlett were passed.

Mr. J. C. Sigsworth presented to the Club a slide of *Plumularia cristata*.

The following gentlemen were elected members of the Club :—Messrs. Ebenezer Diver, O. T. Hodges, and W. A. Adams.

The PRESIDENT alluded, in feeling terms, to the death of R. Hovenden, Esq., a much respected member of the Club.

May 15*th*, 1872.—Paper by H. LEE, Esq., the President, on "THE MICROSCOPY OF A FISHMONGER'S SHOP."—The PRESIDENT, in introducing his subject, said—" If we take our stand in front of a well-stocked fish shop, determined to examine with intelligent appreciation a spectacle which we have passed day by day and hundreds of times, with the carelessness and want of observation which familiarity is too apt to engender, our notice will probably be first attracted by the great difference of external form, the variety of coloration, and the dissimilarity of the dermal covering of the fishes exposed for sale on the cool and moistened slab. Frequent absence from home, such as I am subject to, may have its advantages to the collector, but it has its drawbacks too. It may bring into his possession a greater variety of objects, but it is a serious obstacle to prolonged and continuous observation of the habits and development of living organisms, and to the successful preparation and mounting of specimens requiring to be soaked in potash, turpentine, or other fluids, the action of which it is necessary to arrest at the proper moment. I mention this because it is my wish to direct attention to the quantity of valuable material for the study of marine zoology easily obtainable by residents in an inland town who may seldom have an opportunity of going to the seaside ; and whilst trying to describe a few of the objects of zoological interest to be found in a fishmonger's shop, I shall refer chiefly, but not entirely, to those branches of the subject which can be best investigated by the aid of the microscope." Mr. Lee having referred, as examples of the variety of form, to the aristocratic salmon, the lordly turbot, and the snake-like eel, said he mentioned these three fishes not only because they offered a marked divergence from each other in outward shape, but because they would serve him presently as illustrations of the existence, in organs apparently identical in each of them, of an important difference hitherto only recognised by its consequences, and the nature and cause of which, if ever we discovered it, could only, as he believed, be revealed to us by the microscope. He enumerated some of our other food fishes, more or less resembling in form those already named, and a reference to which, he said, would elucidate his next point. The brill, plaice, dab, and flounder, belonged to the same family as the turbot; the *rays* are represented by the skate and thornback; the *gadidæ* by the cod, haddock, and whiting; the *scornberidæ* by the mackerel; the *clupeidæ* by the herring, pilchard, sprat, shad, and whitebait; and other genera by the mullets, bass, dory, gurnard, &c. "The second noticeable feature which I mentioned" (continued Mr. Lee)—"their variety of colour—is perceptible at a glance, but the difference in their skin-covering demands more careful attention, and more lengthened comment. The turbot, for instance, has no proper scales, but is furnished with isolated plates, or tubercles, beneath its skin, which connect it with the *placoid* order of fishes—the rays and sharks. These have horny plates instead of scales, which are often armed with median spines, as in the thornback, or are bristled with small sharp eminences, like a rough file, as in the "shagreen" of the sharks and dog-fishes. And yet the congeners of the turbot—the brill, sole, &c.—are completely covered, both on their upper and under surfaces, with over-lapping *ctenoid* (comb-like) scales, like those of the perch. The salmon, the herring, the cod, the eel, and the families which they represent, have all *cycloid* scales, smooth and simple on the margin, and presenting the appearance of concentric rings. The two first-named are shielded by these circular, or ovoid, over-lapping scales. In the salmon they are firmly fixed; in the herring they are so loosely inserted that they are easily detached by the slightest touch. In the eel and cod, however, they are not on the outer surface, but beneath the epidermis, and from the skin of the former, especially, a novice might find some difficulty in extracting them. The eel was long supposed to be a scaleless fish, and and as such is still avoided by the Jews as a forbidden article of food; but you have only to wash the skin of one to see, through the transparent membrane, the scales arranged in curious pattern beneath. This is still more effectively displayed if a portion of the skin of an eel or cod be dried, mounted in Canada balsam, and submitted to the polariscope. A microscopical examination of the structure of fish scales and their pigment-cells may some day lead us to understand a phenomenon for which at present we are able only very imperfectly to account, and it is an interesting and instructive study, which I commend to your attention. It is a well-known fact, and one which you can verify for yourselves in any aquarium, that fishes, especially flat-fishes, have the power of assimilating their colour to that of the bottom on which they lie. And this change is effected very rapidly. Not very long ago, I placed in a tank, in the Zoological Gardens, some small plaice, which I had caught on the flat shore near Reculvers. They were then indistinguishable in tint from the sand from which they had been removed, but the bottom of their new home was strewn with cockle-shells which had become partially covered by the growth of a dark green conferva, and appeared in the imperfect light as if irregularly chequered with black and white. Within a quarter of an hour of their being put in this tank, all the young plaice had lost their sandy hue, and had assumed the mottled appearance of the bottom on which they were resting. The colours of some fishes vary also at different seasons. An old kelt salmon, after the spawning season is over, is hard to recognise as the brave, brilliant fish he was when, fresh from the sea and dressed in his wedding suit, he took his course up the river, despising the adverse force of the swiftly-running stream, and overleaping with vigorous ardour the obstacle of weir or waterfall which opposed his progress on his way to meet his bride. He returns a hook-nosed, draggle-tailed, lean, and almost loathsome brute; with his colour changed to a lurid, unwholesome red, as if some marauder had robbed him of his bright silver armour, and sent him home in an old damaged suit of rusty iron. I instance this as indicating the changes that take place in the structure and coloration of fish-scales as a useful subject for microscopical investigation. Let us now examine the respiratory organs of some of these fishes. The blood of all animals has, as I need not tell you, to be purified and renovated by contact with oxygen. In the mammalia, in birds, and in the mature reptile, this office is performed by the lungs, and the oxygen is obtained from the air; but as fishes breathe water, and not air, they are furnished with a respiratory apparatus—the gills—by which their blood in the course of its circulation is purified by being brought under the influence of the oxygen contained in the water. Most lovely objects for the microscope are the gills of fishes, either in their natural state, or injected as permanent specimens; and wonderfully beautiful the minute network of vessels in their laminæ, so constructed and arranged as to present the greatest possible amount of surface to the action of the water. But there is one point concerning them to which I referred just now, and which has always struck me as very remarkable. In examining the gills of the salmon and the eel, I have found no structural difference between them so marked and important as to form a satisfactorily characteristic distinction separating them from each other and from other fishes. And yet in the salmon we have a fish which passes half of its time in fresh water, and half in salt water, and can breathe and enjoy life equally well in either; whilst to the great majority of sea fishes contact with fresh water is instant death; and the salmon itself would be suffocated if buried in the slime and mud, which is the chosen abode of the eel. I here offer you another topic deserving the most careful and painstaking microscopical investigation." Mr. Lee then described, at some length, many of the parasites which were found adhering to the gills and other portions of various fishes. Amongst others he mentioned the cruel-looking *Lerneonema Spratta*, which burrows deep into the eye, and sometimes into the body, of the sprat; *Chondracanthus Zei*, which is found only on the gills and gill-plates of the dory; *Nicothoe Astaci*, which is peculiar to the branchiœ of the lobster; and *Bopyrus Squillarum*, which attacks the prawn, getting beneath its carapace, and giving it the appearance of a person with a badly swollen face. "Of these," he said, "I have specimens on the table; but I will take, as typical of their class, for brief description, the three entomostracous parasites of the salmon. Adhering to the scales of a salmon, generally on the belly and near the vent, may often be seen a brown-looking crustacean from half to three-quarters of an inch in length, and somewhat resembling in shape the great *limulus*, or 'king-crab.' This is commonly known as the 'sea-louse' *(Lepeoptheirus Stromii)*, as it is only on salmon coming up from the sea that it is found. On another salmon may possible be seen *argulus foliaceus*, the little green flat creature with two leaflets to its tail which attacks every freshwater fish, and which you may see turning somersaults, and performing the funniest antics in the tanks at the Zoological Gardens—especially that in which the perch are kept. This is known as the 'river-louse,' and is not found in salt water. Adhering to, or rather fixed in, the gills —often in considerable numbers—is a third parasite, called by fishermen the 'maggot;' and from the presence or absence of these parasites some have endeavoured to discriminate between a 'fresh-run' and a 'foul fish.' The presence or absence, however, of either of the parasites of the salmon is not a true test of the condition of the fish. My own investigations lead me to believe that neither of these parasites cause disease or injury to their hosts, although sickly and diseased fish are more exposed than healthy ones to their attacks, because they are less able to avoid them. Fish, like human beings, when sick, are disposed to remain still and inactive, and at such times these agile little swimmers are enabled more readily to approach and attack them. The supposition was once pretty generally received as correct that the migrations of the salmon were attributable to these parasites—that it leaves the sea to get rid of one of them in the fresh water, and becoming there infested with the other, seeks to free itself from its river enemy by returning once more to the salt water. I scarcely need say that the noble fish acts upon a far higher and more important motive than fleeing in this battledore-and-shuttlecock fashion from two little insignificant foes. The salmon ascends to the head waters of the rivers not to avoid the presence of the 'sea-louse,' but in obedience to the instinct implanted in it, to find a fitting place for the deposit of its eggs, and for the reproduction of its species. The males of these parasitic crustacea are so minute, and so totally unlike the females, that few of them have been satisfactorily recognised, and of their embryology and development hardly anything is known. I, therefore, direct your attention to this, as another department of microscopical zoology in which much work remains to be done. An examination of the stomachs of fishes will well repay the naturalist for the trouble of making it, not only on account of the parasitic entozoa which are generally found there, but because some fishes, especially the cod tribe, are good collectors of waifs and strays which sometimes prove valuable. They are exceedingly fond of the crustacea, and as they do not masticate their food, amongst the remains of it may often be discovered specimens of those which frequent deep water, and are consequently rare and difficult to obtain by any other means. It is impossible to name anything which a cod will not gorge. I have, myself, amongst other odds and ends, taken from the stomach of one a large lump of coal, the sleeve of a fisherman's red guernsey, and the heel of an old boot; and, from another, a rib-bone of a loin of mutton, and two under-cooked potatoes, which I had thrown overboard not many minutes before he was hooked. Captain Charles Hill, master of the North Sea fishing smack 'Hurricane,' mentioned to my friend Mr. Buckland and myself his having found in a cod's stomach a bunch of keys which he had dropped overboard off Cape Wrath, miles away from where the cod was caught. But, perhaps, the strangest thing ever found in a fish's stomach is the metal spirit flask which I hold in my hand, and for the loan of which I am indebted to my friend Mr. Henry Ffennell, son of the late respected Inspector of Salmon Fisheries, to whom it was given. It bears the following inscription:—'Royal Irish Fisheries Company. This flask, containing two glasses of an ardent spirit, was found in the stomach of a ling taken off Berry Head, February, 1849.—Presented by James E. Stopford, Esq., L.L.D., Director, and Wm. Andrews, Esq., Manager, to Wm. J. Ffennell, Esq., in testimony of esteem, and of their sense of the services rendered by him as Commissioner of Fisheries.' We are yet only at the beginning of the list of objects of interest which may be found on a fish-stall in an inland town; but time passes, and I must stop; for it would be impossible for me to catalogue the hundredth part of them. I can only hint at an examination of the structure of the bones and teeth of fishes, their earbones or otoliths, and the crystalline lenses of their eyes; of the shells of the crustacea, the ciliated gills of the oyster and the mussel, the eyed mantle of the scallop, the exquisitely toothed lingual membranes of the whelk and periwinkle, &c., and the *tunicata*, polyzoa, annelids, sponges, &c., &c., which are to be found on the shells of some of them. But I must remind you that in about a month from now you may have an opportunity, if you choose, of observing the development of young oysters from the condition in which the spawning mollusc is said to be 'white-sick' to that in which, with perfectly-formed double-convex valves, they are ready for extrusion from the mantle of the parent when it is said to be 'black-sick.' And now, gentlemen, although I have drawn only an outline sketch, I think I have said enough to cause you to agree with me that if, whilst searching for pretty objects for his cabinet, the young microscopist will study the structural and comparative anatomy of the sea-creatures laid out before him, he may learn many a lesson in marine zoology, and contemplate many a 'wonder of the deep' without 'going down to the sea;' and that if he appreciate properly the exquisite harmony of their organs and parts, and their perfect adaptation to the circumstances in which they are placed, and the uses to which they were intended to be applied, there is possibly another lesson still that he may learn whilst thinking over 'The Microscopy of a Fishmonger's Shop.'"

Two or three questions, pertinent to the subject, having been put by Mr. F. Warren, Mr. H. Long, and Dr. Strong, and replied to by the President, the thanks of the Club were heartily accorded to that gentleman for his highly interesting and instructive paper.

It was also announced that this was the last meeting prior to the recess, and it was mentioned that three or four excursions had been contemplated during the summer months, of which notice would be given through the usual media.

The following gentlemen exhibited objects, more or less intimately connected with the paper that had been read:—The President, Mr. A. D. Taylor, Mr. J. Berney, Mr. Cushing, Mr. J. S. Johnson, Mr. Henry Long, Mr. Edward Sturge, and

Mr. K. McKean. Mr. J. S. Johnson presented to the library lithographed drawings of Trilobites, for which the thanks of the Club were accorded.

June 19*th*, 1872.—The members of the Club joined those of the Quekett Microscopical Club in a very pleasant excursion to Leatherhead.

June 29*th*, 1872.—An excursion to Addington Park, by kind permission of His Grace the Archbishop of Canterbury.

July 13*th*, 1872.—Excursion to Caterham Valley and Godstone, to meet the Quekett Microscopic Club.

On Saturday, August 24*th*, 1872, about 25 members visited Gatton Park, the seat of Lord Monson, by kind invitation of H. M'Almont, Esq., the proprietor. A number of gentlemen, who went by an earlier train, were invited by this gentleman to partake of lunch; after which they had the pleasure of examining the beautiful chapel attached to the mansion, and the large collection of valuable works of art. When the second contingent arrived, the party adjourned to the lake, and spent the afternoon in searching among the weed and mud for objects of microscopic interest, returning from Redhill about six o'clock.

September 18*th*, 1872.—On the "MICRO-LEPIDOPTERA," by Mr. A. D. TAYLOR.—This valuable paper was one which contained much information on these microscopic insects. Mr. Taylor went through many species, detailing their various characteristics, as also the localities where they may be found. Some discussion took place afterwards upon the relative value of laurel leaves, chloroform, and cyanide of potassium, for the purpose of killing insects intended for preservation, all three substances being used by various members of the Club.

At the close of the paper, Dr. CARPENTER, by permission of the PRESIDENT, stated that it was intended to form a Museum in connexion with the Literary and Scientific Institution in the town. On the completion of the School of Art, the room now occupied by its classes will be adapted for a local Museum. The valuable collection of the Surrey Archæological Society has already been placed in a room in the building, and thus forms a nucleus for further additions. This is a work in which the members of the Microscopic Club may do much to help, and it is hoped that the members will be willing to do what they can in the matter.

The PRESIDENT promised his assistance, and there is no doubt that others will come forward as well.

The following gentlemen were elected members of the Club: Messrs. W. Mosse Robinson, H. Turner, George Smithers, jun., F. Gibbes, and H. Martin.

October 19*th*, 1872.—Paper read by Mr. E. F. JONES on the "VOLVOX GLOBATOR."—In this paper Mr. Jones propounded a new theory regarding the origin of the earth, and the other bodies of the solar system.

Another paper, by Mr. D. E. GODDARD, of Dorking, was read by Mr. M'KEAN, on the "SLIDE KNOWN AS ROLLING STONES, AND THE MODE OF PREPARING IT."—The paper described the various experiments by which the writer pursued the investigation, till at last he achieved an entire success.

November 20*th*, 1872.—Paper on "THE DISPERSION OF SEEDS," by Mr. GEORGE PERRY.—The writer commenced by describing the mode in which the seeds of the mushroom are spread, beginning with one spore, which produces a single mushroom. This ripens and produces a number of seeds, which drop in a ring round the single plant. These again produce their spores, and thus the ring increases until we see the dark green rings known as fairy-rings. Amongst others, Mr. Perry described the burdock, with hooked seeds, which attach themselves to any passing body; and some with winged appendages, with feathered appendages, seeds with pods, and those of ferns, with many others were described. The lecturer concluded with some remarks on the great value of the study of Botany.

The PRESIDENT followed up the paper by stating that in examining skins of the Coypu, of South America, he had often found the prickly burrs, or seed pods of a plant, thus showing that the animals have been the unconscious means of spreading the seeds. In the discussion which ensued, Dr. STRONG referred to the extraordinary vitality in some seeds, as shown by those seeds of wheat which are found in the mummy cases of Egypt.

Mr. Beeby exhibited specimens of *Juncus capitatus* and *Juncus pygmæus*, two plants new to British Flora, which he found in Cornwall last June. He also showed a specimen of *Œnanthe lachlenalii*, a plant common in salt marshes, but hitherto unknown as an island plant.

The PRESIDENT expressed the gratification he felt that the Club had received the original communication made by Mr. Beeby, and hoped that the members would be able from time to time to add to our knowledge of new and local species.

November 27*th*, 1872.— SOIREE AT THE PUBLIC HALL. — This gathering may be again described as a most complete success. Amongst those present were many of the most respected residents in the district. In addition to these were some from a distance, who had come specially to honour the Club by their presence; amongst whom was Dr. Chambers, the Mayor of Margate.

Deputations were sent by the following Clubs and Societies:—The Royal Microscopical Society, the Old Change Microscopical Society, the Quekett, South London, the Forest Hill, West Kent, and Margate Microscopical Clubs.

Many of the principal London makers kindly exhibited instruments.

The following members of the Croydon Club exhibited objects:—

H. Lee, Esq. (President), Dr. Carpenter, Dr. Strong, Dr. Whitling, Messrs. J. W. Flower, G. Corden, J. S. Johnson, Henry Long, C. W. Hovenden, G. F. Linney, W. J. Nation, Alfred Crowley, Philip Crowley, J. J. Gill, G. N. Price, F. Warren, A. D. Taylor, G. Manners, W. R. Cooper, T. Cushing, C. F. Clark, A. G. Roper, H. W. Beeby, Henry Crouch, McRae, G. Purser, and H. Lee, jun.

The room was tastefully decorated by Messrs. Ridge and Son, of North-end; and the platform was covered with a choice collection of exotic plants by Mr. J. H. Ley, of Lansdowne-road.

The Music was excellent; Mrs. Mendham presiding at the piano.

In addition to the objects shown by the members with their microscopes, there were Stereographic views of Switzerland and Italy, with numbers of other curiosities, exhibited by the President; Shells of the Genus Conus, by Dr. Carpenter; Antiquarian relics, by Mr. J. W. Flower; a valuable collection of portraits, by Mr. G. Manners, F.S.A.; but it is impossible to enumerate all. The committee have to thank those gentlemen who came from a distance to give such valuable aid, as well as those of their own members who assisted.

The refreshments were supplied by Messrs. Biddell and Son, High-street.

December, 18*th*, 1872.—On "THE FORAMINIFERA IN THE CHALK," by Mr. ARTHUR ANGELL, of Guildford, read by Dr. STRONG.—The writer entered fully into the subject, describing the peculiarities of these singular forms of fossil shells. They are so minute that the microscope has hitherto failed to detect either digestive or respiratory organs. The theory of their formation is that when the chalk was deposited there, minute shells were mixed with the oozy mud at the bottom of the sea; and in the course of ages the whole has formed one solid mass of chalk. At the conclusion of the paper discussion took place on the subject, in which the PRESIDENT, Dr. CARPENTER, and Mr. M'KEAN took part.

A paper on "THE PREPARATION OF POLYCISTINA," by Mr. D. E. GODDARD, read by Mr. T. CUSHING.—This paper contained useful suggestions to those members engaged in mounting; and was extremely well received. The Hon. Secretary supplemented the paper by some suggestions as to mounting derived from the pages of his own experience.

Several members exhibited objects kindred to the lecture; amongst these were Messrs. W. R. Cooper, H. Long, K. M'Kean, G. Manners, H. Ashby, J. S. Johnson, and A. D. Taylor.

The following gentlemen were admitted members of the Club, viz.:—Messrs. H. W. Winshurst, E. W. Townly, and D'Archambaud.

LIST OF MEMBERS.

Adams, W. A., Dingwall-road.
Adams, T. R., M.D., Ottoman Villas, St. James's-road.
Allsop, Marston, London-road.
Anderson, J. C., Albert-road, Addiscombe.
Ashby, Henry, St. James's-road.
Austen, Nathaniel Lawrence, F.L.S., F.Z.S., "The Acacias," Pitlake.
Baker, Samuel, Montague Villa, Lansdowne-road.
Baldiston, Frederick, Hanover Villa, Lansdowne-road.
Beeby, H., 41, North-end.
Berney, Edward, M.R.C.S., 73, High-street.
Berney, John, F.R.M.S., 61, North-end.
Berry, Edward, Park Hill-road.
Bennett, Arthur, 107, High-street.
Bindley, T., St. Peter's-road.
Blake, W. J., Duppas Hill-terrace.
Blockey, W. F., 38, London-road.
Bonus, Charles, Oakwood House, Sydenham-road.
Brodie, Robert, M.A., George-street.
Carpenter, Alfred, M.D., J.P., 113, High-street.
Clarke, F. C., Farnham House, Morland-road.
Clarke, A. H. 143, High-street.
Cleaver, H. A., M.R.C.S., 40, North-end.
Cooper, George, M.R.C.S., 4, George-street.
Cooper, W. R., Escholt Royd, Oakfield-road.
Cordon, George, 53, High-street.
Corry, John, "Rosenheim," Park Hill-road.
Crowley, Alfred, Bramley Oaks, Bramley-hill.
Crowley, Jonathan Sparrow, 3, Park Hill-rise.
Crowley, Philip, Waddon House.
Cushing, Thomas, 1, Manilla Terrace, Albert-road.
Dickens, Richard Joseph, Addiscombe-road.
Dix, T. H., 36, High-street.
Diver, Ebenezer, M.D.
Drummond, Arthur B., Derby Terrace.
Drummond, John, 76, North-end.
Drummond, William, 2, Sydenham-road.
D'Archambaud, A., Albert-road, Upper Norwood.
Eastty, J. M., J.P., Wellesley House, Wellesley-road.
Edridge, T. R., J.P., "The Elms," High-street.
Evans, Henry, Bramley-hill.
Ewart, Ernest, Edwin Villa, Mayday-road.
Fagg, Edward, Warwick Villa, Addiscombe.
Flower, John, M.A., F.Z.S., Fairfield-road.
Gibbes, F. J., Alverton House, South Penge Park.

Gibson, John, Canning Lodge, Addiscombe-road.
Grundy, Charles, Outram Villa, Outram-road, Addiscombe.
Haddock, Roland, 64, High-street.
Hales, Edward, 27, The Waldrons.
Hodges, O. T., 19, St. John's-road.
Hopgood, James, Clapham Common.
Horsley, Henry, M.R.C.S., 24, North-end.
Hovenden, C. W., 2, Hyde Park Villas, Wandsworth Common.
Hovenden, T., Arbor End, Selhurst-road.
Hudson, Robert, F.R.S., J.P., Clapham Common.
Ingrams, William, Whitgift School.
Jacobs, Alfred R., Carshalton.
Johnson, Cuthbert W., F.R.S., Waldronhyrst, The Waldrons.
Johnson, J. S., M.R.C.S., 105, High-street.
Jones, E. F., St. Germain Villa, Forest Hill.
Klasson, H. M., Upper Grove, Selhurst-road, South Norwood.
Lanchester, Henry, M. D., Encombe Villa, Lansdowne-road.
Latham, Baldwin, Whitgift Lodge, Wellesley-road.
Lashmar, Charles, M.D., Wellesley-road.
Lee, Henry, F.L.S., F.G.S., F.R.M.S., The Waldrons.
Lee, Henry, jun., The Waldrons.
Leeds, C. E., Selhurst-road, South Norwood.
Linney, G. F., Friends' School, Park-lane.
Long, Rev. D., Bramley-hill.
Long, Henry, M.Q.M.C., &c., 90, High-street.
Loy, William Thomas, 9, Garrick Chambers, Garrick-street, London.
Major, C. W., Cromwell House, Duppas-hill Terrace.
Manners, George, F.S.A., F.L.S., The New Terrace, Lansdowne-road.
Marshall, Edward, M.R.C.S., Mitcham.
Martin, Howard, The Ferns, Addiscombe.
McKean, Kenneth, jun., Bramley-hill.
Moore, John, Oakwood, Park-hill.
Morland, Charles Coleby, Rastrick Lodge, Morland-road.
Mosely, T. B., Raymond Buildings, Gray's Inn.
Muggeridge, T. Benjamin, Upper Addiscombe-road.
Muggeridge, W. H., Lower Addiscombe-road.
Nation, W. J., M.Q.M.C., 1, Clifton Villas, Thornton-road.
Newton, Charles, Crossland Villa, Broad-green.
Noakes, Henry, Whitgift Street.
Olding, William M. B., F.R.S., Sydenham-road.
Oswald, Edward Charles, The Palace.
Owens, Henry, M.D., F.R.M.S., 6, Sutherland Villas, Selhurst-road.
Page, Joseph, 5, Ebenezer Terrace, Parson's-mead.
Paget, Peter, Combe-lane.
Pain, O., 30, High-street.
Peek, W. H., M.P., Wimbledon House.
Penley, C., Fairfield-road.

Perry, G., Park-lane.
Petherick, H. W., Maple Lodge, Havelock-road, Addiscombe.
Podmore, H. R. B., Bramletyr, Bramley-hill.
Price, G. N., St. Peter's-road.
Punnett, P. S., "Wintons," Park Hill-road.
Purser, George, 3, Wellesley Villas, Sutton.
Reid, George, 3, Athol Villas, St. James's-road.
Ridge, Byron, 60, North-end.
Rigby, G., Wellesley-road.
Roberts, Rev. G. R., The Limes, High-street.
Robinson, W. Mosse, Birdhurst.
Rogers, W. Edward, Shaftesbury Cottage, Lansdowne-road.
Roper, A. G., M.R.C.S., 57, North-end.
Rowland, W. H., High-street.
Rutley, Charles, The Oaks, Warrington-road.
Simons, George, Beddington-lane.
Snelling, W. H., Selhurst-road, South Norwood.
Smithers, George, Duppas-hill.
Smithers, George, jun., Duppas-hill.
Spencer, G. J., The Grange, Sutton Common, Sutton.
Spencer, John, M.Q.M.C., The Grange, Sutton Common, Sutton.
Stanley, W. F., "Stanleybury," Albert-road, South Norwood.
Stephenson, H. P., The Hermitage, Warrington-road.
Stevenson, Albert, Oak Hill-road.
Steele, Joseph, L.D.S., M.R.C.S., George-street.
Strong, H. J., M.D., North-end.
Sturge, Edward B., The Waldrons.
Suffield, Rev. R. R., Alfred Villa, Parson's-mead.
Sutherland, W., M.D., George-street.
Taylor, A. D., Ripley-place, Dingwall-road.
Thrale, Peter, George-street.
Thrale, Ralph, George-street.
Toms, Alfred, Lytchett Villa, Tavistock-road.
Townsend, Harry, Harefield, Cheam.
Townly, E. W., 116, High-street.
Tritton, Thomas, 2, Clifton Villas, Selsdon-road.
Turner, H., Wellington Terrace, St. James's-road.
Twentyman, Alfred, Fairfield House, Addiscombe-road.
Warren, Francis, Ailsa Villa, Wellesley-road.
Watney, D., Bedford Park.
West, Frederick, The Waldrons.
West, Frederick, jun., The Waldrons.
Whiffin, G., Bramley-hill.
Winshurst, H. W., Thicket-road, South Norwood.
Whitling, Henry Townsend, F.R.C.S., F.R.M.S., High-street.
Wood, J. D., Woodbine Cottages, Upland-road.
Woodward, John, 1, Lee's Villas, Canning-road.

CROYDON MICROSCOPICAL CLUB.

RULES.

OBJECTS OF THE CLUB.

The Club is constituted for the mutual help of its members; for the discussion of subjects connected with, or dependant upon Microscopical research; for the exhibition and exchange of Microscopic Objects and Preparations; and for the promotion of the study of Microscopy and Natural History generally.

MANAGEMENT OF THE CLUB.

The business of the Club shall be conducted by the President, Treasurer, and Hon. Secretary (*ex-officio*), and nine other members—three to form a quorum. Two of the Committee shall retire every year, but shall be eligible for re-election at the Annual General Meeting.

MEMBERSHIP.

1.—Every candidate for membership shall be proposed by two or more members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the Form appended. The certificate shall be read from the chair, and the candidate therein recommended balloted for at the following meeting—three black balls to exclude.

2.—The Annual Subscription shall be 10s., payable in advance on the 1st of January, and no person shall be entitled to the privileges of the Club until his subscription has been paid.

3.—Distinguished men may be elected Honorary Members of the Club, provided they do not reside within the district; such honorary and corresponding members shall not be subject to any of the expenses of the Club, and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall by their merit satisfy the committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any member from the Club, the same shall be done by a resolution of the committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the members present shall vote for such member's expulsion, he shall no longer be considered a member.

7.—Any member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the member by whom he is introduced, in a book to be kept for that purpose.

ORDINARY MEETINGS.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at eight o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other time as the committee may appoint.

2.—The ordinary course of proceedings shall be as follows :—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.

II.—The names of candidates for membership shall be read, and the ballot for the election of members shall take place.

III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the members present at any ordinary meeting shall elect a chairman for that evening.

4.—No paper shall be read which has not received the sanction of the committee; and, whenever it is possible, early notice of the subject of the papers to be read shall be given by the secretary to the members. No paper shall exceed fifteen minutes in the actual reading, unless by the especial permission of the chairman.

BUSINESS MEETINGS AND ELECTION OF OFFICERS.

1.—The accounts of the Club shall be audited by two members appointed at the ordinary meeting in December. No member of the committee shall be eligible as an auditor.

2.—At the same meeting notice of the annual meeting in January shall be given from the chair, and the nomination of members for election as officers for the ensuing year shall be announced.

3.—An annual meeting of the Club shall be held, in the place of the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the committee on the affairs of the Club, and the balance-sheet, duly signed by the auditors, shall be read.

4.—No permanent alteration in the rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or additions must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

—o—

CROYDON MICROSCOPICAL CLUB.

Mr.

of

being desirous of becoming a Member of this Club, we beg to recommend him for Election.

(on my personal knowledge).

This Certificate was read 187

The Ballot will take place 187

—o—

NOTE.—The foregoing Rules were adopted at a general meeting of the original members of the Club, held on the 16th of March, 1870, when the following gentlemen were elected as officers and members of the committee.

President—MR. HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.
Treasurer—MR. JOHN WICKHAM FLOWER, F.G.S., &c.
**Hon Sec.*—MR. HENRY LONG.

Committee:

JOHN BERNEY, F.R.M.S.	G. F. LINNEY.
ALFRED CARPENTER, M.D.	GEORGE MANNERS, F.S.A.
WILLIAM REEVE COOPER.	GEORGE PERRY.
PHILIP CROWLEY.	HENRY J. STRONG.

FREDERICK WEST, Jun.

*Communications to be addressed to the Hon. Sec., 90, High-street, Croydon.

THE LIBRARY.

RULES FOR THE CIRCULATION OF BOOKS.

1.—Books to be lent out to Members at any time when the Library of the Literary Institution, at the Public Hall, is open, on application to Mr. Pusey, the Librarian.

2.—All books and periodicals to be marked with the stamp of the Club and numbered before being circulated, and kept in such a place as shall from time to time be determined by the committee.

3.—Members may obtain books by making personal or written application for them, and by signing a receipt for the same, which shall be held by the Librarian until the book is returned. No member shall have more than one work at a time, nor shall he keep any work for a longer period than 14 days. But when a book is returned by a member it may be borrowed by him again, provided it has not been bespoken by any other member. Books which have been bespoken shall circulate in rotation according to priority of application.

4.—Standard works, as shall be named by the committee, to be kept for reference and not to be lent out.

5.—Members retaining books longer than the specified time shall be subject to a fine of one penny per day. If any book be retained by a member for two months, and be not returned after written application has been made for it, the committee may order it to be replaced and charge the member in default with the amount thus incurred, in addition to the fine. If any book, when returned by a member, is found to have been damaged during the period such member has had it, a fine equivalent to the injury shall be paid by the member.

LIST OF BOOKS BELONGING TO THE CROYDON MICROSCOPICAL CLUB.

1	Vol.	Beck's Illustrated Catalogue of Scientific Instruments.
1	,,	The Rev. J. B. Reade's Address before the Royal Microscopical Society.
1	,,	The Achromatic Microscope, by Beck.
1	,,	Polarized Light, by Charles Woodward.
1	,,	Davies on Mounting.
1	,,	Collection and preparation of Algœ, by Johann Nave
2	,,	Smith's Diatomaceæ.
1	,,	Quekett on the Microscope.
1	,,	Carpenter on the Microscope.
1	,,	Microscopical Manipulation, by Suffolk.
1	,,	How to work with the Microscope, by Dr. Lionel S. Beale.
1	,,	Marvels of Pond Life, by H. J. Slack.
1	,,	Carpenter's Foraminifera.
1	,,	Turton's British Shells.
2	,,	Bentham's Flora.
1	,,	Berkeley's Cryptogamic Botany.
1	,,	Lectures on Histology, by Quekett.
1	,,	Human Microscopic Anatomy, by Kalliker.

Nos. 20, 21, and 22, Journal of the Quekett Microscopical Club.
Lithographed Drawings of Trilobites.

FOURTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 15, 1874.

CROYDON:
PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1875.

FOURTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 15, 1874.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH-STREET.

1875.

OFFICERS AND COMMITTEE

FOR THE YEAR 1874.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

JOHN WICKHAM FLOWER, F.G.S., &c.

Honorary Secretary:

HENRY LONG, M.Q.M.C.,

90, High Street, Croydon.

Committee:

JOHN BERNEY, F.R.M.S.
ALFRED CARPENTER, M.D.
WILLIAM REEVE COOPER.
PHILIP CROWLEY.
G. F. LINNEY.
GEORGE MANNERS, F.S.A.
GEORGE PERRY.
HENRY J. STRONG, M.D.
FREDERICK WEST, Jun.

REPORT OF THE COMMITTEE.

The Fourth Annual Meeting of this Club was held in the Reading-room of the Literary Institute on Wednesday evening, January 15th, H. Lee, Esq., President, in the chair. The minutes of the last meeting having been read and confirmed, the undermentioned gentlemen who had been nominated for membership were balloted for and declared duly elected :—Mr. Walter Walters, Park Hill-road, Croydon ; Mr. John Shepherd, "The Hollings," Sutton ; Mr. C. Chambers, "Eversfield," Sutton ; Mr. William Harrison, 2, St. John's-villas, Bensome Manor-road, Thornton Heath ; and Dr. Barrett, Carshalton. The following gentlemen were nominated for membership at the next meeting :—Mr. John Oldfield, No. 16, Tamworth-road, Croydon ; Mr. C. J. Jolland, St. Peter's-road ; Mr. Frederick Fletcher, Eastnore House, Howard-road, South Norwood ; Mr. John Gregory, Dark Hill-lane ; Mr. Charles Millard, Brandries Hill House, Beddington ; Mr. C. Jecks, 26, Langham-place, Northampton ; Mr. Charles Waters, George-street, Croydon ; and Mr. Edward Lovett, Holly Mount, Upper Addiscombe.

Mr. H. Long, the Hon. Secretary, then read the following

ANNUAL REPORT OF THE COMMITTEE.

The Committee of the Croydon Microscopical Club have much pleasure in submitting to the Members the Fourth Annual Report of the Club's proceedings. During the year 29 new Members have been elected, and there have been 11 withdrawals, principally through Members leaving the neighbourhood. The Committee have to refer with regret to the death of an eminent Member, J. W. Flower, Esq., their respected treasurer. The number now in the Club is 149.

The Monthly Evening Meetings continue to be attended with great success, both as regards the numbers usually present, and the interesting nature of the Papers that have been read ; and it is also gratifying to the Committee to have observed that a greater number of Members have brought their microscopes to these meetings to assist in illustrating the Paper of the evening, as well as to exhibit objects collected and mounted by themselves. The Committee are desirous that even more of those Members who have the opportunity will bring their instruments on these occasions, feeling sure that individual endeavour to show objects not hitherto exhibited acts as a healthy stimulus to the Members. The following Papers have been read :—

January 6th.—"On the Organs of Respiration in some of the Invertebrate Animals," by Mr. J. S. Johnson, M.R.C.S. ; and "Some Notes of Observation of Animal Life in the Brighton Aquarium," by the President.

March 19th.—"On the Entozoa," by Mr. Henry Ashby.

April 16th.—"On the Structure and Distribution of Blood Vessels," by Dr. Greenfield.

May 21st.—"On Coleoptra," by Mr. A. D. Taylor.

September 17th.—"On Blood," by Mr. Cecil Saunders.

October 15th.—"On several undecided or doubtful points in Natural History," by Mr. Simpson.

November 19th.—"On Dry Rot and its Cryptogamic Alliances," by Dr. Alfred Carpenter.

December 17th.—"On Colour of Flowers," by Mr. Charles Jecks.

The Fourth Annual *Soirée* was held on the 26th November. The larger and smaller halls of the Literary Institution, besides extra rooms, having been secured for it, greater accommodation was afforded for visitors and exhibitors, and it is pleasing to the Committee to report that amongst the latter was a greater number of our Members; and as other Clubs were also more fully represented, the table-room of the larger hall was devoted almost exclusively to microscopes, and there was a better display of instruments than at any previous *Soirée*.

The smaller hall was well filled with objects of interest, and an extra room was set apart for dissolving views, kindly provided and shown by Mr. George Manners, a Member of the Committee. It was arranged that exhibitors, not Members of the Club, should have an extra ticket for a friend, so that the attendance was much increased, and notwithstanding the inclemency of the weather on the day of the *Soirée*, tickets to the amount of £22 7s. 6d. were sold.

The thanks of the Club have been conveyed to the Members of the following Societies, who kindly assisted on the occasion :—The Royal Microscopical Society, the Quekett Microscopical Club, the Forest Hill and Sydenham Microscopical Club, the South London Microscopical Club, the Old Change Microscopical Society, and the Hackney Scientific Association.

Excursions to the following places were arranged during the summer recess :—

June 14th.—To Reigate, in connection with the Quekett Club.

June 17th.—To Leatherhead, and Quekett Club Annual Dinner.

July 12th.—To Hampton Court.

August 12th.—To Wandsworth Common.

September 6th.—To Bromley, for Keston.

There is room for improvement in the number of Members who join in these excursions, and the Committee would be glad to receive any suggestion calculated to induce others to attend them. It has been suggested to the Committee that early morning excursions in the neighbourhood during the summer months might be sufficiently supported to encourage their organisation. It would certainly afford an opportunity for combined outdoor work to those who cannot attend the Saturday afternoon excursions.

By the accounts it will be observed that the sum of £5 8s. 11d. has been expended in books, and the Committee are prepared to make a further outlay in works that may be suggested by Members as likely to be useful additions to the library. The books are in the care of Mr. Pusey, librarian of the Literary Institution, and may be obtained by Members complying with the rules for the circulation of books given at the end of the report of last year's proceedings.

During the year Members have attended, as representatives of the Croydon Club, *Soirées* given in connection with the Old Change Microscopical Society, the Quekett Club, the Hackney Scientific Association, and the South Norwood Microscopical Club. A number of our Members have also exhibited, by invitation, at *Soirées* held at the Crystal Palace and at the General Post Office, London. The assistance given by our Club at these interesting gatherings has been duly acknowledged by the different Clubs.

BALANCE SHEET FOR THE YEAR ENDING DECEMBER 31st, 1873.

Receipts.

		£	s.	d.
By Balance in hand ...				
,, Sale of *Soirée* Tickets...		67	15	3
,, Members' Subscriptions		22	7	6
Unpaid Subscriptions ...	3 10 0	65	0	0
		£155	2	9

Expenditure.

	£ s. d.	£	s.	d.
Hire of Room for Monthly Meetings ...		5	12	6
Advertising and Printing ...		2	10	9
Mr. Baldiston, Printing Third Annual Report and Abstract of Proceedings ...		7	15	0
Postages ...		1	13	8
Stationery ...		0	6	0
Mr. J. Wheldon, for Books ...		5	8	11
Messrs. Maw and Son, for Stamp...		0	12	6
Mr. J. Jones, attending to Lamps, and Oil for ditto ...		1	0	6
Attendant on Secretary at Meetings ...		0	10	6
Sundries ...		0	16	6
Soirée Expenses.	£ s. d.			
Printing and Advertising ...	6 19 10			
Messrs. Standidge & Co., Admission Cards	2 14 0			
Hire of Halls and Rooms ...	7 7 0			
Refreshments... ...	11 2 5			
Hire of Piano, &c. ...	1 1 0			
Police, Ticket Collector, and Attendants ...	0 18 0			
Postages and Stationery ...	2 2 9			
Mr. Hodder, for Tables ...	8 2 6			
Hire of Lamps ...	1 4 6			
Messrs. Ridge & Sons, Decoration of Stage...	2 0 0			
Green Baize ...	2 19 3			
Mr. Pollard, ...	0 18 9			
Carriage, Bill Posting, and Sundries ...	2 7 10			
		49	17	10
By Balance in hand ...		78	18	1
		£155	2	9

ALFRED CARPENTER, *Treasurer.*

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct.

January 13th, 1874.

GEORGE COOPER, } *Auditors.*
J. S. JOHNSON, }

The President, before asking anyone to move the adoption of the report, intimated that the Committee would be very glad to hear any suggestions or remarks from the Members. He might tell them that there was an increase of £10 in the balance, and he could not help congratulating the Club upon the increase in its numbers, as five Members had joined that evening, and eight more were proposed for membership. A great many joined because they wished for information on subjects with which other Members of the Club were acquainted, and for his own part he was always a learner, and as ready to impart any information in his power. It had struck the Committee that they might do good service to the junior Members, and perhaps to some of the older ones, if they invited Mr. Suffolk, or some other gentleman of similar experience to give them instruction in the use of the microscope, and also in mounting objects. He thought they might supplement this instruction by having extra meetings of the Club, at which the Members might ask for information on various points. They would have to pay a gentleman for his professional services, but he thought their subscriptions would permit them to pay him out of their funds, and the Club would be greatly benefitted by such an arrangement. With regard to the library, he must tell them candidly that it had not been used to such an extent as he would have liked; indeed some of the books had not been inquired for at all. The Committee would like to buy more books, but they did not feel justified in spending money for books which were not used. He did not think, because they had a balance, that they were bound to spend it, but that they ought rather to look forward to the future. He hoped the time would come when they would meet in connection with the museum, which would be open till ten at night for the benefit of the working classes. If any Members of the Club would assist in explaining various objects of natural history to the working men, he was sure it would be their delight to do so; indeed, he thought that some arrangement might be made by which the Club might have the use of the museum-room for their meetings, and in return give their services as amateur curators. In such a case, it would be desirable to have funds in hand. (Hear, hear.)

Dr. Carpenter said the proposition made by the President was one which must meet with their approval. For some years he had hoped they would have a local museum which would be of service to the town and to the Microscopical Club. Latterly he had been trying to raise a fund sufficient to enable them to have that museum, and either to appropriate a room beyond the one in which they were assembled, or build a room above it, so as to have a top light, and have it fitted up properly as a museum. He hoped to see this carried out in the course of the present year. Last year many things occurred to prevent it, amongst which was the establishment of the new hospital; the year before was the School of Art; and the year before that the clearing off of the debt of the old church, and a number of other things which had occupied a great deal of his energy and taken money which might otherwise have been appropriated to the object; but during the present Spring he hoped to see the museum carried out, and then there would be a permanent home for the Microscopical Club. He could only look upon the museum as an appendage to their Society. There would be a curator's room, which might be made available as a room for the Members of the Club where they could meet for the purpose of microscopical examination and instruction. If this proposal to obtain professional instruction were carried out, they would rapidly advance to a more general knowledge of the mode of cultivating microscopical examination of the kind of subjects which he had alluded to as being so important, and on which he (Dr. Carpenter) would like to have some instruction; for there were various things connected with microscopical examination which he did not understand. It would be a great pleasure to have assistance and information from such an eminent authority as Mr. Suffolk, and when they had received it many of them would perhaps be able to repeat what they had learned for the benefit of others. He was therefore most anxious to see the museum carried out in the course of the year.

Mr. Warren said, on behalf of the Members of the Club he thought he might express their appreciation of the hints which had been thrown out. As they had an increase of £10, he believed they would fall in with the President's desire to be careful about expending that money, and not to spend it simply because they had it. It struck him very forcibly that they might reserve that money to help on that which was so essential a matter in connection with their Society, viz., the local museum. If they had a museum he hoped it would be of a strictly local character in which they might store objects of natural history, and objects connected with natural science. He felt that if they had such a museum it would be a great incentive to the study of natural science in connection with their own locality. A museum would help the Microscopical Club and also promote the study of other sciences. He was sure the members of the Club wished to help Dr. Carpenter in this object. Let the museum be the cry of the town, and then they would soon get it.

The President explained that it was not the intention to devote one farthing of the funds of the Club to the purposes of the museum. His remarks were simply intended to show the benefit that might accrue to the Club from having the museum, and in return for the hospitality they would receive in having the use of the room, he thought they might give their services as amateur curators, and in many other ways.

The Rev. R. R. Suffield expressed his strong sympathy with the objects proposed by the President, in utilizing their future room. He referred to the immense interest which working men in London took in lectures of a scientific character, and the equally strong desire of the members of the Working Men's Club to be instructed in similar subjects. He thought the Committee of the Microscopical Club might see their way to giving lectures on Saturday evenings, and on other occasions, to a number of people in the town on natural history and kindred subjects. He knew that in the Working Men's Club, the greatest interest was taken in botany and other subjects, and he believed that by promoting the study of these things more would be done to elevate the taste of the people than could be done in any other way. With reference to the library, he thought that when persons took an interest in a book, they usually purchased it, and he suggested that periodicals might be obtained for the use of the Members of the Club. He thought these might circulate when books would not.

The President pointed out, as an objection to the last suggestion, that as three days must be allowed for reading, the last man to receive a periodical would have it several months after the date of its publication, unless the Members of the Club had a room to which they could have daily access.

The Rev. R. R. Suffield asked if a party could be conducted to the Brighton Aquarium, or the museum, under the auspices of the Club.

The President said if there was such a party as would justify him in speaking to Mr. Knight, the General Manager of the London, Brighton, and South Coast Railway Company, he would do so, and he could undertake to say on behalf of the Directors of the Brighton Aquarium that he could offer the party something like free admission. (Cheers.)

Mr. J. Flower then referred to the satisfactory nature of the report which had been read by the Hon. Secretary, and moved that it be adopted, printed in the transactions of the Club, and circulated among the Members.

Mr. Johnson seconded the motion, which was carried.

ELECTION OF PRESIDENT.

Mr. Lee said he had at a previous meeting expressed his willingness to continue to occupy the post of President, if he were asked to do so; but he was also quite willing to give it up to any worthy successor whom the Club might appoint, and the members might feel sure he would not be offended if such a step were taken. He had been very greatly relieved from the detail work and had received all possible co-operation and assistance during the past two years. He would, therefore, gladly continue in office if it were the wish of the Members of the Club, as he was assured it was so. (Cheers.)

Dr. CARPENTER said he rose with very great pleasure first of all to propose a vote of thanks to the President for his services during the past year. He was quite sure that this would meet with their cordial approval, because however well a secretary or committee might work, without the head of the establishment was an equally good workman, as it were, an undertaking was not likely to be so successful as it should be. During the past year the President had thrown his whole heart and soul into the work, and helped the Club in every possible way. They had seen how it had grown and was still growing. This was chiefly owing to Mr. Lee's exertions, and he was sure, therefore, that they would most cordially thank him for his services during the past year. He had now the pleasure of proposing that he be re-elected their President for the ensuing year. (Cheers.) The way in which Microscopical Societies were springing up all over the country was indicative of a growing desire on the part of the people to become more acquainted with natural history and natural science, and it was very important that those who had the management of societies of this kind should be men of knowledge and talent, and who, by their position, were connected with the very subject which a society was formed to promote. It was, therefore, a very happy thing for them to have a gentleman of Mr. Lee's position and acquirements willing and able to take command of their Society; because in proportion to the estimation in which the commander was held would be the estimation in which the Society was regarded. It was on that acconnt that their Club was held in such high estimation by other Microscopical Societies. If the Croydon Microscopical Club stood high in the estimation of other societies, it was entirely due to their President. (Hear, hear.) Mr. Lee had said he should be glad to retire if a suitable successor could be appointed, but he (Dr. Carpenter) could hardly understand the Croydon Microscopical Club without Mr. Lee as its President. It would be like a Liberal Ministry without Mr. Gladstone as premier, or a Conservative Ministry without Mr. Disraeli in the cabinet; it would not do at all, and the thing could not possibly go on. He hoped as long as Mr. Lee was among them they would have the honour of retaining him as their head, and would be willing and able to assist him. He had much pleasure in proposing Mr. Lee as their President for the year ensuing. (Cheers.)

The Rev. R. R. Suffield seconded the motion. He said he had heard the Club highly spoken of in London by gentlemen connected with scientific bodies, and Mr. Lee was always regarded as the centre and founder of it. He also referred to the genial and kindly manner of the President and his happy mode of bringing the Members together, for which, and for his many services to the Club, he considered they owed him a deep debt of gratitude.

Dr. Carpenter put the motion to the meeting and it was carried *nem con.*

The President briefly returned his acknowledgments for the compliment of re-election, and said he would endeavour to do his best for the Club in the future as he had done in the past. Notwithstanding their approval of him, however, he could assure them that there were as good fish in the sea as ever came out of it; but whenever he had occasion to "take a back seat," as the Yankees termed it, he would take care it should not be very far back, and he would be at the right hand of his successor, ready and willing to give him all possible assistance. He would, in fact, always be happy to serve, in any capacity in which they might like to place him, the Members of the Croydon Microscopical Club. (Cheers.)

ELECTION OF TREASURER.

The President having feelingly alluded to the removal, by death, of their late Treasurer, Mr. J. W. Flower, stated that the post which he left vacant had been accepted by Dr. Carpenter, and it was now for the Members to propose that he continue in office.

Mr. Linney endorsed the tribute to the memory of their late Treasurer, whom he highly respected. He then moved that Dr. Carpenter be re-elected as Treasurer to the Club.

Mr. G. N. Price seconded the motion, which was carried unanimously.

THE HON. SECRETARYSHIP.

The President announced that the Hon. Secretaryship of the Club would remain in abeyance till the Committee could find a successor to Mr. Long, who felt compelled to retire, owing to the now onerous nature of the duties, and the claims which his business had upon him. If he thought Mr. Long could be induced to remain in office, there was no solicitation of his which should not be pressed upon him; but after the explanations which Mr. Long had given, he felt that it would be wrong to request him to do so. Mr. Long, however, had kindly consented to continue the duties until a suitable successor could be found. He had now to propose that the cordial thanks of the meeting be given to their Hon. Secretary for the services he had rendered to the Club since its formation, and he hoped that before long it would be possible to add some other expression of their good-will. (Applause.)

Dr. Carpenter, in seconding the motion, also bore testimony to the care and attention with which Mr. Long had devoted himself to the interests of the Club.

The motion having been carried unanimously,

Mr. Long expressed regret that he was unable to continue in office, but explained that the claims of his business, and the increasingly onerous nature of the duties of the Secretaryship, left him on alternative. He felt he should not be doing justice to the Club by continuing in office, but it would be his earnest endeavour to forward its interests so long as he occupied the position. He thanked the Members of the Club for the kindness, good feeling, and forbearance which he had experienced at their hands during the whole time he had been Secretary.

THE COMMITTEE.

Mr. W. R. Cooper and Mr. Johnson were unanimously elected Members of the Committee for the year ensuing.

A vote of thanks was then passed to the Press, and the reporters present were requested to convey to the Editors of their respective journals the appreciation by the Club of the reports which were from time to time given of its proceedings, and of the support which the Society received generally from the local journals.

This terminated the business proceedings of the meeting; but before the company separated the Chairman announced, amidst much applause, that the next Paper would be contributed by himself, and would be "On Certain Developments which have taken place in the Brighton Aquarium."

ABSTRACT OF PROCEEDINGS.

1873.

The following are the subjects that have been introduced, and the Meetings, Excursions, &c., that have taken place.

February 19*th*, 1873.—Paper on "The Organs of Respiration in some of the Invertebrate Animals," by Mr. J. S. Johnson, and "Some Notes of Observations of Animal Life in the Brighton Aquarium," by the President.

The minutes of the last meeting were read by the Secretary.

The President called the attention of the Club to a proposal which had been confirmed by the Annual Meeting, that a library of select scientific works should be formed for the use of the members, and invited suggestions for books to be placed in it.*

Mr. J. S. Johnson then read his paper, "On the Breathing Organs of the Invertebrate Animals," illustrating it by numerous diagrams, showing their peculiar habits and mode of obtaining oxygen for the support of life, either from water or the atmosphere. He first gave an account of the similarity existing between plants and animals at the first moment of their existence, and explained that they all consisted of a cell, containing a nucleus, which has the property of reproducing others like itself. Under the influence of light, heat, and moisture, pure water, so kept that nothing but air shall have access to it, will, after a time, produce them in abundance; the vegetable organisms appearing first, and the animal as soon as there is enough of vegetable matter for their subsistence. Aquatic animals and vegetables for the most part are provided with vibratory organs, which project from their bodies. These are, in some, agents of locomotion; in others, both for movement and the production of a current of water, so as to gain fresh supplies of oxygen. Next the fresh water polypos came into consideration; their form and long arms, or tentacles, were shown, and the manner of seizing their prey; they breathe by means of these tentacles, which are covered with minute processes, called cilia. The leech and earthworm breathe on the aquatic principle; they have no respiratory organs. Water containing oxygen is absorbed through their skin. Of the *Crustacea*,

* See list of books, with rules for lending, at the end of the report.

comprising water fleas, fresh water shrimps, the water-louse, shrimps, prawns, &c., some breathe by flabelliform appendages attached to the feet, others by laminated plates in cavities at the sides of the thorax. *Insects*, many of them, especially flies, are in their larval state inhabitants of the water, and breathe through their tails, which they apply to the surface; when metamorphosed into flies, they breathe through pores, situated on the sides on the body. The gnat, at its first metamorphosis, breathes with its tail; in its second by two tubes attached to the head; in its last, when a flying insect, by pores or stigmata on the sides of its body; the wings are also permeated with breathing tubes. Caterpillars have pores on the side of the body, frequently protected by a sieve-like membrane, which prevents the entrance of dust. Among spiders, which breathe by pores leading to air sacs or lungs within their bodies, is the water spider, and in proof that its habits are most interesting, Mr. Johnson said—I kept some of the water spiders in an aquarium for two months or more, and watched their proceedings. The Argynoreta comes to the surface head foremost, assisted by a thread attached to a leaf or some other object by one end, and to the surface of the water by the other; it turns up the point of its abdomen, and catches a bubble of air; this is retained amongst some hairs on the under part of the body, and produces a shining metallic appearance. With this bubble it dives, and leaves it attached to the plant at the end of the thread under water. The same operation is repeated frequently until the aerial home is large enough. Around this it spins a web to strengthen it, and, when finished, creeps in and there lies in wait for prey. I have seen the males build their dwellings side by side, and noticed the male visit the female, both living in one compartment. After a time my aquarinm was dotted over with little balls or cocoons like cotton, and not very long after a swarm of young ones made their appearance. Many of these crawled out of the water and perished; the remainder soon disappeared, and disappointed me of the pleasure of rearing them. I believe they were eaten by their parents. How these spiders get into and out of their bubble homes, without allowing the air to escape is, to me, a mystery. *Molluscous animals*: Amongst these are the oyster, scallop, and mussel; these breathe by ciliated laminated plates (commonly called the beards), producing a constant current of sea water in and out of their shells, thus obtaining the necessary oxygen for respiration. In the garden snail, an opening exists on the right side near the head, leading to a pulmonary air sac or lung. During hybernation the shell is closed by a natural cement, which is perforated for the admission of air. The aquatic water snails come to the surface to breathe; most of these propagate by eggs; one, as an exception, brings forth its young alive; openings for the admission of air exist on the side of the head, leading to air sacs in their interior. In conclusion, Mr. Johnson alluded to the monad, or unicellular microscopic animal, as the type of the first beginning of life in all animals from the lowest to the highest. These microscopic atoms, he well observed, are calculated to excite the wonder and admiration of those who investigate the subject, and sufficiently attest their divine origin.

The President asked to what peculiarities of motion Mr. Johnson had alluded as the distinguishing marks of animal and vegetable organisms.

Mr. Johnson said as far as his observations went, he thought that animals moved as if they had some purpose in view, avoiding obstacles, and that, on the other hand, vegetable organisms moved much slower, and with a trembling motion.

Dr. Carpenter said: We have heard with considerable satisfaction the observations made by Mr. Johnson, and much admired the excellent drawings with which he has illustrated his paper, but I should like to ask a question or two regarding some of his remarks in the earlier part of it. I should wish to know upon what grounds he concludes that the actions which he has alluded to as taking place in the *Amœba*, and in some other of the lower forms of life in the class *Protozoa*, are respiratory actions. The same action it is which nourishes and which propagates the creature, if creature it is. I doubt the correctness of the definition as being respiration, any more than it is circulation, or motion, or actual life. It may be true animal life. It is asserted by some eminent physiologists that the difference between the animal and vegetable is the production in the one case of carbonic acid by the act of living, and in the other, the decomposition of carbonic acid, and the setting oxygen free; but this does not hold good in every case, for some undoubted plants produce carbonic acid. It is well known also that the important action of movement is set up quite independently of respiration, for a simple alteration of density, such as occurs on different sides of a moist membrane, gives rise to a very active movement indeed, which is not respiration, and which is not life. It is easily shown by placing liquids of different densities on different sides of a piece of bladder. I do not mean to insinuate for one moment that Mr. Johnson is not perfectly right in his idea that everything has proceeded from some germ which has developed into the object. I quite agree to the idea that a preceding germ or ovum is necessary for the production of life, but I cannot agree for one moment with the suggestion, promulgated by some scientific men, that life may be produced by a certain combination of forces independent of life itself; yet, the theory propounded by

Mr. Johnson does not strike me as quite correct. I will grant that if the term is used simply for the purpose of indicating that the withdrawal of atmospheric air would be fatal to the creature, and that that only is understood by the term used, it may be taken as correct; but the removal of air would be equally destructive to the diatoms and desmids as well as to the *Protozoa*, and is therefore something more than respiration.

The President alluded to the manner in which he had seen diatoms move about, avoiding obstacles in their way, but thought that no correct inferences could be drawn from this fact. There was one point, however, which Mr. Johnson had brought forward which was most interesting, namely, the development of many forms of life from monads. He remarked upon the great changes which took place in fœtal life, and upon the fact that crabs, newts, and efts breathed through external branchia, as well as the fœtus in some animals. He highly praised Mr. Johnson's paper, and the excellent diagrams by which it had been illustrated, and gave him some practical hints by which the latter might be made permanent drawings available for future use.

A cordial vote of thanks having been passed to Mr. Johnson for his excellent paper,

The President then gave the following "Notes of Observations of Animal Life in the Brighton Aquarium":—"When I was first hard at work at the Brighton Aquarium on behalf of my friend J. K. Lord, just before its opening, I was often in the building nearly all night superintending the work of the good fellows who so cheerfully and faithfully obeyed my orders, and carried out my plans in a very difficult crisis. I had thus many opportunities of observing the nocturnal habits of the sea-fish. In the daytime tanks in which I had placed dozens of fishes, might have been, and often were supposed to be, devoid of life. The flat fishes, for instance, such as the soles and plaice, and the rays and skates (though of another order) which bask motionless during a great part of the day, and so assimilate themselves in colour to the ground on which they lie that only careful scrutiny can detect their presence, swim gaily at night; and I spent many a pleasant half-hour in watching by the light of my bull's-eye lantern the exquisitively graceful curves of their bending bodies and undulating fins. But my attention was attracted more to the dogfishes than to any other specimens in the tanks. At that time we had but two species there—the roughhound *(Scyllium catulus)* and the picked dog *(Acanthias vulgaris)*. Now, here were two fishes which had long been classed in one family—the *Squalidæ*—both called "dogfish," both belonging to the shark tribe, and very much resembling each other in form and structure, though not in colour, but differing from each other in their habits in a manner which had not been previously observed. I noticed that the "picked dog" *(A. vulgaris)*, swims about actively night and day, whilst on the contrary, the roughhound *(S. catulus)*, and the nursehound (*S. canicula*), are almost entirely nocturnal in their habits. During the day the first-named hug themselves close up to the surface of a rock, or, if possible, in some crevice, head up and stern down; and the latter lie on the bottom, and remain motionless. It was known that one, the "picked dog," brings forth its young alive; and that the other, the roughhound (and also the nursehound), deposits horny-cased eggs, which remain many weeks in the water, attached by tendrils to some sea-weed, stone, or Gorgonia, before they are hatched. But the method by which these eggs were made fast to their anchorage had never been seen by the eye of man, and naturalists differed in opinion whether they were intentionally fastened by the fish, or whether the tendrils were straight at the period of their extension and coiled around prominent substances by some "inherent vitality" of their own. I had the great pleasure of watching one of the oviparous dogfishes, the nursehound *(Scyllium canicula)* deposit its pair of eggs, and of witnessing the manner in which the parent attaches them to plants, rocks, &c., at the sea-bottom, and I cannot better describe it than by quoting from my notes made at the time: At 1.15 one Sunday afternoon, one of the attendants at the Brighton Aquarium noticed that a nursehound had hanging from her, close to her body, an egg which had just been extruded. He quickly drew my attention to it, and I need not say how delighted I was to have the opportunity of observing an operation which has been a subject of speculation and conflicting opinion. The lady tested my patience severely, but it was ultimately well rewarded. The tank in which she was contains more than 50,000 gallons of water, and for five hours she swam round and about, generally near the surface, with an activity quite unusual to these fishes during the daylight, appearing neither to care for, nor to be incommoded by, the appended egg. But about half-past six p.m., when, as it afterwards appeared, the second egg was ready for expulsion, she began to rub herself heavily along the shingle at the bottom of the tank, and to endeavour to free herself of her incumbrance by vigorous contortions of the body and rapid muscular motion of the tail. In readiness for such an event, as we had no *Gorgonias* or *Laminaria*, I had previously ordered to be prepared some artificial *Gorgonias*, made of the twigs of a birch broom, and fastened firmly, in the shape of a little brush, to a heavy stone. One of these I now lowered into the tank, close to the parturient fish. For some time she took no notice of it, and continued, at intervals of about five minutes, her former movements along the ground; but in about half an hour she began to reconnoitre my sham *Gorgonia*, swam round it twice, and then, seemingly satisfied that it would suit her purpose, deliberately tried to make a way through the midst of the little bush near its root. At this part, however, the sticks of the birch broom were stiffer and less yielding than the branches of the "sea-fan," or "sea-weed," for which she took them, and she failed to drive a heading into them; but, with wonderful intelligence, she rose higher and higher, and at last succeeded in separating with her nose the upper and more pliant twigs, and forced a passage for herself through the brushwood. Resting for a second, she, with a quick undulation of the hinder portion of her body, entangled the tendrils at the first-presented end of the egg amongst the branches, and sailing slowly through and around the upper and slighter part of the tree, dragged from her body the tendrils at the other end of the egg, and with them another egg, similarly furnished. The moment this second egg had passed from the orifice, the mother fish gently sank towards the bottom, and curling herself into the form of a ring—nose and tail meeting, and partially overlapping—encircled the base of the bush, and with its stem as an axis, revolved around it fourteen times, winding from her body the tendrils of the last-produced end of the second egg, as silk is wound from a cocoon, or as a seampstress or tailor, in finishing the sewing-on of a button, coils several turns of a thread around the needle-stitches by which it is first fixed. As soon as this was completed she swam slowly away, and gave no further attention to her embryo progeny. I have seen some of these eggs left in a tank with several dogfishes for many weeks, but the latter take no notice of them, and evidently care neither to protect nor injure them. As some present may not have seen the egg of the nursehound, I may mention that it has a horny case of a yellowish colour, and is in shape something like a butcher's tray, or, rather, like two such trays placed together with the convex bottoms outwards. It is four and a half inches long, one and a half inches broad, and about three quarters of an inch thick in the centre. One end is rather rounded off, and I noticed that it is this end which issues first from the body of the fish. The other end is square across. From the four corners, where the handles of the tray would be, are produced horny tendrils, twisted spirally like the spring of a bell-wire, but not so tightly, and gradually becoming thinner, until at their ends they are almost as fine as cobweb or floss silk. I find that the tendrils at the rounded end of the egg of this fish are about three feet in length, and those at the square end five feet. The eggs of the roughhound (*S. catulus*) are smaller than those of the nurse-hound, being about two and a half inches long. The tendrils of these latter measure, at one end, about two feet six inches, and at the other only about twelve inches when stretched out. The egg cases are in no way connected with each other by the tendrils. Before ejection the spirals are not straight, but are very tightly twisted and coiled in a small compass; and, far from "curling round an object by their inherent vitality, after emission, those first protruded gradually *relax* their convolutions; the coils slacken and lengthen out like an overstrained spring of a bell-wire; and it is not by any "inherent vitality" in the tendrils, but by inherent instinct in the parent fish, that they are purposely, and of forethought, entangled with the coral, fucus, or shell, which the mother selects as a suitable anchorage for them. After witnessing the deposition of these eggs, the use and meaning of the several portions of the structure of their cases are plain and unmistakeable. The case itself is made of material sufficiently firm and tough to protect the contained ovum from injury, but not so hard as to be liable to fracture. The rounding off of the corners of the end first extruded facilitates its passage from the body of the fish. The fine flossy ends of the tendrils, curled up loosely, like a lady's "frisette," are just suited to their entanglement with any rough projecting object. The tendrils at the square or "aftermost" end of the case are longer than those first entangled, to enable the fish to wind them round and round, and fasten them off; and when this has been effected, and the flossy ends have "belayed" themselves, the egg case rides securely, moored by skilfully-coiled cables, so elastic that they yield gently to the force of the waves, and it is thus protected from being violently torn from its hold. And yet some will affirm that all this perfect adaptation of means to ends in the construction of these eggs, and the marvellous instinct displayed by the parent in her manner of affixing them, have been "developed by necessity." To my mind the egg of a dogfish furnishes evidence of design in its construction, and testifies to the existence of a supreme intelligence and an omnipotent will.

The reading of this paper was greeted with loud applause; and the President then made some further observations on the "Development of *Hydra Tuba*."

A few days ago, said he, Mr. Lawler, the sub-curator of the Brighton Aquarium, wrote to tell me, with his usual attention to my wish to be informed of anything of especial interest that may occur there, that hundreds of small *medusæ* were swimming about in the tanks. On the Saturday before last I had the delight of watching them in all their beauty. There they were, in countless multitudes, jerking themselves rapidly along in their course, with a motion just like that of the quick opening and closing of a lady's parasol with a slight fringe round it. The brisk, partial closing of the parasol propelled them through the water, ferule foremost; and just at the moment when the impulse ceased to give them any further progressive movement, they opened their little umbrella as wide as possible, and struck out again in the same manner. It was easy to recognise them as the *medusæ* of *Hydra Tuba.* The polypes from which they have been thrown off, have evidently been brought into the tanks on the shells of the oysters, which we have found so useful in rendering the sea-water clear and transparent. Of this I shall have more to say on a future occasion. But these beautiful little fellows have a wonderful history attached to them. The transformation they undergo are almost beyond belief. People are so familiar with the fact that the brightly coloured butterfly or moth has once been a crawling caterpillar, and afterwards a dull chrysalis incapable of locomotion, that they have almost ceased to regard these developments as remarkable, and look on them as a matter of course. But the changes of form and habit in many marine creatures which take place during their varied life, are equally surprising and more complicated; and, owing to the difficulty of observing them, are not so well known to the general public. For instance, the little acorn barnacle (*Balanus balanoides*), whose conical house is seen affixed to almost every stone and shell taken from the sea, was once an active little thing, capable of free motion through the water. The home-staying oyster in its childhood paddled itself about by means of its ciliæ wherever it listed, in a manner which you have before heard described; the jelly-like ascidian was once a minute tadpole; and I might cite dozens of similar instances of marine animals enjoying activity in youth, and subsiding afterwards into sedentary maturity. But the transformations of the *medusæ* are quite as wonderful. The common jelly-fish, or " moon-fish" (*Medusa chrysaora*), which must be familiar to everyone who has had a sea-side holiday, has been observed (by Sir J. Dalyell) to produce minute ova, from which proceed embryos called *planulæ*, little crawling organisms, which by-and-by attach themselves to the rocks, and become metamorphosed into stationary polypes. In this condition, as *Hydra tuba*, they were brought into the tanks of the Brighton Aquarium, parasitically affixed to oyster-shells. *Hydra tuba* has the appearance of a little cone with tentacles, holding by its pointed end to the surface to which it is attached. At a certain period its outline appears corrugated, and a closer examination shows these corrugations to consist of so many little saucers, piled up one within the other. The topmost saucer detaches itself and swims away; and the rest, one by one, follow its example until the cone of *Hydra tuba* is dispersed, and the little saucers are seen to be so many *medusæ*, such as are now abundant in the Brighton tanks, and some of which are on this table. At this stage our real knowledge of their history ceases. It is believed that they continue to grow until they become the large jelly-fishes which are so common in our seas, but I am not aware that any observations have been made of their intemediater development.

Dr. Carpenter proposed a vote of thanks to the President for his original communication. He said it was something to have such a communication submitted to them, and the observations which Mr. Lee had made about things never before observed by the eye of man were particularly interesting. He had no doubt that there were many points with reference to Natural History which would be solved in the Brighton Aquarium. He hoped if their President remained with them, that he would give them, on a future occasion, some observations of a similar character.

The vote of thanks was passed by acclamation, and the President having briefly acknowledged the compliment, the proceedings of a most agreeable evening were brought to a close.

The following gentlemen put their microscopes at the service of Mr. Johnson to assist him to illustrate the subject of his paper :— Messrs. P. Crowley, C. W. Hovenden, G. F. Linney, H. Long, K. McKean, G. Manners, E. Sturge, A. D. Taylor, and Dr. Strong. There was also exhibited by Mr. Henry Ashby, a preparation sold or cocoa, but the microscope revealed it to be composed principally of arrowroot coloured with red ochre. The President exhibited an egg of the dog fish, in illustration of his own paper.

March 2nd, 1873.—Paper on "Entozoa" by Mr. Henry Ashby.

The minutes were read by Mr. H. Long, the secretary, and confirmed.

Mr. Henry Ashby said—Mr. President and Gentlemen : Conscious of the many valuable papers read before this society since its commencement by distinguished gentlemen from beyond our own limits, and also those emanating from our own more prominent members, I have hesitated before occupying an evening of the session now fast drawing to a close. But holding, as I do, that if this Society is to be as successful in the future as in the past, while ever welcoming assistance from the outside, it must look for support for the most part to the exertions of its own members. As one of the rank and file of this Society, I have ventured to occupy your time this evening in considering one of the most interesting classes of the animal kingdom, inasmuch as man, in common with his poorer relatives, plays towards them the part of unwilling host. For not only are we food for worms when this world has done with us, but in our lifetime, as we go about our daily work, we are liable to breed and nourish within us a host of entozoa as our guests—a lot we share with the humblest member of the animal kingdom. For parasitism is a law of nature almost as universal as gravitation, from the smallest monad to the hugest beast, and inhabiting almost every tissue of the body, from the liquid blood to the solid bone. It is plain that such creatures need be of the simplest structure; they need no elaborate digestive apparatus to prepare their food for assimilation when they are surrounded by the ready prepared liquid nourishment of their hosts. We find them, for the most part, destitute of heart or blood-vessels, secretory apparatus, and nervous system of a rudimentary kind. On the other hand, on the principle that "Nothing grows like evil," and necessitated by the vicissitudes of their changing lives, they have very highly developed organs of reproduction. It is evident any systematic attempt to classify them must be difficult, considering the varying circumstances under which they live, and the gaps still to be filled up in their life history. There is one characteristic, however, which they all possess in common with one or two other groups of the animal kingdom, and that is the possession of a *water-vascular* system, which was noticed in the paper read at our last meeting. This water-vascular system is a sort of representative of a system of blood vessels and alimentary canal, the water or fluid in which they live performing the offices of the blood. It consists of a number of channels communicating with one another cut through the parenchyma of the animal, ramifying in all directions, and communicating by one or more apertures with the water outside, some of these vessels being contractile, others provided with ciliæ, by means of which they keep the fluid circulating. By this means the great pabulum of all animal life, oxygen, is brought in contact with their tissues, and by which, in the same way, nourishment is conveyed into the interior and absorbed by the cells. After describing the six groups or orders of worms, which he classed under the name of *Annelida,* Mr. Ashby proceeded with a sketch of the *Ascaris lumbricoides*, a worm which is common to man and his domestic animals, as his first type. It varies in length from 3 to 12 inches, and its residence is the intestine. Beginning at the head, we notice, by means of a lens, three prominent papillæ, which are uniform in size and moveable during life, and are probably suctorial organs, though the animal moves freely about in its abode. The oval aperture leads at once into a strong muscular œsophagus nearly half-an-inch in length; this passes through a slight construction into a straight tube, getting wider as it proceeds, and finally ends near the hinder extremity in a narrow aperture. No trace of any glands can be found; indeed it would be difficult to conceive their necessity in a creature whose food requires so slight modification to convert it into its own protoplasm. All the tissues of the body appear highly elastic and contractile, but the true muscular system consists of four longitudinal bands, passing from one end of the body to the other. The nervous system is represented by one or two ganglia near the mouth, and cords proceeding down the body. The vascular system by contractile canals communicating with the mouth, and spreading over the body, but observers are not agreed about the distribution of the nervous cords and contractile canals. The reproductive powers of these worms are enormous, Dr. Estricht calculating that a mature female ascaris may carry 64 millions of eggs. What becomes of this innumerable horde? Doubtless, many of them perish, perhaps devoured by birds, or other animals incapable of offering them suitable lodgings. But, of one thing we are certain, and that is, the tenacity with which they stick to life. Professor Owen mentions a nematoid worm exhibit vital movements after boiling for an hour in a codfish. Many instances are recorded of their resurrection after being dried; and others, after being soaked in spirits of wine and turpentine. The eggs are ovoid and covered with a transparent envelope. Rechter placed some ova squeezed out of an ascaris into some water and watched them from time to time by the microscope. Segmentation having taken place, the developement of the young was complete in fourteen days. They moved with great briskness, but did not break through their shells. This continued during the autumn, and during the winter they were in a quieter state of mind. Thus, it is probable they remain encysted for a considerable period, until chance throws them in favourable circumstances, when they break through their shells and commence life on their own account. Nothing, however, for certain, is known of their doings from the time they leave the parent till they turn up like base coin in the intestine of some animal. Probably they are about in great numbers swept along by the wind, alighting in stagnant pools, wandering about perhaps among the green pastures of Beddington, floating down the Wandle, or lurking in some gutter on the look out for a thirsty dog. It is evident there are a thousand chances to one that any single worm ever finds its way to a suitable abode, and but for their enormous powers of reproduction their race must become extinct. There are two factors necessary for their developement—the presence of the ova and a suitable soil on which they may flourish. They are more likely to flourish in that individual animal that is out of condition. One may often notice it is the sickly fruit tree on which the blight appears. Anyone who has kept dogs must have noticed if the dog gets at all out of condition, he soon swarms with fleas and other vermin. I have seen this in dogs kept for experiment, that when put upon certain diets for long together, as fat or starch, and when they have undergone operations and got out of condition, they swarm with vermin. However, dogs are seldom wholly free from entozoa, from their irregular mode of getting a living; eating and drinking any refuse, they must constantly be exposed to their inroads. Out of twenty-five dogs I have examined there were only three in which I found no *tænia* or *ascarides*. But these were all dogs that had led a city Arab life. Passing over the oxyuris and its allies, as closely resembling the ascaris, we must delay a while over the *trichina spiralis*, for this little entozoon is invested with more practical interest, inasmuch as it has, perhaps, caused more mischief to the human race than any other. The mature trichina inhabits the intestines of man and animals. It measures one-eighteenth to the one-eighth of an inch in length, with a round file-form body, narrow head, finely pointed, unarmed with hooklets or suckers, and as a single oval aperture. According to Leuckart, on the second day after entering the intestine they attain their full size. In six days the female contains ova, the embryo freely moving in its shell, and when fully mature passes into the intestine. The embryo worm breaks its shell, and not content with the dull life of its parent, begins its wanderings. Boring through the walls of the intestines, it wanders freely through the muscles and tissues of its host, and if its host survives its invasion, it takes on the encysted form ; it curls itself up, becomes surrounded by a cyst, and here patiently awaits a further change. This change may never come, their bearers continuing to live in spite of them. They die, and a cretaceous deposit takes place around them ; or, on the contrary, their host is killed for food, the trichina cysts transferred to the devourer's intestine, and once more their life's circle begins again. The presence of these free trichina in the muscles of their bearers is liable to give rise to a very serious inconvenience and danger to life. A single instance, related by Professor Langenbeck, of Berlin, will show this. Seven persons took part in a " church visitation," which consisted in their sitting down to a heavy breakfast of ham, cheese, wine, and the eternal sausage. A few days after everyone of them were taken ill, and suspicion rested on the innkeeper for poisoning the wine. They had fever, pains in the muscles, &c. ; four of them died, and the other three were ill for some time afterwards. Some years after, one of the survivors had to undergo an operation which entailed excising a portion of muscle. This muscle was found filled with numerous dead trichina cysts. This evidence, with other circumstances which came to light, proved beyond doubt they had eaten pork in the sausage containing trichina cysts. Passing on to the Tœniada, or tapeworms, we meet a new class of ontozoa. The mature tœnia differ from the rematoid worms in their being destitute of an alimentary canal, and consisting of a series of segments or proglottides, each of these being hermaphrodite. We meet with the tœniada in two forms, the sexually mature and the sexually immature. The former inhabit those parts of their host that are in free communication with the exterior, in order that their ova may escape. The latter inhabit the solid organs of the body as in the liver. All parasites so found are immature, and generally speaking the two forms are found in different individuals and different races of animals. Taking as our type the *Tœnia solium*, we will trace its life developement. The egg, escaped from a segment which had already been expelled from its host, commences its own wanderings. Each embryo is furnished with a complete boring apparatus, consisting of three pairs of hooks situated at its anterior ends. By chance it is swallowed by a pig among the rubbish, and its outer shell crushed by the teeth. Thus set free in the stomach of the pig it begins a vigorous use of its spikelets, commencing to bore its way through the various organs, or perchance it penetrates a blood vessel, and is carried to the liver or the brain. The first portion of its path is traversed by bringing together the several pairs of spikelets so as to form a wedge-shaped stiletto. The lateral pairs are then brought back so as to thrust its body forward. In this free condition it is called a *proscolex*. Having arrived at some comfortable spot, say in the muscle, it settles down for a while into a more quiet life. Dropping its boring apparatus, it becomes enclosed in a vesicle or cyst, white, glistening, and filled with fluid. Gradually, during its abode, it developes a head, armed with four suckers and a row of hooklets. In this condition it is called a *scolex*, and is the larva of the tapeworm. A number of them together produce the appearance in pork, which goes by the name of the *measles*. In about ten weeks they attain the size of a pea to a kidney bean. Their further history consists in the pork being eaten without being properly cooked. The vesicles burst, the embryo, fixes its hooks and suckers in the intestine, and from it segment after segment grow, until a colony is produced, forming the mature *tænia*, it may be as much as 35 feet long. In about three months the lowermost segments contain ripe ova, and are discharged from the intestine. The head of the tœnia is barely larger than a pin's head, armed with four suckers and a double row of hooks for anchorage. Each segment contains a male and female reproductive organ, and is entirely distinct from its neighbour. The only organ in common is the water vascular system. The lower segments contain ripe ova. This metamorphosis of the tapeworm has four distinct stages—ovum and proscolex, both free ; scolex and perfect form, both fixed. It may, indeed, be compared in its developement to a butterfly — ovum, larva, pupa, and butterfly. It is only in the last 20 years that the connection between these cysts and the tapeworms have been worked out. Von Siebold and Leuckart fed dogs with the cysts from various animals, and invariably found they produced tœnia, though difficult to say which tœnia. Not content with dogs, they determined to experiment on man. Thus Kuchenmeister fed a condemned criminal, some hours before execution with some *cysticerci* from the hog. They disguised them as grains of rice in warm rice soup, and partly as bits of fat in blood puddings. After death, a number of young tœnias were found hooked in his intestines. Humbert of Geneva, not content with that evidence, on the 11th December, 1854, himself swallowed 14 fresh *cystercerci*. Early in March he had the pleasure of finding his breeding experiment successful. After having described several other kinds of worms infesting different classes of animals, Mr. Ashby passed on to consider what could be done to prevent the spread of the various diseases connected with the development of the entozoa. In the first place, beyond all doubt, the thing most to be regarded is never to eat badly cooked or underdone meat. We have learnt a great deal from the investigation of the entozoa by German savans, but, perhaps, we have learnt more by the consequences of the German taste for par-boiled sausage meat. The diseases connected with the developement of the trichina have flourished as epidemics in a manner wholly unknown in this country. But we are not free to boast in this country. During this last winter numbers of hams have been imported into London, from America, full of tœnia cysts. These, probably, being the cheaper kinds, find their way into the cook shops, and it is a well known fact that they are not thoroughly cooked, for the simple reason that, during that process, they lose weight. And after all it is very doubtful if the temperature rises above 150 degrees inside, while it may be at the boiling point outside. A temperature under the boiling point is insufficient to destroy the cysts. In the next place, it is the duty of the authorities to take all suitable measures to prevent cattle and pigs from becoming infected. It is a well known fact that pigs hailing from Ireland and America are far more diseased than from our own counties of Yorkshire and Berkshire. The reason is not far to find. Where sanitary arrangements are neglected, and human filth deposited all over the place, and pigs allowed to wander far and free in search of food, it can be no wonder that there is plenty of measly pork to be found. Referring to the pigs of India, which consumed all the offal and excreta of the Indian villages, Mr. Ashby read an extract from Dr. Gordon, and argued that it needed no divine revelation to forbid Israelite or Mussulman the use of pork. It is interesting, too, to note the sanitary conditions of Iceland, where Eschricht, writing in 1863, says that the freedom from tapeworms is the exception rather than the rule, and that at least one-sixth of the whole population are infested with hydatids. Each peasant keeps from six to eight dogs, which live together within the bosom of the family, in the close and filthy huts. I have only ventured this evening to bring before your notice some of the commoner and most readily studied of the entozoa. It was quite out of the question for me to give a description that should embrace more. To write the natural history of the entozoa would be to write the natural history of the animal kingdom. According to our tastes, their lines have not fallen in pleasant places, and it is no very savoury task to unearth them. It is hardly as cleanly work as stripping the petals from a flower, or investigating the habits of pond life; but I claim for their life-history an interest unsurpassed by any being endowed with the wonderful mystery of life, and among them may be found a scene of labour as practical as any in the wide domain of great nature's harvest field.

The reading of the paper was followed by considerable applause, and Mr. Ashby made some supplementary remarks with reference to sewage irrigation at Beddington, raising the question as to the transference of some of the forms of life of which he had been speaking, from human beings to animals.

The PRESIDENT said the paper had opened up a vast field for discussion concerning various animals, and their change into one final species. He asked Dr. Carpenter's opinion concerning sewage irrigation as bearing on the subject of the paper.

Dr. CARPENTER said he should have preferred to have heard remarks upon that view of the subject from others before he made his observations upon Mr. Ashby's clear and suggestive paper; but as the President had called upon him, he would make a few observations upon those points which had struck him whilst Mr. Ashby was addressing them. Mr. Ashby's reference to the possible effect of the ova of Entozoa upon humanity through the operation of sewage farms had not escaped him. It was a subject that had engaged a good deal of his (Dr. Carpenter's) attention ever since the sewage farms were established, and he had given the matter his serious consideration, for the chances of such a calamity as that indicated by Mr. Ashby had been repeatedly brought before some of the London Medical Societies, and he had had to oppose distinct attacks which had been made upon sewage farms by enthusiastic men, both at those meetings and before Committees of both Houses of Parliament. The arguments he had used were, that although the dangers as indicated might arise, they did not; that the inhabitants of Croydon, from certain well known circumstances, were more exposed to the possibility of such dangers, yet that he (Dr. Carpenter) had not met with any evidence that indicated that the people of Croydon were more liable to be troubled by Entozoa than other places; that in fact it was found by reference to the books of the Poor Law Medical Officers, by enquiries of his own medical friends, and by his own experience, that cases of *Tænia Solium* were all but unknown among the natives of Croydon. When cases did occur it was generally (not invariably, of course) among those who had lived some time in India, or in some part of the centre of Europe, or in Africa, showing conclusively that the ova developeing the disease had been planted in the human frame in other lands. People who made the charges against sewage farms did not know anything about the management of them, and described them in a manner contrary to fact. They supposed that the ova of entozoa would be carried on to the land, applied to the crops, and then consumed as ova by the cattle upon the farm. This idea showed at once their want of knowledge as to what sewage farming meant. No such contamination could take place, except by accident, such as might happen in anybody's kitchen when meat which might perchance find its way into the cook's hands with *trichina spiralis*, or other parasites in it, if she did not cook it properly, or it was eaten raw, and disease was thus propagated. If they cooked their meat properly no evil could result; let their farm be managed properly and no such danger as was indicated in Mr. Ashby's paper as likely to arise, could so arise. The possibility of such accident was to be guarded against, and was no sound argument against a sewage farm. There was another point that he would like to allude to, viz., the destination of the millions of ova which undoubtedly did find their way to Beddington. He had often searched for them years ago at the outfall, but never found them. He would throw out, as a hint to members of the Club, that a good work might be done in solving the question of developement by following out a point which he had not hitherto found time to do. He had an idea that the ova of entozoa placed in other channels, in other conditions as to moisture and as to temperature, might develope into some other form than that of parasites. He had found the ova of entozoa, but in every running stream exposed to the air and which received human sewage, he had never failed to find the blood-red worm, the "Naid," waving its body about in the flowing stream. It was contrary to received opinion that such a developement should take place, but whence the "Naid," and where were the parasitic ova of the entozoa? The one is never found; the other is plentiful. He did not think Mr. Ashby was qnite right in his idea regarding the way in which the *trichina spiralis* found its way into the human body. It did not always simply burrow through the walls of the intestine, and encyst itself in the muscle, but it found its way into the circulation, and its ova were carried by the blood; at times it invaded every muscle in the body, especially the eye. In some parts of Germany he believed those muscles were examined, and if found infected, the animal was at once condemned as unfit for food. Now the animal could not burrow into the eye, neither were the vessels large enough to carry it as such. The ova were the particles which were so carried, and developed into the parasite *in situ*. In conclusion he would just refer to the effect of the round worm, the *lumbricas*. He recollected, when a youth, four children dying in one family under suspicious circumstances. He made a *post-mortem* examination, and he found in one of these 53 large worms, from eight to fourteen inches in length, and all the other children were similarly affected. The children had been living principally upon turnips, and the worm had set up an active inflammatory action in the bowels which produced symptoms like to arsenical poisoning.

Dr. LANCHESTER mentioned a peculiar case of *tænia* which he had successfully treated, and stated that from his experience at the Croydon Hospital, he could say that very few cases of the kind occurred in this district.

Dr. CARPENTER said he believed that in some portions of Africa persons were much infested with entozoa through not having a proper supply of salt, and he understood, from one of our recent African travellers, that one of the punishments inflicted upon criminals was that they were confined in a certain place and deprived of salt.

Mr. MARTIN stated with reference to the deprivation of salt producing entozoa, he believed it was a fact that in the old kingdom of Poland one of the means of punishment employed was the keeping prisoners without salt, so that they always died of entozoa in horrible agony in consequence.

Mr. ASHBY ably replied to the various questions addressed to him, and stated that he had no intention of making an attack upon sewage-farms. The dangers of such farms had doubtless been exaggerated, and it was satisfactory to learn from Dr. Carpenter that *tænia* prevailed at Croydon to a very small extent.

A cordial vote of thanks was then passed to Mr. Ashby for his paper, and

The PRESIDENT stated that he had an apparatus at Brighton which he would place at the disposal of Dr. Carpenter for solving his experiment with the entozoa, and which could be submitted to the action of a running stream as long as might be necessary.

Besides several specimens of entozoa in glass jars, Mr. Ashby exhibited some mounted under two microscopes. The following gentlemen also exhibited entozoa with their instruments:—Dr. Lanchester and Dr. Strong; Messrs. P. Crowley, C. W. Hovenden, J. S. Johnson, H. Long, K. McKean, G. Manners, and G. Perry.

Mr. T. Hovenden, of Selhurst-road, South Norwood, and Mr. Edward Berry, of Park Hill, Croydon, who had been nominated for membership at the last meeting, were balloted for and declared duly elected. The undermentioned gentlemen were nominated for election at the next meeting:—Mr. Alfred Toms, Lychett Villa, Tavistock-road, Croydon; Mr. T. B. Moseley, Raymond Buildings, Gray's Inn; Mr. John Corry, "Rosenheim," Park Hill-road, Croydon; and Mr. Henry R. B. Podmore, of Brambletye, Bramley-hill, Croydon.

The President, as a matter arising out of the minutes of the last meeting, said that some books had been purchased, some of which were on the table; others were ordered but had not yet been received. The committee would be happy to receive suggestions for the purchase of books, and would procure them if they felt justified in laying out the money. One splendid volume on the table, "Carpenter's Foraminifera," had been presented to the Club by his friend, Mr. Frank Crisp, and he (the President) felt sure that the members would appreciate the gift.

The proceedings of a most agreeable evening were then brought to a close.

April 16*th*, 1873.—Paper read by Dr. Greenfield, of St. Thomas Hospital, on "The Structure and Distribution of the Blood vessels."

The minutes were read by Mr. H. Long, the secretary, and confirmed.

The President, before proceeding to the business of the evening, said he regretted to have to mention the decease of one of their most prominent members. Their honorary treasurer, Mr. Flower, was no more. He (the President) had only just heard of his death, as he had been away from Croydon for some time, and probably everyone present knew of it before himself. He was sure the intelligence filled all of them with sorrow and regret. Mr. Flower was a kind and distinguished member from the first; a very distinguished man of science, and a highly respected inhabitant of Croydon. He (Mr. Lee) had looked forward to him and to Dr. Carpenter for assistance in forming their museum, and it was so short a time since they had seen him that they could scarcely realise the fact that he had passed away. He would say no more concerning Mr. Flower, except that he was sure a large circle of friends would sympathise with them in the sorrow they all felt for his death.

Dr. Greenfield then, at the request of the President, read his paper on "The Structure and Distribution of the Bloodvessels," dealing most ably with the subject, and giving not only an account of the smaller vessels in the higher animals, but of their structure and mode of developement in some of the lower, illustrating his remarks by reference to diagrams, and mentioning some very interesting experiments with tadpoles, frogs, &c. He regretted that since he had undertaken to read the paper he had been so much occupied that he had not had time to prepare it in the manner he intended, and he feared that what he presented to the members only gave them a disconnected idea of the subject.

Dr. Carpenter thought that Dr. Greenfield had expressed himself so ably that he had left no hole by which he could be pulled to pieces. He had expressed himself very ably on a difficult subject, but one which must commend itself to the Microscopical Society. He then referred to the simplicity observable in Nature's works as seen in the structure of the capillaries, whether in animal or vegetable forms of existence. In those creatures which had no vessels they saw a budding process, which Dr. Greenfield had described, and which was very interesting to notice. Dr. Carpenter also referred to the first establishment of circulation in some animals as being more in connexion with the lacteals than the capillaries, and independently of heart or brain.

Mr. Ashby also made a few remarks on the lecture.

Dr. Greenfield having replied, a cordial vote of thanks was passed to him for his very interesting lecture, and the President intimated that it had given the members great satisfaction, and that they would be very pleased to hear Dr. Greenfield again.

Mr. A. D. Taylor, who exhibited some honey-comb with queen bees and workers, said he had asked a friend of his to get him some queen bees, and he had thought of him during the winter, and furnished those now produced. The bees appeared to be *in situ* with the portion of the comb in which they had been found dead.

Dr. Carpenter asked in the event of a queen-bee dying, how the vacancy was filled up.

Mr. Taylor said he believed that numerous queens were born, but only one was chosen.

Mr. Berney said that during the reign of the old queen-bee, the younger queens in the hive were imprisoned; but if the old queen died one of the younger ones were let loose to be the future queen.

The following gentlemen placed their instruments at the service of Dr. Greenfield :—Messrs. H. Ashby, J. Berney, W. R. Cooper, J. S. Johnson, H. Long, G. Manners, K. McKean, G. Perry, A. D. Taylor, and Dr. Strong.

The undermentioned gentlemen who had been proposed for membership at the previous meeting were balloted for and declared duly elected:—Mr. Henry R. B. Podmore, "Brambletye," Bramley-hill; Mr. Alfred Toms, Lytchett Villa, Tavistock-road; Mr. John Corry, "Rosenheim," Park Hill-road; and Mr. T. B. Moseley, 2, Raymond-buildings, Gray's Inn.

There were nominated for ballot at the next meeting Mr. Geo. Simonds, of Beddington-lane, and Mr. Charles Coleby Morland, Rastrick Lodge, Morland-road, Croydon.

May 21*st*, 1873.—Paper on "OUR BRITISH BEETLES," by Mr. A. D. TAYLOR.

The minutes of the previous meeting having been read and confirmed,

The following gentlemen were nominated for election:—Mr. John Price, jun., Ashton House, Tavistock-road, Bedford-park; and Mr. James Fletcher, Howard House, Enmore-park, South Norwood.

The PRESIDENT then called upon Mr. A. D. Taylor to read a paper on "Our British Beetles."

Beetles, Mr. TAYLOR said, may justly be called the scavengers of creation, for wherever there is any decaying matter, whether animal or vegetable, on land or in water, there will be found numbers of these insects, both in the lava and perfect state, actively engaged in its removal; and so beautifully are they constructed for this purpose, with large armour-like coverings to their bodies, or close brush-like hairs, that although many of them are found in most disgusting material of all kinds, yet none of the offensive matter clings to them in any form. Other species may be found in our gardens feeding upon snails, slugs, and various insects, not being by any means particular in eating each other. I have never seen any of these carnivorous beetles in groups, probably on account of this special failing of theirs; while, on the other hand, the vegetable feeders are generally found in some numbers together; and it is among these last that our enemies may be found, more especially in the order commonly known as Weevils (Rhyncophora), the most destructive being the corn and rice Weevils. At a meeting of the Entomological Society of London, in 1870, it was stated that 74 tons of Spanish wheat had been carefully sifted to separate the beetles from the corn, and out of this quantity, 10 cwt. of Weevils were sifted. Again, 145 tons of American maize were subjected to the same process, and at two siftings 1¾ tons of Weevils were removed; and from the small size of these insects, there must have been many millions of them. I have been told that almost any quantity of these Weevils may be obtained from the docks, and that in some of the vessels they may be swept up in handfuls. Beetles are distinguished by two horny or leathery wing cases, termed elytra, and two membraneous under-wings folding beneath the elytra; these being kept open during flight, giving the insect an appearance of having four wings. In their pupæ state they are not covered by an uniform hard case, as in the Lepidoptera, or moths and butterflies; nor active, as in the Hemiptera (an order of insects having membraneous wings, with wing covers usually half membraneous and half coriaceous), but exhibit all the parts of the future insect in a rudimentary condition, covered by a continuous tight-fitting outer skin, which renders them incapable of motion by means of their limbs. After briefly referring to the metamorphosis which the beetle pass through, namely, egg, larva, and pupæ, Mr. Taylor then proceeded to describe the external anatomy of this interesting insect, and then entered upon a description of the various sections of families. The order Coleoptera, he said, contains a vast number of species, of which nearly 3,000 are known in this country, and these are divided into eleven great sections, namely, the Adephaga, or carniverous beetles; the Brachelytra, or Devil's Coach-horses; the Necrophaga, or carrion feeders; the Lamellicornes, or chafers; the Sternoxi, the Malacodormi, the Heteromeræ, the Rhynchophora, the Longicornes, the Eupoda, and the Pseudotrimera. These are again divided into sub-sections, families, &c. The first section is divided into two sub-sections—the Geodephaga, which contains the terrestial, and the Hydradephaga, the aquatic species. The first-named are easily distinguished by their hard well-developed mandibles, or jaws, and their legs eminently constructed for rapid movements, combined with strength. This section is specially noticeable for their carniverous propensities, passing their lives both in the larval and perfect state in the pursuit and destruction of their weaker brethren; they are to be found in wet marshy places; under stones, bark, and felled trees; in the cracks of mud banks and chalky cliffs; also on sandy heaths. Most of them are nocturnal in their habits; a few of them, however, are to be found in the bright sunshine, actively flying or running about in pursuit of their victims. Many of the day-feeding species are metallic, brightly coloured, prettily banded or spotted; a few are clothed with scales or scanty hairs, and these form beautiful objects for microscopical examination. The members of the water-beetle sub-section exhibit a similarity of structure, with modifications adapted to the change of element. Their larva are also aquatic and very predacious. Mr. Taylor then described the Devil's Coach Horses (*Ocypus olens*), which he said constituted a very large group. Most of the larger species were predatorial, and must not be placed either together or with other insects in the collecting bottle; a great number of them were carrion feeders, and were found in the bodies of small dead animals; others were found in rotten fungi and decaying vegetable matter; a few under bark, in flowers, or parasite upon Hymenopterous insects, &c. One of the families of this section (the *Oxypodæ*) is found in the nest of a certain species of ants. It is rather a curious fact that ants, which show such antipathy to intruders in their homes, as well as their being somewhat carniverous in their habits, should allow many of the beetle tribe to live with them and have the run of their nests. Another family, known as the Bacon Beetle, are great ravagers, and on being frightened retract their limbs and counterfeit death. Another family, the Bythridæ, are conspicuous from their faculty of packing their limbs; and the last one noticed in the section was Hydrans-piecus, often seen in aquaria, and is perhaps, the largest British beetle known. Passing on to the next section, the Chafers, Mr. Taylor said this section was divided into ten families. Of these he mentioned the common Rose Beetle, the June Bug, the common Cockchafer, the habits of the larva of which he said were unfortunately too well known; the Clock of Dumbledor, so-called from their rolling up pellets of the excrement of animals in which they had deposited their eggs; the Copredæ, to which belonged the sacred beetle of the Egyptians; and the well-known Stag Beetle, which was very common in the South of England, but very seldom seen in the North. Among the section Sternoxi are to be found many interesting species. Amongst others, Mr. Taylor mentioned the Elateridæ, which are sometimes called "skip-jacks" or "click beetles," for their powers of jumping when placed on their backs. Having described the mode by which this jumping was effected by the insect, Mr. Taylor passed on to the next section—Malacodermi, which he said was divided into 15 families, one of the most prominent being the Lampyridæ, genus Lampyris, the female of which is the common Glow-worm. Another family was the Byturidæ, genus Byturus, the larva of which was found in the fruit of the blackberry, raspberry, &c. In another family, *Ano-bridæ*, is the cylindrical little *Ptilinus Pecticornis*, whose neat round drills may be frequently observed in old willows. This species is noteworthy for the beautiful fan-like structure of its antennæ in the male. In the next section, Heteromera, containing 20 families, among the best known are the Cellar, or Churchyard Beetle, the Mealworm, the Cardinal (the elytra of which are exceedingly beautiful), the Oil Beetle, and the Spanish Fly, or Blister Beetle. Of the next section, the *Rhynocophora*, or Weevils, Mr. Taylor said he possessed more species than any other section, and so beautiful were they, that to his mind they were, one and all, fit objects for microscopical examination and study.

They rank among our numerous insect foes; the section is divided into 17 families, of which the first is the *Bruchidæ*, the larva of which is very destructive to our beans and peas—and is often brought to the table in those vegetables. In the genus *Sitones* are many species especially noxious to clover and trefoil. Some of the species in the genus *Anthonomus* commit great havoc among apples and pears, the female insect boring a hole into the young buds and then depositing an egg in it, the larva subsisting upon the blossom, and occasionally the fruit. The Nut Weevil, the larva of which is commonly found in a nut, is also a very beautiful species. Mr. Taylor referred to several other families in this section, all of which he said were very prettily variegated, although most of them were well-known for their destructive habits. Briefly glancing at the next section, the *Longicornes*, Mr. Taylor said it comprised a series of Beetles conspicuous for the great length of their antennæ. They are entirely plant-frequenting insects, existing, as lava and pupæ, either in solid timber, or on the surface of felled logs and beneath the bark; and in their perfect state haunting the trunks of trees and bundles of dry twigs, or basking in flowers. Many of the species are gaily coloured, and some of the elytra as well as the antennæ are worthy of examination. There is another genus, *Tetrops*, of which the single species found near London is worthy of notice from the fact of its eyes being completely divided by its antennæ. The next section was *Eupoda*, divided into nine families, all the species of which, Mr. Taylor said, had their special attractions. He mentioned a few of them and passed on to the last section, *Pseudotrimera*, containing eight families, the principal of which was a collection of insects generally known as Lady-birds, abundant all over the kingdom and especially so in our hop districts, where they are valued for their blight-destroying habits. Before concluding, Mr. Taylor mentioned that the whole of the mounted specimens exhibited that evening had been specially prepared by himself to illustrate his paper; and from the great number of both beautiful and wonderfully-constructed insects in the order *Coleoptera*, he had been somewhat puzzled to make a selection. Mr. Taylor added that beetles might be very easily obtained, as they might be found almost anywhere. This was now the best time in the whole year for collecting, and when caught they might be preserved for months in an air-tight jar, filled with bruised laurel leaves, and could be set at leisure.

Mr. Taylor exhibited some very beautiful mounting of several species of beetles in illustration of his paper; also a number of microscopic objects illustrative of the subject which he so ably treated. In addition to Mr. Taylor's microscope, the following members placed their instruments at his disposal:—Dr. Strong, Messrs. H. Ashby, J. Berney, W. R. Cooper, C. W. Hovenden, J. S. Johnson, G. F. Linney, H. Long, K. McKean, G. Manners, and J. Parry.

Dr. Strong asked which was the best way of killing and preserving beetles.

Mr. Taylor said the best way was to immerse them in a test tube in boiling water. Care, however, should be taken to immerse them long enough, otherwise they would show signs of vitality, and make their escape. He happened with a misfortune of that kind on one occasion. He found that a good means of preserving them was by placing them in a bottle with broken laurel leaves.

The President said the question of killing destructive beetles was very important. Some of the Weevil species committed great havoc in coffee plantations, and destroyed timber trees. He was asked some time ago to give his advice in a case where these insects had completely destroyed a large quantity of ash wood, rendering it useless for the purpose to which it was to be applied, and his advice was to bake the wood. These insects had been soaked in carbonic acid, and still they lived; but he believed that the baking of the wood would kill them. How the insects in growing coffee bushes were to be destroyed he did not know.

Mr. Taylor, in reply to a member, said the larva of the beetle was very difficult to rear. He succeeded, some 14 years ago, in rearing some—the first ever known in this country. He pointed out how the genus *Byturus* which infested the blackberry and raspberry might be obtained. When the fruit gradually dwindled and died away, the piece became slowly absorbed, but when picked before it withered, fermentation took place, and an excess of moisture was developed sufficient to drown the insect. This Mr. Taylor had prevented by burying the fruit in sand, which removed the superfluous moisture, and enabled him to secure the larva.

The President, in according to Mr. Taylor the thanks of the Club for his very interesting and highly practical paper, suggested that that gentleman should take charge of an excursion now that the season was coming forward, and teach the members where to find these beetles for themselves. The President also announced that the usual monthly meetings would be adjourned to the 17th September. He was happy to say that their meetings this year had not been inferior to those of former sessions. Some excellent papers had been read, followed by good discussions, and cheerful and happy association of the members with each other, and he trusted this would continue for their mutual benefit. The summer months would be devoted to excursions, of which due notice would be given.

The following gentlemen, who had been nominated at the previous meeting, were duly elected :—Mr. Charles Coleby Morland, Rastrick Lodge, Morland-road ; and Mr. George Simonds, of Beddington-lane.

EXCURSIONS—1873.

June 14th.—An Excursion to Reigate, to meet the members of the Quekett Club.

June 19th.—Some members went to join the Quekett Club at their Annual Dinner, at the "Swan," Leatherhead, and a few spent the afternoon on the Mickleham Downs.

July 12th.—Excursion to Hampton Court.

August 9th.—Excursion to Wandsworth Common.

September 6th.—Excursion to Keston, meeting a large number of the Quekett Club. This excursion was better attended than any of the others, and a very pleasant day was spent.

It is to be regretted that so few members availed themselves of the opportunities afforded by these excursions.

September 17th, 1873.—Paper read by Mr. CECIL SAUNDERS, on "BLOOD; ITS CONSTITUENTS AND LIFE."

The fact of the circulation of the blood appears to have been unknown until the startling discoveries of Harvey, in 1628; and, subsequently to that, but little with regard to its composition has been found out until comparatively late years; for some time, however, physiologists and microscopists have been successfully prying into some of the secrets of nature in this particular department, amongst whom Huxley, Gardener, and Beale are names well known.

Preliminary microscopical experiments on the human blood are more easy to conduct than many other experiments, owing to the great convenience we have for obtaining the object; by twisting a piece of string round the middle of the last joint of *some-one else's* middle finger, and, when the end of the finger has become darkly coloured, pricking it with a sharp, clean needle, you will obtain a good sized drop of blood and he will suffer scarcely any pain. Place the drop upon a glass slide and cover it gently with a piece of thin glass; let a second slide receive another drop, and let it be put under an inverted tumbler to keep it from drying; and let a third drop be dealt with in the same way, a few grains of salt being first added to it.

To the naked eye the layer of blood upon slide number one appears of a pale reddish colour, quite clear and homogeneous; but on viewing it with a pocket lens, it will look like a mixture of excessively fine yellowish-red particles, such as sand or dust, in a watery and almost colourless fluid. When the blood is just drawn, the particles will be seen scattered very evenly through the fluid, but by degrees they flock together into minute patches, and the layer becomes more or less spotty.

On looking at slide number two, the drop of blood will be found unaltered in form, but changed in that it no longer flows, but has become a soft moist mass that may be removed from the slide with a penknife. This setting, or coagulation, be it observed, is very different indeed from drying; and, on turning to slide number three, you will discover that the salt has prevented the coagulation, the blood remaining as fluid as it was when it left the body.

Let me at once bring before your notice the solid or living part of the blood. The fine particles, of which I have spoken as being seen under a pocket lens, resolve themselves, under the microscope, for the most part into red discs, rather thinner in the centre than at the edge, and with a slightly granulated surface; in fact, they are in shape more like the domestic crumpet, which is sometimes to be found a welcome addition to the tea table, than anything else that I know of. They are soft and elastic, so that they readily squeeze through apertures less than their own breadth, and immediately regain their proper shape on getting through. As to the size of these corpuscles, they have none to speak of—that is to say, their dimensions are so very minute that neither observation nor description can give a clear idea of them. About 3,200 of them can be ranged in single file in the length of one inch very well; then 3,200 files side by side, each file containing its 3,200 corpuscles will give 10,240,000 corpuscles to form the pavement of one square inch; but they are lying flat upon the floor, and they will probably be not more than one fifth as high as they are broad, so that we may imagine 16,000 layers in the height of one inch, all of which gives the result of 163,840 millions of corpuscles in one cubic inch. In the full grown and healthy human body there are about 15-lbs. of blood, of which about 21-lbs. 2-oz. are solid matter or corpuscles, whose total array comes out at about two and a-half millions of millions. In other animals than man the corpuscles are slightly different, both as regards shape and size; in the mammals generally they are of the crumpet shape, with the surfaces of the discs slightly hollowed out; in the camel tribe, however, they are longer than their breadth and without the hollowed surfaces; in birds and most fishes they are oval and flattened, the shape of the surfaces varying in different tribes; they have also a nucleus in them usually of an oval shape; in the reptiles they are oval, very large, and comparatively thin with rather hollowed surfaces, with a nucleus which projects a little sideways.

About one in every five hundred of the solid bodies to be found in our veins is of altogether a different sort from those of which we have been speaking, being globular and colourless; and while the coloured corpuscles are hurrying along in the stream of serum, keeping themselves, apparently, as much as possible in the centre, our new friend, the colourless corpuscle, loiters along on the margin, very often actually touching the sides of the channel, and looking, at first like a transparent ball, covered with knobs, rolling over and over as it moves. By looking more carefully, however, we find that his shape is constantly changing, first one part of the surface and then another, being pushed out and withdrawn in a curiously undetermined manner. The entire substance, indeed, of which he is formed is in a state of perpetual unsettlement, flowing and rolling in every conceivable direction. Some microscopists describe him as first pushing forward a minute feeler or finger into some fine cranny or pore of the body, much smaller than himself, and then bringing after the feeler all the rest of his mass in the same attenuated way until the opening is completely passed, after which the corpuscle regains his original size and shape. Sometimes specks of great activity are seen here and there inside the corpuscle, and then it begins to grow larger and splits into fragments, forming a brood of young corpuscles, each exactly like its parent in all its powers and appearances.

The pale corpuscle is believed to be formed out of the fully prepared albuminous material. (Professor Huxley says it probably comes from the liver.) It is in fact a living creature fashioned, in some way or other, out of the dead liquid in which it appears, but from which it is distinguished, very broadly, by the power of motion it contains within itself, the particles of which it is composed always dancing, rolling, and falling over each other. Another mark of life that it possesses is the power of growth; it increases its own substance out of the contributions it receives from the materials around it: and yet a third evidence of life is to be seen, and it is this: the substance of the life-endowed corpuscle has the power of constructing a material which is not alive, but has been produced by living operation, and which cannot be produced in any other way: this material is known as "*formed substance.*" It seems probable that the fibrin of the blood is itself "formed substance" which has been made by the energy of the living corpuscles.

We have then three distinct states of matter in the blood:

1st.—Food substance or formative material, such as the fluid albumen.

2nd.—Living substance, or formative material which has been endowed with actual life, such as the corpuscle immediately under our notice, and

3rd.—Formed substance, the final result of vital operation, only to be obtained therefrom, but not itself alive. It seems to be a law that food substance can only become formed substance by going through the process of being living substance.

Taking one of our colourless corpuscles, we find that being living substance, it is busily engaged in the production of formed substance from the food substance around it. Some of this formed substance, as the fibrin perhaps, is thrown off into the general current of the blood, but in other instances it is merely thrown as far as the outside of the corpuscle and there forms a film all round it: in other words the little living body has enclosed itself in a cell; but when the cell is formed, and formed completely, all further food for the inhabitant must be drawn in through the pores of the cell wall and, after having satisfied the growth of the inmate, is used as more formed substance in thickening the cell-wall from the inside, strengthening and modifying its character. And all the various parts of the body are made in this way, a number of the finished cells being fixed together in a mass which is threaded by channels for the purpose of supplying fresh food to the innermost workers, until, as each cell-wall becomes more and more perfect and developed, the living germ within becomes less and less, and at last the cell is fully formed in a fit character for its position, but it is no longer alive.

While the colourless corpuscle is engaged in the process of multiplication by splitting, as it does, into families of young ones, it does not clothe itself with formed substance; it only does so towards the end of its life when it goes into the building trade, as seen before.

The *coloured* corpuscles are more of the nature of cells from the very first, and are most probably a variety of the young coloured corpuscle; but the question of their early relationship is still undecided. It is thought by some that a nucleus in the colourless corpuscle developes into the coloured race, and by others that the red globule is as a porous mass of "formed substance," containing in its pores coloured living pulp.

Globules of oil are also found in the serum ready to keep up the combustion necessary to maintain the animal heat: these are derived from the fat contained in the flesh eaten.

I have not been able to touch upon many parts of my subject such as to the constitution of the colouring matter in the red corpuscles, or the knowledge brought to light by means of the spectroscope; I have simply endeavoured to bring before you some of the more prominent facts in relation to the constitution of the blood as discovered by eminent microscopists, and, at the risk of wearying you, to show you some of the peculiarities and properties of this complex and fundamental part of our own frames, this beautiful series of substances, pointing so directly to the exquisite ingenuity, so to speak, of the Framer of our bodies, which is to be seen throughout the universe by any who will seek it, but nowhere more obviously than in "The blood which is the Life."

An interesting discussion followed, in which blood poisoning, the infusion of blood of quadrupeds into the veins of living human beings, and the identification of blood stains by means of the microscope were referred to by the President, and a cordial vote of thanks was passed to Mr. Saunders for his excellent paper.

The President stated that Dr. Carpenter had kindly accepted the office of Treasurer in place of their lamented friend, Mr. Flower, and the vacancy would now be filled up. This intimation was received with much satisfaction, and the President having announced that the next meeting of the club would be held on the 15th October, the proceedings of a most agreeable evening were brought to a close.

The following members placed their microscopes at the service of Mr. Saunders:—Messrs. P. Crowley, J. S. Johnson, H. Long, K. McKean, G. Manners, G. Perry, and A. D. Taylor.

The following gentlemen, who had been nominated at the last meeting, were ballotted for and duly elected:—Mr. John Price, jun., Ashton House, Tavistock-road, Bedford Park; and Mr. James Fletcher, Eastmore House, Howard-road, Enmore Park, South Norwood.

October 15*th*, 1873.—Paper read by Mr. Simpson, of the Forest Hill and Sydenham Microscopical Club, on "Several Undecided or Doubtful Points in Natural History."

Mr. Simpson said that in a science like Natural History there must, and ever will be, many difficulties to perplex the most careful student. To whatever branch he may turn his attention, he will constantly meet with something which he cannot explain; something which is contrary to his preconceived notions of what he has met with elsewhere. These might be called undecided or doubtful points, and therefore he proposed to bring forward a few examples which, in the present state of our knowledge, appeared to him to be disputed or doubtful. We all knew the difficulty that existed, in the lower forms of animal and vegetable life, in distinguishing the one from the other—a difficulty which did not appear to decrease as our knowledge increased. So much was the difficulty felt that one able zoologist (Dr. Haeckel) had proposed to form an intermediate kingdom, in which to place all organisms of a doubtful character. Professor Rolleston remarked that "there are organisms which, at one period of their life, exhibit an aggregate of phenomena such as to justify us in speaking of them as *animals*; while at another they appear to be as distinctly *vegetable*." It was only within the last few years that the position of two well-known objects—Volvox and the Sponge—had been determined. The former, from its power of locomotion, was ranked by the earlier observers with the microscope among the infusorial animalculæ, whilst the latter, from its want of those powers, and from its habit of fixedness, was placed in the vegetable kingdom. But now the Volvox was considered to be a low form of vegetable organism, while the sponge was looked upon as one of the Protozoa, or first form of animal life. Then, some insects resembled the leaves on which they fed or among which they lived; others were like little bits of stick or twigs. Other animals were white in winter; the red grouse was assimilated to the colour of heather, the black grouse to that of peaty earth, and so on. But if these disguises were intended, as stated, for the protection of these creatures, how was it that we found so very few, comparatively speaking, thus protected? Why should one tribe or family be thus favoured, and numberless others left to take care of themselves as best they could? Whilst admitting that certain animals were thus protected, he could not help thinking that the so-called "disguises" were *accidental*, by which he meant that in the immense varieties of forms and colours that we met with in the field of Nature, some animals must of necessity bear a resemblance to some vegetable or other object in colour or shape, so that the term "disguises" was not correct, inasmuch as it implied a *power* in those animals which they did not possess. Of the half-dozen disputed or undecided points, Mr. Simpson first alluded to the air or swim bladder in fishes, which he said was an organ, the function and action of which had by no means been clearly ascertained. Having quoted from the descriptions of this organ by several known authorities, Mr. Simpson said it was evident that the bladder was present in some fish and absent in others whose habits and habitats seem to be alike. Another question which it appeared to him was not thoroughly understood was, the power which some of the class of reptiles had, in common with other of the lower order of animals, of throwing off portions of their bodies. The word "power" was the term usually adopted, and it implied a voluntary act on the part of the animal, and it was with that meaning that it was generally used by writers on physiology. Professor Jones speaks of the "singular *power* of breaking off the limbs which was possessed by some of the crustacea." The common lizard and blindworm were both well-known to possess this faculty, and some wonderful stories had been told respecting the former. All the writers spoke as if the animal had the *power* of doing this, but his belief was that the act, so far from being voluntary, was quite *involuntary*; that it was a mere spasmodic effort, arising from fright or other causes; and that the animals had no more power in the matter than we had to stop the pulsation of our hearts, or to prevent starting or turning pale when suddenly frightened. Mr. Simpson then passed on to birds, respecting which he thought several things would be found which were not thoroughly known. First he asked what was the "oil-gland," which was situated near the tail. It was usually supposed that this gland furnished an unctuous secretion for the purpose of oiling the feathers, and so enabling them to repel moisture so effectually that they were never wetted. Some considered it to be an excretory gland, and contended that if it was used for oiling purposes, dirt would adhere to the feathers. The Penguin, a thorough water bird, had no oil-gland, and many birds were so saturated with oil that an oil-gland would be unnecessary. It was probable that the manner in which the feathers were placed was the cause of the water running off them as it did. So long as a water bird was alive, it kept dry under any circumstances, but in case of death, or a broken wing, for instance, its power of keeping its feathers in the proper position to resist the entry of water ceased, and the bird soon became wet to the skin. This gland was absent in the Rumpless Fowl, and yet this bird kept its plumage in beautiful condition. Another point in connection with birds which was not thoroughly understood was their migration, which Mr. Simpson said was of two kinds—partial and complete. Partial migration was effected by going from one part of the country to another; but in complete migration the birds came over to our land from distant regions at one season, and left it at another. The difficulty of accounting for the migration of *winter* birds was great, because it did not appear to be necessitated either by change of food or climate. It seemed to be unaccountable that birds, after having remained through the hardships of a severe winter, should leave us on the return of spring for colder climates, there to build their nests and rear their young. The only reason he could assign was, that they were unable to withstand great extremes either of heat or cold, consequently they left the higher latitudes during the extreme cold, and the southern ones during the extreme heat. Mr. Simpson having briefly referred to a protruding middle claw with which some birds (such as the Night Jar) were furnished, adduced several instances as showing that this singular construction of the foot was not yet properly understood. He also pointed out that in the invertebrate class of animals there were various other difficulties, as might be readily imagined when we consider the small size of the objects and the difficulty there was in observing them. Mr. Simpson also remarked that there was a great difference and uncertainty of opinion respecting the construction of the tongue of the bee, some supposing it to be tubular and others believing it to be solid throughout. The last subject to which he referred was the curious moving little organs on the echini, called Pedicellariæ. These were long considered to be parasites, and although they were now known to be part of the shell as much as the animals themselves, yet he thought their functions were not clearly understood. Some had supposed that they were useful in keeping off parasitic intruders, whilst others looked upon them as so many hands by which any object grasped by one of them situated on the posterior half of the body, could be gradually passed over towards the mouth. As these animals were now very common in aquaria, perhaps their President could give them further information respecting them. These, concluded Mr. Simpson, were some of the points in Natural History which appeared to him to be undecided; and a great many more might be added to the list by any one who had studied any particular branch of Zoology. Our knowledge must be greatly increased; more observations must be made and facts accumulated, before we could hope to clear up many of them; and it was, in a great measure, by societies such as this that much might be done in that direction. Our minds were all differently constituted, therefore we saw things in various lights; and it was by meeting together and comparing our ideas, that we might hope to elicit the truth which should be the grand aim and object of every true Naturalist.

After some discussion, the President, then, on behalf of the club, awarded their thanks to Mr. Simpson for his able paper.

Mr. Simpson having briefly acknowledged the compliment, replied to a few observations that had been made in the course of the discussion, and this terminated the business of the meeting.

The following gentlemen exhibited objects with their microscopes:—Messrs. H. Ashby, W. R. Cooper, C. W. Hovenden, J. S. Johnson, H. Long, G. Manners, J. Price, and A. D. Taylor.

November 19*th*, 1873.—Paper read by Dr. Carpenter on "Dry Rot and its Cryptogamic Alliances."

The minutes of the last meeting having been read by Mr. H. Long, the secretary, and confirmed, the undermentioned gentlemen were ballotted for and declared duly elected :—Dr. H. Philpot, 6, Sydenham-road ; Mr. E. Mitchell, Sanitary Inspector, Croydon ; Mr. E. Bailey, 4, Ripley-place, Dingwall-road, Croydon ; and Mr. H. W. Windsor, 8, Old Jewry.

Dr. Carpenter said the subject he had undertaken to introduce to the Society was Dry Rot and its Cryptogamic Alliances, by which he meant those members of the vegetable kingdom which produced effects corresponding to dry rot, and which effects took place in consequence of disturbances in animal and vegetable life produced by the growth of fungi. It was right that he should define what was meant by Cryptogams, because there might be some persons present who were not so thoroughly acquainted with Natural History as others, and in order that it might be known in what part of the vegetable kingdom these plants were placed by naturalists. He alluded to the difficulties which had been experienced as to whether they should be classed under the head of animals or vegetables, the lines of separation. as in many other instances in Nature, being exceedingly slight, but he considered they really were vegetables, though unlike vegetables they destroyed starch, and gave out carbonic acid. Cryptogams, compared with exogens and endogens, had essential differences, for they consisted of cells only ; this character was however not absolute, for vascular tissue was found in ferns and club mosses, though not even in the young plants of those families : again, growth always took place from the tips of threads of cells, and their ramifications. They had no true pistils, no pollen, and no anthers, but were essentially agamous. There was no embryo as far as the spores were concerned. This portion of the vegetable kingdom is divided into *acrogens* and *thallogens*. The acrogens generally have herbaceous leafy appendages, with stomata and spiral spermatozoids. The thallogens are seldom herbaceous, and if leafy, have no stomata.

The spores rarely produced prothallus, and if they do, they produce a second order of spores germinating at definite points, if with spermatozoids are produced, they are not spiral.

It is among the thallogens that we find the species which contains "dry rot." We will trace it to its proper place.

The thallogens are divided into *algals* (or seaweeds), which derived nourishment from the water in which they were submerged, and differed as to fruit from the *mycetales*, the other division of thallogens, this latter was sub-divided into two families with similar kind of fruit, viz., the *lichens* and *fungi*. The lichens were aerial, and were nourished by air and not by a matrix, and contained *gonidia*. The family of *fungi* were hysterophytal or epiphytal,that is either growing within or upon organic matter, nourished by a matrix, not producing *gonidia*. The gonidia were globular cells with green contents developed in a central layer of the thallus, and contained chlorophyl; and the presence of gonidia may be taken as proof that the plant is *lichen*, not *fungus*. It might be thought that the lichens were more allied to seaweeds than to fungi, but this is not so, because a fungus has fruit similar to the lichen, but dissimilar to the seaweed, and it is by the character of the fruit that the alliance is established. It should also be understood that no proper conclusion can be come to as to the nature of these plants, unless the fruit is absolutely produced. Great confusion with regard to fungi prevailed among the early writers, because several kinds passed through several grades before arriving at maturity, and those grades were thought to be different families or orders. There were about 2,500 British kinds, but many classes were made which were only parthogenetic, that is, passed through many changes, as was well known to occur among insects and other members of the animal kingdom before the final change was arrived at. They have their origin in mycelium or spawn, which are threads of closely compacted cells, processes being put forth from the germinating spores. The idea or notion of a *fungus* as distinguished from an *algal*, forbade the idea of free cells without ulterior development. Many mycelia produced in vegetable and mineral infusions were only submerged confervoid forms, and should be referred to *algæ*. With reference to the formation of fruit, every fungus had a vegetating and a fructifying surface, the two being confluent at first. The fruit was formed on two distinct plants, viz:—1. *Acrosporous* or sporiferi. The tops of certain threads swelled into bodies which gave rise to a single cell; the cell contents either condensed into a mass, or compounded by the formation of membranous partitions. The spores ultimately fell off, and threads formed by germination. 2. *Ascigerous*, or sporidiferi. Certain threads formed bags or tubes, and the cell contents resolved into a definite or indefinite mass of spores, often eights. The family of *fungales*, or *fungi*, was divided into six principal orders, which were called by hard names, but easily understood by those gentlemen who had learnt Greek, and to them a description of their nature would be unnecessary beyond naming them, but as all present did not know Greek, he would describe them, viz:—*Hymenomycetes*, or naked spores, of which an ordinary mushroom was the type. *Gasteromycetes*, or those in which the spores were enclosed in a peridium, or bag, of which puff-balls were examples. *Hyphomycetes*, or web-like, in which the hymenium formed a web-like growth with spores springing from it, as in the potato blight. *Coniomycetes*, in which the hymenium could scarcely be seen, and which had abundance of dusty spores, and in this order we find those diseases affecting our grain crops, as bunt and red rust; these four are *sporiferi*. Then *Ascomycetes*, in which the spores are contained in asci or bags, as in truffles and morels; and lastly, *Physomycetes*, as in those moulds which affect our fruits, jams, and other things which are said to "go" suddenly, and which were of great interest to the housewife, and afforded materials of great beauty for the microscopist; these are *sporifera*. The agaric which is found in the *hymenomycetes* class, consists of *mycelium* or spawn; *hymenophore*, or stem and cap; *hymenium*, or gills. The hymenium is not a real membrane, but is the extension of mycelium and forms the gills in mushrooms, tubes in toadstools, veins in chantarelle, pores or veins in dry rot, and spines in the hydrum. The hymenomycetes consisted of several divisions, including agaricini, the latter divided into six groups, distinguished by colour of spores, viz., 1 white, 2 pink, 3 feruginous, 4 brown, 5 purple, and 6 black. Dry rot used to be placed among the agaricini; but Berkeley has placed it among the polyporei. The mycelium was eomposed of filaments creeping in the substance of the wood, disorganizing it, feeding on its elements and leading to its decay, sometimes in the most rapid manner possible. Dry rot, or *merulius lachrymans*, Dr. Carpenter remarked, was connected with a very important matter, of which they had heard a good deal lately. He recollected three or four years ago, a church near to Sutton was affected seriously before it was out of the contractor's hands. St. Matthew's Church was also affected in a similar manner by it, soon after the building was finished, and the Parish Church of St. John's was found to be seriously injured from a similar cause, although its erection was superintended by the greatest architect of the day; whilst the Congregational Church in Dingwall-road showed that we were not restricted to the established churches for instances of its destructive effects. A friend of his recently built a large billiard room, but in the course of a few months it was found that the table was disappearing into the room below. The floor had altogether gone with the dry rot before the year was out in which it had been erected. The subject of dry rot was very interesting, because it explained some of those changes which took place in the human body; he considered that a condition similar to dry rot could exist in the human frame as well as in timber; and although some great men held that it could not be, because they could not get spores of disease to grow when away from the juices of the body, he (Dr. Carpenter) made bold to say that, in so deciding, they were deciding against evidence, because they might with just as much justice decide that the spores of ordinary agarics which were before the meeting were not spores of a fungus, because they could not be made to germinate and grow fruit in their present state, unless planted in a suitable soil. The spores of an ordinary mushroom could not be made to grow with any degree of certainty. He had been trying for a long time to grow different spores. In some he succeeded, and in some he did not; ordinary mushroom spores would not grow in the usual way, but if watered with the urine of a horse, or if stable manure was added, the spores would grow as fast as possible, but unless they had the particular material which was wanted for the spores to germinate they would not get them to grow; and wise-acres said they could not, whilst in reality they had failed to make them grow, because they had not the proper matrix. Thus it is proved that a solution of albumen in distilled water will not allow of fungus growth if kept for a year, but the addition of a few drops of almost any acid makes a profuse growth of fungi very rapidly manifest. Thus it may happen that the first germs of fungi may grow very slowly for want of proper nidus, but let it be supplied, and the fungus puts in a very rapid appearance indeed. The germs of *merulius lachrymans*, the name of the dry rot fungus, probably exist on all kinds of wood (several of the microscopes in the room showed the spores). When germinating, they send threads of mycelium into the vascular tissue of the timber, abstract the nitrogenous matter from it, set free carbonic acid and water, and leave behind next to nothing, viz., the inorganic or mineral matter of the tree only, in the lightest possible skeleton form. The effect of the fungus in the act of growth is to produce acid; acid also promotes its growth and hence, if there is no ventilation to carry away the results of its growth, viz., the impure and acid air, that very air will help forward the further destruction of the timber by retaining the acid which is required, whilst if immature timber is used, the juices which are contained in it may, by their own changes, ferment and really produce the acid which is wanted for the growth of the fungus. To use immature wood, therefore, in unventilated places, is to make the production of dry rot a certainty, and shows gross carelessness on the part of those who are responsible for it. The power of fungus growth is very great. Probably some might remember that at Basingstoke some years ago, the inhabitants found heavy flag-stones mysteriously raised, and on taking them up it was found that it was due to the growth of a number of fungi beneath. As a remedy for dry rot, he had no hesitation in saying that there should be free ventilation. If this were well looked to, and the use of immature wood prohibited, dry rot would not occur, and indeed ought not to have occurred in those instances he had mentioned. Referring to the potato blight, Dr. Carpenter ascribed it to the presence of the *botrytis infestans* (specimens of which were exhibited), and showed that the spores were planted with the seed potatoes, and that thus the possibility of the disease was provided for. In July and August, during thundery weather, a whole field might be infected in a night. He showed that its action was precisely similar in its effects and had a similar origin to that which produced diphtheria in the human being. He also contended that the method of housing potatoes contributed to the propagation of the disease. The potaoes were put into clamps, or damp cellars, where they became covered with botrytis, and were taken thence and planted with some of the conditions necessary for reproducing the disease. The germs being planted with the tuber, often in the form named resting spores, it was quite certain that in thundery weather, with heat and moisture, they would develop, but if care were taken to destroy the germs as in the dressing of corn, there would be less chance of potato blight. Last year he addressed some letters on the subject to the *Times*, and this year he had had a great deal of correspondence on the same subject. Some persons had written to say that they had followed his advice, and had had no blight. Others had not been so successful, but in those instances there could be no doubt that the remedy had not been properly applied. He felt fully satisfied that potato blight could be reduced to a minimum by proper treatment. In conclusion, Dr. Carpenter said that a study of fungus life might help forward some of those questions now disturbing the scientific world, and be also the means of raising their society in its position amongst other societies of the kingdom, if the members could solve some of the disputed points by special attention to apparently minor matters, but really matters which were at the base of all true knowledge.

Mr. Berney said he had not gone deeply into the nature of fungi, but he knew something of dry rot. It was likely to be occasioned if timber were felled in the spring instead of the autumn, because in the spring it was full of sap, while in the autumn it could be obtained free from sap. Unless floors were thoroughly ventilated, they were quite certain to be affected by the dry rot, and ventilation in the centre was not sufficient to remove it, for there would still be a stagnant atmosphere. He stated, however, that the application of sulphate of copper to timber would destroy the dry rot, and get rid of the fungus altogether.

Mr. Perry exhibited some pieces of wood in which dry rot had established itself, and showed that whenever there was a damp material on one side, and a waterproof material on the other, dry rot was sure to be produced. He illustrated this by a piece of coal box into which damp tea leaves had been thrown, and which had a polished external surface. He also referred to the practice of placing oilcloth in servants' apartments in the basements as likely to injure the structure of houses.

Mr. Martin referred to the fact that the potato disease exhibited itself differently on light and heavy lands; that in some years there was a great deal of it, and in others very little; and raised some questions as to how the disease had originated lately.

Mr. Perry, as one interested in ships, pointed out that timber kept in contact with salt water never got the dry rot.

The President thought that although salt might be very well applied to a ship to prevent the dry rot, it would not do in a house, as it would gather the moisture from the atmosphere, and the boards would generally be wet.

A member stated that wherever there was a confined atmosphere and a certain amount of damp, dry rot would be likely to be produced. He then thought it would more properly be called damp, or stagnant rot. As the practical remedy, he suggested ventilation from corner to corner, which would be sufficient to remove it.

Dr. Carpenter briefly replied to the observations which had been made upon his lecture. He considered that the potato disease might be propagated by local circumstances—*i.e.*, local with regard to a district—such as thunderstorms, and that thus one range of hills would sometimes be affected, because the proper electric state was present, while on another there would be no trace of disease. As showing the importance of paying attention to the subject of dry rot, he mentioned that during the Crimean War, our ships in the Black Sea suffered immensely from it, and there was a great destruction of timber. He also showed that in various other ways dry rot was a most destructive agent, and that it was desirable, both from sanitary and economic considerations, to study its causes and prevent its action.

A cordial vote of thanks having been given to Dr. Carpenter for his highly instructive and admirable lecture, the proceedings of the evening were brought to a close.

The following members put their microscopes at the service of Dr. Carpenter:—The President, Messrs. H. Ashby, J. Berney, P. Crowley, J. S. Johnson, H. Long, K. McKean, G. Manners, G. Perry, J. G. Price, E. B. Sturge, A. D. Taylor, and H. T. Whitling.

November 26th, 1873.—*Soirée* at the Public Hall.

The *Soirée,* held on Wednesday evening under the auspices of this Club, was even more successful than those which have preceded it. Not only was the number of visitors larger, but the objects exhibited were on a more extensive scale than hitherto; and the acquisition of the small hall and other rooms prevented the inconvenience to visitors which must have been experienced had they been restricted to the use of the large hall.

The assemblage, as is usual on such occasions, was a brilliant one. The general effect was heightened by the conversion of the platform into a miniature boudoir, which had been tastefully arranged by Messrs. Ridge and Son, North-end, and with a collection of choice plants, lent by Mr. Ley, presented a very beautiful appearance.

Amongst the exhibitors, in addition to the home club, were members of the Royal Microscopical Society, the Quekett, the Old Change, the South London, and the Sydenham and Forest Hill Clubs, besides a number of our most celebrated makers of optical instruments.

The following members of the Croydon Club exhibited objects, viz. :—H. Ashby, N. L. Austen, Dr. Anderson, J. Berney, Charles Bonus, W. H. Beeby, R. Brodie, Dr. Carpenter, T. Cushing, P. Crowley, A. Crowley, J. Chumley, W. R. Cooper, A. B. Drummond, J. Flower, C. W. Hovenden, J. S. Johnson, H. Lee, G. F. Linney, H. Long (hon. sec.), G. Manners, T. B. Moseley, K. McKean, W. J. Nation, Dr. Owens, G. Perry, G. Purser, J. G. Price, A. G. Roper, C. Royston, Dr. Strong, E. B. Sturge, J. G. Turner, H. T. Whitling, F. West, M. Woodford, and J. Woodward.

Valuable and interesting objects were also exhibited as follows :—

W. H. Rowland, stuffed birds; A. Crowley, eggs, skulls, &c.; P. Crowley, Wolfe's illustrations of animals; M. Wigzell, of the Croydon School of Art, pictures; W. Blake, junr., ivory turnings; Thomas Hanbury, Chinese curiosities; and E. B. Sturge, ancient books.

Amongst the scientific gentlemen who attended on Mr. Lee's invitation were Mr. Glaisher, F.R.S., and and Mr. Thomas Spencer, F.C.S.

The evening was enlivened by music, Mr. Pusey, jun., being the performer on the piano.

December 17*th*, 1873.—Paper read by Mr. CHARLES JECKS, on "THE COLOUR OF THE FLOWERS OF TEMPERATE, AS COMPARED WITH THOSE OF TROPICAL CLIMATES.

Mr. JECKS said :—Mr. Wallace has stated in his "Malay Archipelago," that the colour of the flowers, and indeed of vegetation generally, is not so brilliant in tropical as in more temperate climates, and we also find it stated in a book on "The Chinese Seas," by Dr. Collingswood (if I remember rightly), that the same rule holds good with respect to seaweeds. Now, it is true that these statements are quite at variance with those generally believed concerning the Flora of tropical climates; but coming from the source they do, we can scarcely, I think, dispute their accuracy. Indeed, when we consider the subject, we shall find that such a result might naturally be expected; for, amid the dense gloom of a tropical forest but little light can penetrate, and it is, as we all know, light which gives colour. Even in our own climate the colour of flowers is not so brilliant *cæteris paribus* in a dense wood as in an open plain. The idea of brilliant colour, especially appertaining to tropical flowers seems, as Mr. Wallace remarks, to have arisen partly from the fact that in this country tropical plants are generally grown in conservatories, where they are exposed to abnormal conditions of light. It would seem, perhaps, that while the tropical regions are far richer in the production of vegetable forms, so far as concerns brilliancy of colour, we have this advantage, that is the vegetation of temperate latitudes is more brilliant in hue than that of tropical regions. How are we to account for this? Partly, I think, as regards vegetation and the colour of flowers, by the following considerations, or perhaps more properly, suggestions. We know that the colour of flowers depends, in some measure at least, upon the amount of radiation of light. Now, there are three distinct classes of rays from the sun; rays of light, rays of heat, and what are called actinic or chemical rays, which, combined with the others, are probably effective in the production of those chemical changes which all plants more or less undergo. It is, then, by the absorption and radiation of these rays of light that the colour of the flower is produced, and as in temperate climates, these rays seem to be in excess, while those of heat and actinism are subsidiary, especially, perhaps the former, the result seems to be that in such regions the colour of flowers is comparatively more brilliant than in tropical climates, where, besides the larger amount of heat and actinic rays and the smaller proportion of rays of light, the effect of these latter is possibly much counteracted by the greater amount of moisture present in the air. It also seems possible that the greater richness of soil which generally prevails in tropical climates, may be another reason of the comparative want of brilliancy in the flowers, for wherever the soil is light and dry, indeed, even arid, under the conditions of a clear blue sky and bright sun, we find the colour of flowers in proportion more brilliant than in certain tropical regions is the case. Coming to our own climate, we shall, I think, find that these suggestions are in some measure borne out; as for instance, in the generally brilliant colour of our wild flowers. It would seem, then, that a rich soil, combined with a damp atmosphere, and a larger proportionate amount of heat and actinic rays, has the effect of, as it were, deepening, and, perhaps, to a certain extent, fixing the colour of flowers. To refer to our practical experience in such matters, is it not generally true that a dry warm season, with plenty of sunlight and clear blue sky, is accompanied by a more brilliant colour in our flowers, and that the latter are also more abundant. Owing to the effect of these conditions, the seed is more plentiful; while under the contrary conditions, the reverse is generally the case. It is true that the deeper colour generally accompanying a mountain Flora may seem an exception to this, but it should be remembered that here we generally have the presence to a certain extent, especially on the lower slopes of the mountains, of more tropical conditions as regards a greater amount of moisture. Coming now to foliage, I think we shall find that the conditions above-named as probably affecting the colour of flowers have here also a proportionate effect, for the foliage of tropical climates is generally of a deeper colour than that of temperate regions, that of the latter being of lighter hue; and, indeed, the further north we go within the temperate zone, the more, as a general rule, do we find this to be the case, the comparatively greater amount of light rays being accompanied by a correspondingly lighter colour of the leaves. There is, however, one exception to this, and so far, as I know, but one—that of New Zealand, where the foliage is of a lighter colour, more approaching that of our own vegetation; but the climate of New Zealand is one nearly similar to our own in character, in the free access and circulation of air admitting more readily the rays of light; and while it naturally increases the extent of evaporation, it also tends to check the superabundant presence of that moisture, which, as a rule in tropical climates, owing to the denser character of the foliage, which also helps to produce it, tends to perpetuate the condition of things which we find there—the prevalence of a deeper hue in the foliage. Again, it is, I believe, a fact that dull-coloured flowers generally have the sweetest scent; while bright and brilliant-coloured ones have either no scent at all, or a disagreeable one. In our own country, for instance, we find that those of brilliant colour, which are perhaps predominant, are comparatively scentless, and that this rule is generally borne out among wild flowers. I think the cultivated flowers are scarcely a fair test, as the colour, and perhaps scent, too, can be modified to almost any extent. There are, doubtless, many exceptions to this rule, but still I think our own experience establishes it as generally correct. Now, may it not be suggested that the same causes, whatever they may be, which tend to produce more brilliant colour, tend also to lessen sweetness of scent, and *vice-versa?* and in tropical regions we know the scent of the comparatively dull-coloured flowers is particularly powerful. The, perhaps, greater number of brilliant-coloured scentless flowers found in a state of nature in our own climate, at least, I think, may be in part accounted for by the visits of butterflies, &c.; for as soon as any flower exhibits any tendency to variation in the direction of brilliancy of colour, it is probably visited by these insects, and its propagation thus ensured, the tendency to brilliancy of colour being increased by the law of heredity, and further confirmed by suitable conditions of growth; and it is true that, to a certain extent, this may take place with regard to dark-coloured flowers (by reason, perhaps, of their sweeter scent); but owing possibly to colour being generally more attractive to insects, and other causes, these latter seem to fail in the competition with their more favoured rivals. It is interesting to consider the rationale of this transportation of a germ from a plant of more or less brilliant colour to another, by the ultimate effects of which the stock is as it were established. Now it is probable that flowers owe their colour to the fact of the existence of a very delicate tissue, which has the property of absorbing some rays, and rejecting others (for all flowers are naturally colourless before exposure to light), but in some cases, owing perhaps to various causes, this tissue absorbs rays of light of a different hue from those which we are accustomed to consider as belonging to the flower in question, and the result is a variation in colour. As soon, then, as this variation (however slight it be) appears, it is taken advantage of by butterflies, which, attracted perhaps by the difference in hue, visit the flower and transmit the germs to another flower in which, in course of time, the variation in colour becomes fixed, partly by the transmission of the germ having taken place at the proper time and under favourable conditions, and partly also from the action of the law of heredity by which any variation in a plant is, under favourable circumstances, liable, not only to be again produced, but absolutely increased in amount with each case of reproduction, so that the variation is now developed in an ever-increasing ratio until it becomes more or less confirmed. In connection with this subject, the question suggests itself—do cultivated plants come under the same law as domesticated in contradistinction to wild animals? We know that the former, at least sometimes, are not so fertile as the latter, so that it would seem that, by confinement or domestication, a certain degree of change is produced in the generative organs inducing partial sterility. Now, there seems reason to believe that in proportion as a plant tends to vary, so does it suffer in its fertility. It is the domestication or cultivation of plants which often produces variation, and this probably means with cultivated plants an increase in brilliancy of colour of the flowers, which would seem, probably by inference, to be attended (at least to some extent) by infertility. The same suggestion may, I think, also be applied to wild flowers, the brilliant colour of which we have seen to be often caused by variation; but the tendency thus produced to decrease in fertility may be here, perhaps, in some measure counteracted by the continual intermixture or crossing of different species by means of the visits of butterflies, which possibly tend to prevent any excess in variation. Again, as our wild flowers seem to be generally noted for brilliancy of colour (in this respect possibly excelling cultivated ones), it may be suggested that this also is accounted for in part by the greater range of intermixture of different germs. Besides, supposing it to be true that bright coloured flowers are less sweet-scented as a rule than duller coloured ones, it would seem possible that as a flower becomes more brilliant in colour, it also generally becomes less sweet scented, and it may not be an object with gardeners to produce a predominance of brilliant colour at the expense of sweetness of scent. Now, if the above theory of colour in flowers be correct, it would seem to follow that we have some reason for the supposition that, as in a comparatively equable, warm, and damp climate (the latter word implying the probable absence to some extent, at least, of the light rays of the sun), brilliant colour in flowers and vegetation is rather the exception than the rule; so, as our own climate partakes more of these conditions, becomes more equable and damp, and therefore probably more dull as regards light rays, will brilliant-coloured flowers, at least in a state of nature, become more and more rare? There would also seem to be some reason for the suggestion (supposing the laws of nature now in action around us to be the same in character as those of long by-gone ages) that as the climate of the Carboniferous era is now generally believed to have been rather of a damp and equable than of a tropical character (somewhat, perhaps, resembling that of New Zealand, but probably more humid) the Flora of that period was of comparatively dull colour, and possibly more sweet-scented than that of the present day, while the foliage was probably of a deeper green than now. As an example of this we know that the principal part of the vegetation of that time consisted of various forms of conifera) cryptogomia and tree ferns (the two latter possibly of a darker hue than those now living, owing to excess of moisture, &c.) Now we find at the present time that mosses and ferns flourish most luxuriantly in damp situations and sheltered from the sun, so that upon the theory I have advanced, we are thus enabled to suggest the probable effects of that dim uncertain light and atmosphere upon the primæval vegetation of the great humid coal formation. And now, in conclusion, I cannot but feel that the theories I have advanced must seem to many as somewhat wild, crude, and undigested; but I trust they will remember that they are only theories, or, rather, perhaps, suggestions. I hope, however, that I have said nothing in any way of a dogmatic character; if it seem so, I trust it will be understood that any such utterance was quite unintentional. I have tried rather to suggest than to assert, and if I have been fortunate enough to throw out any fresh material for thought, I shall be amply repaid.

An interesting discussion followed the reading of the paper, in which the President, Mr. Cooper, Mr. Morland, Dr. Carpenter, Mr. P. Crowley, Mr. Perry, Mr. Taylor, and Mr. Haddock took part. The chief point touched upon was the action of light with regard to the formation of colour in flowers. Dr. Carpenter pointed out that flowers having different hues was evidence that they decomposed light, and fixed a certain portion of that light in their tissues. Certain chemical agents would produce a change in a flower, but without light, so far as lateral flowers were concerned, it would be impossible to get a variety of colours. He had not an acquaintance with foreign countries, but he had been under the impression that tropical climates certainly produced the most brilliant flowers, as they did birds of the most brilliant plumage. The possession of scent in a flower was generally accompanied with less brilliant hues, but this was not always the case. He did not think that much light was wanted for the production of colour, because some of the fungi on which he had remarked at a former meeting, grew in in the deepest glades of the forest, and had the most brilliant hues possible, and generally the darker the glade the brighter the hue of the fungus that grew there. Dr. Carpenter also referred to the brilliant colours that could be obtained from gas tar, showing that although ages ago, when the vegetation of the coal formation flourished, brilliant colours were not produced, still the colouring matter was there, and could be obtained. He considered Mr. Jeeks' paper a most suggestive one, and he highly commended it.

Mr. Taylor expressed an opinion that light had but little to do with determining the colour of flowers. He mentioned that he once planted some crocuses the wrong way upwards, and as they did not appear above the surface of the soil, he made an examination, and found they had bloomed in the ground in their usual colours.

Mr. Haddock expressed an opinion that plants of the same class seldom bloomed in two colours, but the experience of other gentlemen was against this supposition.

The President having put a variety of questions to the lecturer, to which that gentleman ably replied, a cordial vote of thanks was passed to Mr. Jeeks for his interesting paper.

The President then formally announced that the annual meeting would take place in January, and that in February, he would contribute a paper on a subject which he had previously mentioned.

The undermentioned gentlemen were ballotted for and elected:— The Rev. G. Smith, Whitgift School, Croydon; Mr. E. W. Barnett, Essex Lodge; and Mr. Frank Crispe, 134, Adelaide-road, N.W.

CROYDON MICROSCOPICAL CLUB.

RULES.

OBJECTS OF THE CLUB.

The Club is constituted for the mutual help of its members; for the discussion of subjects connected with, or dependant upon Microscopical research; for the exhibition and exchange of Microscopic Objects and Preparations; and for the promotion of the study of Microscopy and Natural History generally.

MANAGEMENT OF THE CLUB.

The business of the Club shall be conducted by the President, Treasurer, and Hon. Secretary *(ex-officio)*, and nine other members—three to form a quorum. Two of the Committee shall retire every year, but shall be eligible for re-election at the Annual General Meeting.

MEMBERSHIP.

1.—Every candidate for membership shall be proposed by two or more members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the Form appended. The certificate shall be read from the chair, and the candidate therein recommended balloted for at the following meeting—three black balls to exclude.

The Annual Subscription shall be 10s., payable in advance on the 1st of January, and no person shall be entitled to the privileges of the Club until his subscription has been paid.

3.—Distinguished men may be elected Honorary Members of the Club provided they do not reside within the district; such honorary and corresponding members shall not be subject to any of the expenses of the Club and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall, by their merit, satisfy the committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No Member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any member from the Club, the same shall be done by a resolution of the committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the members present shall vote for such member's expulsion, he shall no longer be considered a member.

7.—Any member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the member by whom he is introduced, in a book to be kept for that purpose.

ORDINARY MEETINGS.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at eight o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other time as the committee may appoint.

2.—The ordinary course of proceedings shall be as follows :—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.
II.—The names of candidates for membership shall be read, and the ballot for the election of members shall take place.
III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the members present at any ordinary meeting shall elect a chairman for that evening.

4.—No paper shall be read which has not received the sanction of the committee; and, whenever it is possible, early notice of the subject of the papers to be read shall be given by the secretary to the members. No paper shall exceed fifteen minutes in the actual reading, unless by the especial permission of the chairman.

BUSINESS MEETINGS AND ELECTION OF OFFICERS.

1.—The accounts of the Club shall be audited by two members appointed at the ordinary meeting in December. No member of the committee shall be eligible as an auditor.

2.—At the same meeting notice of the annual meeting in January shall be given from the chair, and the nomination of members for election as officers for the ensuing year shall be announced.

3.—An annual meeting of the Club shall be held, in the place of the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the committee on the affairs of the Club, and the balance-sheet, duly signed by the auditors, shall be read.

4.—No permanent alteration in the rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or additions must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

CROYDON MICROSCOPICAL CLUB.

Mr.
of
being desirous of becoming a Member of this Club, we beg to recommend him for Election.

(on my personal knowledge).

This Certificate was read 187
The Ballot will take place 187

NOTE.—The foregoing Rules were adopted at a general meeting of the original members of the Club, held on the 16th of March, 1870, when the following gentlemen were elected as officers and members of the committee.

President—HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.
Treasurer—JOHN WICKHAM FLOWER, F.G.S., &c.
Hon. Sec.—HENRY LONG.

Committee:

ALFRED CARPENTER, M.D.	GEORGE MANNERS, F.S.A.
JOHN BERNEY, F.R.M.S.	G. F. LINNEY.
WILLIAM REEVE COOPER.	GEORGE PERRY.
PHILIP CROWLEY.	HENRY J. STRONG.

FREDERICK WEST, JUN.

THE LIBRARY.

RULES FOR THE CIRCULATION OF BOOKS.

1.—Books to be lent out to Members at any time when the Library of the Literary Institution, at the Public Hall, is open, on application to Mr. PUSEY, the Librarian.

2.—All books and periodicals to be marked with the stamp of the Club and numbered before being circulated, and kept in such a place as shall from time to time be determined by the committee.

3.—Members may obtain books by making personal or written application for them, and by signing a receipt for the same, which shall be held by the Librarian until the book is returned. No member shall have more than one work at a time, nor shall he keep any work for a longer period than 14 days. But when a book is returned by a member it may be borrowed by him again, provided it has not been bespoken by any other member. Books which have been bespoken shall circulate in rotation according to priority of application.

4.—Standard works, as shall be named by the committee, to be kept for reference and not to be lent out.

5.—Members retaining books longer than the specified time shall be subject to a fine of one penny per day. If any book be retained by a member for two months, and be not returned after written application has been made for it, the committee may order it to be replaced and charge the member in default with the amount thus incurred, in addition to the fine. If any book, when returned by a member, is found to have been damaged during the period such member has had it, a fine equivalent to the injury shall be paid by the member.

LIST OF BOOKS BELONGING TO THE CROYDON MICROSCOPICAL CLUB.

1 Vol. Beck's Illustrated Catalogue of Scientific Instruments.
1 ,, The Rev. J. B. Reade's Address before the Royal Microscopical Society.
1 ,, The Achromatic Microscope, by Beck.
1 ,, Polarized Light, by Charles Woodward.
1 ,, Davies on Mounting.
1 ,, Collection and preparation of Algœ, by Johann Nave.
2 ,, Smith's Diatomaceæ.
1 ,, Quekett on the Microscope.
1 ,, Carpenter on the Microscope.
1 ,, Microscopical Manipulation, by Suffolk.
1 ,, How to work with the Microscope, by Dr. Lionel S. Beale.
1 ,, Marvels of Pond Life, by H. J. Slack.
1 ,, Carpenter's Foraminifera.
1 ,, Turton's British Shells.
2 ,, Bentham's Flora.
1 ,, Berkeley's Cryptogamic Botany.
1 ,, Lectures on Histology, by Quekett.
1 ,, Human Microscopic Anatomy, by Kölliker.
Nos. 20, 21, and 22, Journal of the Quekett Microscopical Club.
Lithographed Drawings of Trilobites.

LIST OF MEMBERS.

Adams, W. A., Dingwall-road.
Adams, T. R,, M.D., Ottoman Villas, St. James's-road.
Allsop, Marston, London-road.
Anderson, J. C., Albert-road, Addiscombe.
Anderson, — M.D., Chelsham Villa, Wellesley-road.
Ashby, Henry, St. James's-road.
Austen, Nathaniel Lawrence, F.L.S., F.Z.S., "The Acacias," Pitlake.
Baldock, J. H., F.C.S., 3, High-street, South Norwood.
Bailey, E., 4, Ripley Terrace, Dingwall-road.
Baldiston, Frederick, Glastonbury Lodge, Sydenham-road.
Barnett, E. W., "The Larches," Penge-lane, Sydenham.
Barrett, — M.D., Carshalton.
Beeby, W. H., 41, North-end.
Berney, Edward, M.R.C.S., 73, High-street.
Berney, John, F.R.M.S., 61, North-end.
Berry, Edward, Park Hill-road.
Bennett, Arthur, 107, High-street.
Bindley, T., St. Peter's-road.
Blake, W. J., Duppas Hill-terrace.
Blockey, W. F., 38, London-road.
Bonus, Charles, Oakwood House, Sydenham-road.
Brodie, Robert, M.A., George-street.
Carpenter, Alfred, M.D., J.P., 113, High-street.
Chambers, C., "Eversfield," Sutton.
Clarke, A. H., 143, High-street.
Cleaver, H. A., M.R.C.S., 40, North-end.
Cooper, George, M.R.C.S., 4, George-street.
Cooper, W. R., Esholt Royd, Oakfield-road.
Cordon, George, 53, High-street.
Corry, John, "Rosenheim," Park Hill-road.
Cresswell, Alfred, M.D., South Norwood.
Crisp, F., 134, Adelaide-road, N.W.
Crowley, Alfred, Bramley Oaks, Bramley-hill.
Crowley, Jonathan Sparrow, 3, Park Hill-rise.
Crowley, Phillip, Waddon House.
Cushing, Thomas, Woodstock Villa, Alexandra-road.
Curling, G., Elgin House, Addiscombe.
Curling, J., Elgin House, Addiscombe.

Dickens, Richard Joseph, Addiscombe-road.
Dix, T. H., 36, High-street.
Diver, Ebenezer, M.D., Caterham.
Drummond, Arthur B., Lynton House, Oakfield-road.
Drummond, John, 76, North-end.
Drummond, William, 2, Sydenham-road.
D'Archambaud, A., Albert-road, Croydon.
Eastty, J. M., J.P., Wellesley House, Wellesley-road.
Edridge, T. R., J.P., "The Elms," High-street.
Evans, Henry, Bramley-hill.
Ewart, Ernest, Edwin Villa, Mayday-road.
Fagg, Edward, Warwick Villa, Addiscombe.
Fletcher, F., Eastmore House, Howard-road, South Norwood.
Fletcher, James, Eastmore House, South Norwood.
Flower, John, M.A., F.Z.S., Fairfield-road.
Gibson, John, Canning Lodge, Addiscombe.
Goddard, D. E., "The Ferns," Harcourt-road, Wallington.
Gregory, John, Park Hill-lane, Croydon.
Grundy, Charles, Outram Villa, Outram-road, Addiscombe.
Haddock, Roland, 64, High-street.
Hales, Edward, 27, "The Waldrons."
Harrison, W., 2, St. John's Villas, Bensham Manor-road, Thornton Heath.
Hingston, Robert, Park Hill-road.
Hodges, O. T., 19, St. John's-road.
Hopgood, James, Clapham Common.
Horsley, Henry, M.R.C.S., 24, North-end.
Hovenden, C. W., Clifton Lodge, Selhurst-road.
Hovenden, T., Arbor End, Selhurst-road.
Hudson, Robert, F.R.S., J.P., Clapham Common.
Ingrams, William, Whitgift School.
Jacobs, Alfred R., Carshalton.
Jecks, Charles, 26, Langham-place, Northampton.
Johnson, Cuthbert W., F.R.S., "Waldronhyrst," The Waldrons.
Jolland, C. J., St. Peter's-road.
Jones, E. F., St. Germain Villa, Forest Hill.
Klaassen, H. M., Upper Grove, Selhurst-road, South Norwood.
Lanchester, Henry, M.D., Park-lane.
Latham, Baldwin, Whitgift Lodge, Wellesley-road.
Lashmar, Charles, M.D., Wellesley-road.
Lee, Henry, F.L.S., F.G.S., F.R.M.S., "The Waldrons."
Leeds, C. E., Selhurst-road, South Norwood.
Ley, J. H., Lansdowne-road.
Linney, G. F., Friends' School, Park-lane.
Long, Rev. D., Bramley-hill.
Long, Henry, M.Q.M.C., &c., 90, High-street.

Lovett, E., Holly Mount, "Upper Addiscombe."
Loy, William Thomas, 9, Garrick Chambers, Garrick-street, London.
Mallett, E. M., 2, Cromwell-terrace, Clyde-road, Addiscombe.
Major, C. W., Cromwell House, Duppas Hill-terrace.
Manners, C., Lansdowne-road.
Manners, George, F.S.A., F.L.S., Lansdowne-road.
Marshall, Edward, M.R.C.S., Mitcham.
Martin, Howard, "The Ferns," Addiscombe.
McKean, Kenneth, Bramley-hill.
Millard, C., Brandnis Hill House, Beddington.
Mitchell, E., Whitehorse-road.
Moore, John, Oakwood, Park-hill.
Morland, Charles Coleby, Rastrick Lodge, Morland-road.
Moseley, T. B., Brighton-road House.
Muggeridge, T. Benjamin, Upper Addiscombe-road.
Muggeridge, W. H., Lower Addiscombe-road.
Nation, W. J., M.Q.M.C., 1, Clifton Villas, Thornton-road.
Newton, Charles, Crossland Villa, Broad-green.
Noakes, Henry, Whitgift-street.
Oldfield, John, 16, Tamworth-road.
Oswald, Edward Charles, "The Palace."
Owens, Henry, M.D., F.R.M.S., 6, Sutherland Villas, Selhurst-road.
Page, Joseph, 5, Ebenezer-terrace, Parson's-mead.
Paget, Peter, Coombe-lane.
Pain, O., 30, High-street.
Peake, F., 14, "The Waldrons."
Peek, W. H., M.P., Wimbledon House, S.W.
Penley, C., Fairfield-road.
Perry, G., Park-lane.
Petherick, H. W., Maple Lodge, Havelock-road, Addiscombe.
Philpot, H., M.D., 6, Sydenham-road.
Podmore, H. R. B., "Bramletye," Bramley-hill.
Price, G. N., St. Peter's-road.
Price, J. G., Ashton House, Bedford Park.
Punnett, P. S., "Wintons," Park Hill-road.
Purser, George, 3, Wellesley Villas, Sutton.
Reid, George, Teignmouth Cottage, Elgin-road, Addiscombe.
Ridge, Byron, 60, North-end.
Rigby, G., Wellesley-road.
Roberts, Rev. G. R., "The Limes," High-street.
Robinson, W. Mosse, Birdhurst.
Roby, R. F., Shirley House, Selhurst-road.
Rogers, W. Edward, Shaftesbury Cottage, Lansdowne-road.
Roper, A. G., M.R.C.S., 57, North-end.
Rowland, W. H., High-street.
Shepherd, J., "The Hollings," Sutton.

Simons, George, Beddington-lane.
Snelling, W. H., Selhurst-road, South Norwood.
Smith, Rev. G., Whitgift School.
Spencer, C. J., "The Grange," Sutton Common, Sutton.
Spencer, John. M.Q.M.C., "The Grange," Sutton Common, Sutton.
Stanley, W. F., "Stanleybury," Albert-road, South Norwood.
Stephenson, H. P., "The Hermitage," Warrington-road.
Stevenson, Albert, Pedstone Villa, Brighton-road, Sutton.
Steele, Joseph, L.D.S., M.R.C.S., George-street.
Strong, H. J., M.D., North-end.
Sturge, Edward B., "The Waldrons."
Suffield, Rev. R. R., Alfred Villa, Parson's-mead.
Sutherland, W., M.D., George-street.
Taylor, A. D., Ripley-terrace, Dingwall-road.
Thrale, Peter, George-street.
Thrale, Ralph, George-street.
Toms, Alfred, Lytchett Villa, Tavistock-road.
Townly, E. W., 116, High-street.
Tritton, Thomas, 2, Clifton Villas, Selsdon-road.
Turner, H., Wellington Terrace, St. James-road.
Twentyman, Alfred, Fairfield House, Addiscombe-road.
Walters, Walter, Park Hill-road.
Warren, Francis, Ailsa Villa, Wellesley-road.
Waters, C., George-steeet.
Watney, D., Bedford Park.
West, Frederick, "The Waldrons."
West, Frederick, jun., "The Waldrons."
Whiffin, G., Bramley-hill.
Williams, E. A., B.A., Friends' School, Park-lane.
Windsor, H. W., 8, Old Jewry.
Winshurst, H. W., Thicket-road, South Norwood.
Whitling, Henry Townsend, F.R.M.S., High Street.

FIFTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 20, 1875.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1877.

FIFTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 20, 1875.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1877.

OFFICERS AND COMMITTEE

FOR THE YEAR 1874.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

ALFRED CARPENTER, M.D., J.P.

Committee:

JOHN BERNEY, F.R.M.S.
WILLIAM REEVE COOPER.
PHILIP CROWLEY.
JOHN FLOWER, M.A., F.Z.S.
J. S. JOHNSON, M.R.C.S.
GEORGE F. LINNEY.
GEO. MANNERS, F.L.S., F.S.A.
GEORGE PERRY.
HENRY J. STRONG, M.D.

Honorary Secretary:

KENNETH Mc KEAN,

Summerfield, Warham Road, Croydon.

REPORT OF THE COMMITTEE.

The Fifth Annual Meeting of the Club was held on Wednesday, 20th January, 1875, Henry Lee, Esq., President, in the chair. The minutes of the last meeting having been read and confirmed, the following gentlemen were ballotted for and declared to be duly elected:—Messrs. W. W. Baynes, D.L., J.P., A. Allen, Charles Waite, Edward Moore, Howard W. Bishop, Samuel Hollis Anthony, W. G. Stoneman, and Nat. Bogle-French, jun. The following gentlemen were nominated for election at the next meeting:—Messrs. John S. Turney, The Ferns, Canning Road, Addiscombe; Capt. Colin Mackenzie, Hareston, Bedford Park; and J. Lacy Morley, M.R.C.S., Lower Addiscombe Road.

The President announced, with some regret, that there had been no competition for the prize of £2 which had been offered by Mr. Long, who had invariably taken a great interest in the welfare of the Club, for the best twelve mounted objects. Mr. E. Lovett was the only member who had endeavoured to compete. He had sent in twelve very excellent mounted objects, and as he had complied with the conditions he was entitled to the prize. He knew that the time of the members was very much occupied, but still he had hoped to see three or four, at least, compete. He (the President) had some idea of doing so himself, in order that the prize might not be won by a walk over, but as he thought that his object might be misunderstood, he had abandoned the idea. If Mr. Lovett would intimate to Mr. Long what book he preferred, Mr. Long would purchase it for him. The President then referred to the proposition for devoting a portion of the balance in hand to a lecture by some distinguished man. The choice of the Committee had fallen upon Professor Morris, than whom there was not a more eloquent man or more eminent geologist. Unless anything unforeseen occurred, it was proposed that the lecture should be delivered on Wednesday, February 17th, instead of at their next ordinary meeting. The subject would be an interesting one, namely, "The London Basin and the Geology of Croydon." It was proposed that each member of the Club should receive four tickets for the admission of his friends, and he believed the Committee would be willing to give more than four tickets to any member who wished to have them. He thought this would be the inauguration of a very successful movement, and he hoped that it would be the means of largely augmenting the number of members. It was proposed that the first lecture should be delivered in the Small Hall, and that the result of their first experiment should be a guide as to their future arrangements.

Dr. Carpenter suggested that the Large Hall should be engaged. He thought the Small Hall would not be large enough to accommodate all who were desirous of hearing so eminent a man on so interesting a subject.

The President said Dr. Carpenter's suggestion was worthy of the re-consideration of the Committee. Personally he had no objection to the Large Hall, if it was disengaged for that evening, and if there was a probability of its being well filled; otherwise he would prefer seeing the Small Hall completely filled, to having a sparse attendance in the Large Hall, which would be depressing, not only to the lecturer, but also to the audience. If the Large Hall was used, the number of tickets given to the members would be increased.

Mr. Martin having ascertained that the Large Hall was not engaged for the 17th February,

The President invited those present to express their opinion on the matter. Some were in favour of the Large Hall; others thought the Small Hall would accommodate all who attended. On a show of hands being taken, it was found that there was a majority in favour of the Large Hall, and the President expressed a hope that every member would assist in making the project a great success, as he considered it to be an important event in the history of the Club.

The PRESIDENT then called upon Mr. McKean, the Hon. Secretary, to read the following report:—

FIFTH ANNUAL REPORT OF THE COMMITTEE.

In presenting their Fifth Annual Report, your Committee have much pleasure in announcing that the Club continues to make satisfactory progress.

During the past year forty new members have been elected, eight have withdrawn (some of these in consequence of having left the neighbourhood), and two have been removed by death. On the 31st of December, 1874, the number of members was one hundred and seventy-one.

By the decease of Dr. Sutherland and Mr. N. L. Austen, the Club has lost two of its valued and industrious members.

The attendance of members at the monthly meetings, though not surpassing the previous year, has yet been fully sustained; the average attendance of members being, in 1873, thirty, and in 1874, thirty.

The following is a list of papers read during the year:—

February 18*th*.—"On some developments that have taken place in the Brighton Aquarium," the PRESIDENT.

March 18*th*.—"On Lenses in connection with the Microscope," W. T. SUFFOLK, Esq.

April 15*th*.—"On Spectro-Microscopy," D. E. GODDARD, Esq.

May 20*th*.—"On the preparation of Animal Tissues for the Microscope,' F. W. PAUL, Esq.

November 18*th*.—"On the Minute Anatomy of the Human Lung," Dr. ANDERSON.

December 16*th*.—"On Sponges," Captain TYLER.

In the early part of the year, an arrangement was made with Mr. W. T. SUFFOLK to deliver a course of Five Lectures to the Club on the Microscope and its apparatus A nominal fee of 5s. was charged to the members for the course, and 37 availed themselves of Mr. Suffolk's valuable instruction.

The Excursions during the summer months were made in company with the Quekett Microscopical Club, in compliance with an invitation to that effect. They were as follows:—

June 13th, Caterham and Godstone.	Sept. 5th, Bromley and Keston.
July 4th, Addlestone.	,, 19th, Darenth Wood.
,, 13th, Southend.	October 3rd, Barnes.
,, 25th, Finchley Common.	,, 17th, Wandsworth Common.

At the invitation of the President, an Excursion to the Brighton Aquarium took place on Saturday, 26th September, and was attended by nearly 50 members, who, with the representatives of the Croydon Press, had the privilege of seeing the private tanks and the various appliances for working the Aquarium not shown to the general public.

The Annual Soirée was held on the 25th November, and was quite as successful as any of its predecessors. One hundred and seventy-two microscopes were exhibited, and of this number the Club contributed fifty-four. Valuable assistance was given by Fellows of the Royal Microscopical Society, and by Members of the Quekett, South London, Forest Hill, Margate, Tower Hill, and New Cross Clubs, and by the leading Opticians, as well as by several private gentlemen. Number present, six hundred and twenty-five, of whom one hundred and eighty-six paid for admission.

The following additions to the Library have been made by donations :—

"The Journal of the Quekett Microscopical Club," from the commencement to the present time, presented by the President.

"Spectrum Analysis," by W. T. Suffolk, presented by the Author.

Your Committee regret that the books in the library are seldom used, and take this opportunity of stating that they will be happy to receive suggestions as to the addition of any works of reference.

During the past year one dozen slides have been presented to the Club's cabinet by Mr. J. S. Johnson ; one dozen by Mr. Philip Crowley ; and one dozen slides by Mr. E. Lovett.

On the retirement of the late honorary secretary, Mr. Henry Long, a testimonial was, by the unanimous desire of the members, presented to him. A portion of the Club's funds having been devoted to this purpose, a handsome Microscope Stand by *Crouch*, was purchased, and the presentation took place at the Greyhound Hotel, on Wednesday evening, June 17th.

BALANCE SHEET FOR THE YEAR ENDING DECEMBER 31st, 1874.

Receipts.

	£	s.	d.
Balance in hand	78	18	4
Members' Subscriptions	81	10	0
Mr. Suffolk's Class—Members' Subscriptions	9	5	0
Annual Supper, Tickets sold	5	7	6
Sale of Soirée Tickets	23	5	0
	£198	5	10
Balance in hand	£81	0	10

Expenditure.

	£	s.	d.	£	s.	d.
Hire of Rooms { Monthly Meetings, Mr. Suffolk's Classes, Committee Meetings }				7	0	0
Postages				5	5	6
Advertising and Printing				4	19	10
Stationery				2	6	0
Microscope (Testimonial presented to Mr. H. Long)				17	3	6
Mr. Suffolk's Course of Lectures				10	10	0
Carriage of Apparatus for ditto				0	2	6
J. P. Budden } Account Annual Supper				10	8	0
Musicians } Account Annual Supper				2	2	0
Excursion to Brighton (sundries)				1	18	6
Gratuity to Messrs. Pusey and Jones (Christmas, 1873)				1	1	0
Mr. J. Jones' attending to Lamps, &c.				1	11	1
" Commission Collecting subscriptions, &c.				0	8	0
Sundries				0	14	9
SOIREE EXPENSES.						
Printing and Advertising	6	16	0			
Messrs. Standidge (Admission Cards)	2	16	0			
Hire of Rooms	7	14	6			
Refreshments	13	9	9			
Hire of Pianos, &c.	2	6	0			
Police, Ticket Collector, and Attendants	0	18	0			
Messrs. Ridge & Son (Decoration of Stage)	2	0	0			
Hire of Lamps and Shades	1	14	0			
Six Dozen Wood Blocks for Lamps	1	11	0			
Mr. Hodder for Tables	8	19	2			
Postages and Stationery	2	3	6			
Carriage and Sundries	1	6	5			
				51	14	4
Balance				81	0	10
				£198	5	10

ALFRED CARPENTER, M.D., TREASURER.

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct.

5th January, 1875.

ALEXANDER DENNETT TAYLOR, } AUDITORS.
W. H. ROWLAND, } AUDITORS.

The Treasurer's statement of accounts having been taken as read,

Mr. Perry moved, and Mr. J. St. Johnson seconded, the adoption of the report, which was carried *nem. dis.*

The election of officers who had been nominated at the last meeting was then proceeded with.

Mr. W. H. Rowland said he had been unexpectedly called upon to propose the re-appointment of their excellent friend, the President, if he would be good enough to accept the appointment again. In the few remarks that he should make, he was afraid he might say something that he ought not to say, and omit some words which he ought to mention. There could be no doubt, however, that the proposition was one which commended itself to the consideration of the Club, and he was happy to think that anything he could say would add very little indeed to the importance of the proposition before them. It had been frequently apparent to them all that the Club had derived the greatest possible benefit from having as its President a gentleman of Mr. Lee's energy, talent, and ability, and although it might be possible to find another gentleman in this town to occupy the position, he was sure no other could carry out the duties so well and satisfactorily. His varied and extensive knowledge on the subjects which from time to time came before the Club, had been of immense assistance to the members, and he hoped the time was far distant when their friend Mr. Lee would be compelled to resign the post he so well and so honourably filled.

Dr. Carpenter, in seconding the motion, cordially endorsed all that had been said by Mr. Rowland. He hoped that so long as Mr. Lee remained in this neighbourhood, and was willing to continue the Presidency of the Club, they would annually have the privilege of electing him. There was no doubt that it was to Mr. Lee's exertions the Club owed its present position, and so long as the members could have the benefit of his valuable services, so long should he (Dr. Carpenter) be unwilling that any other gentleman should be proposed as President of this Club.

The motion having been carried by acclamation, The President said this was the only meeting in the course of the year at which he felt uncomfortable. He always felt happy at their meetings, and he was happy now in the consciousness that he possessed their universal suffrages and good feeling. He would not trust himself to say much on the present occasion, for he deeply felt the kind expressions which had fallen from his friends, Mr. Rowland and Dr. Carpenter. Year after year he had considered that the office of President should be filled by some other gentleman, and had it not been for a pressing request of the members, he should have thought it right to place his resignation this year in the hands of the Club. He assured them that he should willingly relinquish his post at any time, and extend to his successor his cordial support and co-operation; therefore the Club would not lose his services by his resignation of the Presidency.

It was moved by Mr. W. R. Cooper, seconded by Dr. Strong, and carried unanimously, that Dr. Carpenter be requested to continue the office of Treasurer.

Dr. Carpenter having replied, it was proposed by Mr. Philip Crowley, seconded by Mr. G. F. Linney, and carried, that Mr. Kenneth McKean be re-elected Hon. Secretary.

Mr. Mc Kean having briefly thanked the Club for their renewed expressions of confidence,

Mr. Baldock proposed, and Dr. Anderson seconded, the re-appointment of the Committee, and the President, in putting the motion, said the Committee had worked admirably; they had relieved him of all the details of the *Soirée*; they were a hard-working, sterling Committeee, and they had the interests of the Club at heart.

The motion having been carried unanimously,

The President, in offering a few observations on the report, alluded in feeling and sympathising terms to the death of two valued members of the Club, Mr. Austen and Dr. Sutherland. He then commented on the fact that as so few books had been taken out of the library, the Committee had not felt themselves justified in purchasing any more books. When books had been taken, they had been kept so long a time, that he feared the holders had incurred heavy penalties. He should like to hear an expression of opinion from the Club as to the desirability of purchasing a few books of reference with the funds they would have to spare after defraying the expenses of the lecture. According to the report, it would appear that there had been an average attendance of thirty at each meeting during the year. This result had been arrived at by examining the attendance book, but he believed that the return from that source did not indicate the actual attendance, in consequence of some gentlemen having neglected to inscribe their names in that book. He therefore hoped, for the honour of the Club, that in future members would be careful to sign their names. He also suggested that every gentleman who exhibited a microscope at their meetings should not only inscribe his name on the ticket, but also the name of the object exhibited. The summer excursions did not appear to have been a source of much attraction hitherto, notwithstanding that the Committee had endeavoured to make them more attractive. The President also expressed a hope that the Club would turn their attention to the Flora and Fauna of the neighbourhood, which afforded abundant scope for pleasant occupation.

Suggestions were then made by Dr. Anderson and Dr. Strong that the library should be strengthened by the purchase of a few works of reference, and that steps should be taken to bring the library more prominently before the members. It was thought that a few standard works on Botany, Geology, &c., would be a useful addition to the library, and the President said that the subject should receive the Committee's attention.

Dr. Carpenter said he should like to support the President's suggestion with regard to a more complete cultivation of the Flora and Fauna of this district. If anyone who possessed a microscope would take a subject, however small and unimportant, and work it out thoroughly, the Club would be enabled to investigate many objects in detail, and derive full and complete information respecting them. For instance, he saw the other day that a Frenchman had made the subject of chalk his study, and had published drawings showing that there were more than 800 varieties of form in carbonate of lime. This result had been attained by working out the subject to its fullest extent; and he was certain that there was abundance of material in this neighbourhood which, if fully studied, would afford valuable information when discussed at the conversational meetings of the Club. Beautiful fossils were to be found in the flints with which our streets are covered, and hidden beauties, only to be revealed by the microscope, are to be found in all directions, and are worthy of a search.

A suggestion having been made that the meetings of the Club should be held fortnightly instead of monthly, it was over-ruled temporarily by the President, who said that the Committee, at present, feared that a few young and enthusiastic members might attend fortnightly for a time, and afterwards grow tired of such frequent meetings. He would rather make them long for more, than that they should be tired of what they had. With regard to the flints of this neighbourhood, the President adverted to the beautiful collection which was in the possession of the late Mr. J. W. Flower. The Club on one occasion had been favoured with an inspection of that valuable collection, and he hoped that their friend, Mr. John Flower, would afford them an opportunity of another inspection. Had his lamented father been spared, there would have been no necessity for looking beyond the confines of the Club for a lecture on the Geology of Croydon.

The proceedings then terminated.

ABSTRACT OF PROCEEDINGS.

1874.

February 18*th*, 1874.—Henry Lee, Esq., President, in the Chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members, namely:—Mr. C. Jecks, 26, Langham-place, Northampton; Mr. Charles Waters, George-street, Croydon; Mr. C. J. Jolland, St. Peter's-road, Croydon; Mr. Edward Lovett, Holly Mount, Upper Addiscombe-road; Mr. John Oldfield, 16, Tamworth-road, Croydon; Mr. Frederic Fletcher, Eastmore House, Howard-road, South Norwood; Mr. John Gregory, Dark-hill-lane; Mr. Charles Millard, Brandies-hill House, Beddington. The undermentioned gentlemen were nominated for membership at the next meeting:—Dr. Alfred Cresswell, of South Norwood; Reuben F. Roby, Shirley House, Selhurst-road; Mr. Francis Peake, 14, The Waldrons, Croydon; Mr. Robert Hingston, Park Hill-road; and Mr. Charles Manners, Lansdowne-road, Croydon.

With reference to the proposed lectures by Mr. Suffolk, the President explained that he had seen that gentleman and had some correspondence with him. He read a letter from him, enclosing a list of his lectures as delivered before the South London Microscopical Club, and stating the terms upon which he would be willing to deliver them at Croydon. The President then stated that the Committee thought they might have a course of six lectures, and that a subscription of five shillings from each of the members who would like to attend them would not be too much. He asked those who were desirous of availing themselves of these lectures to give in their names to the Hon. Secretary.

The President then proceeded to deliver some remarks "On some of the Developments that have taken place in the Brighton Aquarium." Mr. Lee said—When I last had the pleasure of communicating to the Croydon Microscopical Club the result of some (observations on the Brighton Aquarium, I described the process never previously witnessed by human eyes, so far as is known) by which the oviparous dog-fishes attach their eggs to projecting substances at the sea bottom. This problem solved, two questions remained to be answered; first, were the eggs laid by the mother in captivity impregnated? Secondly, if so, how long a time would pass before they were hatched? The first pair of eggs of last season were deposited on the 14th of January, and during the following week many others were successively attached to oysters on the sham gorgonias made of birch broom twigs, and fastened to heavy stones, which I placed in the tank for the use of the fish in their mooring operations. After that more than 200 of these eggs of the "rough hound" and many of the "nurse-hound" were laid in the Aquarium, and of the greater number of the former the date of deposit has been carefully noted. The finding of these eggs occasionally in the dredge, or cast ashore with the young embryo not half-grown in them, and yet having the outer surface of their shells covered with algœ, sponges, and other marine organisms, in a condition which indicated the growth of many weeks, had quite prepared us for watching patiently for some months for their arrival at maturity. For the purposes of observation, I attached several of their eggs artificially to my sham gorgonias, and placed them where they could be conveniently watched. In some of these the movements of the young fish were clearly seen from its first existence as a minute, worm-like creature living apart from, but connected with the yelk-bag from which it derives its sole nutriment while in the egg. At the end of six weeks, the little fish is about an inch long, and attached by an umbilical cord or tube to the yelk-like sac or nutrient vesicle; the head is of the ungainly shape usual in the embryonic condition of young fishes, the eyes disproportionately large, the ventral fins scarcely perceptible, and the tail and hinder portion of the body much elongated. For the first three or four months the young fish increases in size very slowly, but at the end of that period its body is as long as the egg-case in which it is curled round. The contents of the umbilical sac or yelk-bag are gradually absorbed, and this appendage itself diminishes in size, so that a little more space becomes available for the youngster's movements. But when it begins to be inconveniently cramped for room, it kicks out with its tail against the rounded end of the case (that which first issued from the ovaries) with a steady, sustained stroke of thirty to the minute, something like the action of a vigorous swimmer, or that of a man standing up in a boat, with his face to the bow, and pushing the sculls, instead of sitting down and pulling them. The now hardened bones of the wedge-shaped head, driven instinctively with unremitting and regularly-delivered blows, like a mechanically-worked battering ram, split the two layers of the horny membrane of the case at its square end, and at length it forces a communication with the outside water, some of which enters the egg. The respiratory organs at this period are still totally different from those which will be of service to the young animal in its perfect form, and exhibit, with remarkable distinctness, the progressive changes which these organs undergo in the fœtus of all vertebrate animals. Instead of the gills, characteristic of the fish, it is furnished with external branchiœ, something like those of the newt, and before it is capable of enjoying a separate existence in the world of the sea, these have to be absorbed, and the internal gills developed. The growth of the young fish, and the changes that take place in its organisation are rapid as it advances towards maturity, and at the end of the sixth month—the yelk-bag being entirely absorbed, and the gills perfect—it issues from the square end of the egg, a well-formed young dog-fish, about four inches long, marked and spotted like its parents, and able to take food by the mouth. We have now about a hundred and fifty of them alive. I am glad to be able to add that the young dog-fishes bred at the Brighton Aquarium have been found valuable material for one of the greatest contributions to modern science, viz., the masterly treatises by my distinguished friend, Professor W. K. Parker, on the development of the embryo skull. If one of the egg-cases, containing a young embryo fish be cut open, and its contents transferred to a deep watch-glass full of sea-water, and placed under a microscope, a spectacle will be presented which none could regard without admiration. The circulation of the blood through the branchiœ will be seen even more distinctly than in the foot of the frog, whilst within the umbilical cord will be visible two great vessels. Through these veins the blood will be seen passing in contrary directions, one of them conveying it from the heart of the fish to the nutrient sac, from which it travels by the other back again to the heart. Passing on to a description of the eggs of the rays, Mr. Lee said the empty cases of the skate and thornback-ray, known as "mermaids' purses," "skate-barrows, &c., were familiar objects of the sea-shore. These black horny cases are about three inches long and two inches broad, flat on one side, slightly rounded on the other, and having a thin, tapering projection from each of the four corners, like handles of of a hand-barrow, a butcher's tray, or a police "stretcher." A person picking up some of these plentifully-strewn items of flotsam and jetsam, would find them empty, or at best containing a little water or wet sand. The young fish had arrived at maturity and escaped. Tired of being left by its mother locked up in the house by itself, it had made bold to force the door, and seek its living in the outside world. How? The tenement seemed all secure and undisturbed, but it was nevertheless certain that the youngster had got out and the sand had got in. A moment's thought would tell one that if the door was forced, the runaway had no means of repairing the fastenings, and that where the fish had made its exit the sand found ingress. Pressing with thumb and finger on the yielding case of flexible horn, out would come sand and water through a previously unnoticed transverse rupture, or slit, across one end of the case. How was this made? By the young fish whose temporary prison it once was, and by a process similar to that which he had described as employed by the young dog-fish. Examining the reason why the eggs of the skates and rays were so seldom cast upon the sea-shore until the young one was gone, and the shell had served its purpose, he remarked that, thanks to the facilities of observation at the Brighton Aquarium, he had been enabled to answer this question. The egg-case of the rays is covered on its convex side with a mass of agglutinated fibres which, when the egg is placed in a jar of water, are seen floating out around it like a dense growth of felted confervæ, and extending along its edge like a broad web. When the egg is first laid, this webby mass is in a glutinous condition, and adheres to whatever it touches. The egg is deposited with the convex side upwards, the proper position of the future fish, and it appears to be the habit of the parent to cover it by a peculiar motion of her fins with the debris of the bottom on which she lies. The stones, shells, sand, &c., stick tightly to the gummy garniture, which hardens almost instantly, and thus the egg is weighed down by the substances adhering to it. Some eggs of the "spotted ray," laid in the tanks in June last, were covered up in this manner, although others were merely deposited in the shingle. The rays, like other flat fishes, are, owing to their conformation and habits, rather troublesome in an aquarium. The flapping of their broadly-expanded bodies and lateral fins stirs up the deposit at the bottom of their tank, and causes the water to become turbid. At Brighton, therefore, it had been found expedient to keep only sufficient specimens to illustrate the various species procurable, and consequently only a few of their eggs had been found there deposited, some of which had not been fertile. Still, from the little material thus placed under his observation, he was enabled to record important results. The eggs were not translucent, like those of the dog-fishes, and so it was impossible to judge with certainty of their contents; but although they had only two which they knew contained living embryos, Mr. Parker's work was so important to science that he (Mr. Lee) felt justified in arresting the development of one of them at the end of the sixth week after its extrusion by immersing it in spirits of wine, and handing it to the distinguished anatomist, who considered it one of the most valuable and instructive specimens he had ever received. The other egg was successfully hatched soon after the expiration of the fifth month, but as the young fish, when it left its case, had still a portion of the umbilical sac attached to it, and unabsorbed, he had reason to believe that its exit was prematurely caused by unskilful and incautious handling; that if left to itself it would have probably remained in the egg for some time longer, and that its true period of development is as nearly as possible the same as that of the dog-fish—namely, six months. From specimens obtained at Margate, he was enabled to show the position of the young ray in the egg after it assumes its proper form. The two sides of the body were folded over on the back, the lateral fins meeting and slightly overlapping, and the tail curled round on one side, the tip pointing towards and nearly reaching the head. Passing on to the spawning of the cod tribe, Mr. Lee described the enveloping membrane of the eggs as so thin and transparent that they were hardly perceptible by an uneducated eye. In appearance they resembled clear globules, rather smaller than a granule of boiled sago. He found that the specific gravity of these eggs was so delicately adjusted by the All-wise Ruler of Nature that in water of the density of that taken from the open sea they floated even when it was tranquil, whilst the constant motion of that which washed the shores, although its density was less, was sufficient to preserve them from sinking to the bottom. The floating of these ova is accomplished by the presence of several small globules of oil, which may be seen within the ovi-sac, and dotted over the yelk. Under the microscope the embryos, variously developed, show beautifully the form of the blastoderm in the least ripe specimens, and in the more advanced the young fish may be seen curled round within them; the prominent eyes, the arched mouth, the rudimentary gills, and the vertebral column being plainly apparent. Some days after the ova were first seen in the tank, not only was the form of the fish discernible in many of them, but the young fry just hatched were detected in the water enjoying independent life. The tiny things, when first turned out of their egg-shelter, are only about three-sixteenths of an inch long, not nearly so large as a young perch at the same period. It would take a dozen of them to make up in weight and bulk the body of a gnat. He (Mr. Lee) could not at present state positively from personal knowlege how long a time elapsed between the emission of the spawn by the mother fish and the escape of the young fry from the egg. Up to the present time he had been unsuccessful in his endeavours to ascertain this with precision. Dr. George Ossian Sars, of Christiana, stated that the period was sixteen days. He hoped to have verified this by artificially spawning the fish of both sexes, in the same manner as he had frequently performed the operation on trout and salmon. He humourously detailed the experiment made for the purpose, the result of which, however, was unsatisfactory. In conclusion he stated that the incident of the spawning of these fish in the Brighton Aquarium was one of considerable interest, as bearing, 1st — On the confirmation of the discovery of Sars in 1865, that the cod, mackerel, gurnard, and other species of fish, spawn at the surface of the water, where the ova float during the whole time of their development. 2nd—On their spawning season. 3rd—Indirectly, and arising out of these, on the expediency (or the contrary) of legislation for the protection of sea-fish, by the enactment of an annual close-time, as proposed by some, and on the restriction of trawling, as advocated by others. Mr. Lee added that he was watching carefully the progressive development of the embryo cod, and hoped some day to be able to lay before the members of the Microscopical Club more exact information concerning the changes it undergoes before leaving the egg. Interesting developments of the octopus, the crustacea, sponges, &c., had also come under his observation, which might supply material for a future paper. (Applause.)

The President exhibited, in illustration of his paper, a specimen of the web-like matter by which the eggs of skates and rays adhered to the substance in which they were laid; he also showed an egg of the dog-fish; a partially-developed dog-fish, showing the external branchiœ instead of internal gills; egg-case of skate, &c.

A few questions were put by Dr. Carpenter and one or two other gentlemen with reference to the points which had been touched upon, after which a cordial vote of thanks was passed to the President for his interesting paper.

Besides several microscopes with interesting specimens of cod ova, exhibited by the President, the following members had objects under their instruments—several of which exhibited developments referred to by the President in his paper:—Messrs. P. Crowley, G. Manners, Dr. Strong, Messrs. J. S. Johnson, J. Berney, K. McKean, H. Long, G. F. Linney, A. D. Taylor, J. G. Price, and H. Ashby.

March 18*th*, 1874.—Henry Lee, Esq., President, in the chair. The minutes of the former meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members, namely:—Mr. Francis Peake, 14, The Waldrons, Croydon; Dr. Alfred Cresswell, South Norwood; Mr. Reuben F. Roby, Shirley House, Selhurst-road; Mr. Robert Hingston, Park-hill-road; and Mr. Charles Manners, Lansdowne-road. The following gentlemen were proposed for election at the next meeting:—Mr. John Henry Baldock, F.C.S., Member of the Pharmaceutical Society, 3, High-street, South Norwood; Mr. John H. Ley, Lansdowne-road, Croydon; and Mr. Edward Mallett, 2, Cromwell-terrace, Clyde-road, Croydon.

The President then called upon Mr. Suffolk to deliver his lecture.

The Lecturer said it was not his intention to encumber his remarks with technicalities, nor should he be able to impart any more information than might be found in the excellent works on the microscope which were published; but it was often found that more real instruction was to be gained by means of a lecture, and the subject would be found much more simple than it was considered to be by reading a formidable work on optics. In alluding to the phenomenon of refraction, the lecturer explained, by the aid of diagrams, that it was the effect which transparent mediums produced on light in its passage through them. Opaque bodies reflected the rays, and transparent bodies transmitted them; but it was found that if a ray in passing from one medium into another of different density, fell obliquely, it was turned out of its course. In passing through a pane of glass, the rays suffered two refractions, which, being in contrary directions, produced nearly the same effect as if no refraction had taken place; but in plane mirrors the rays of light were reflected from objects placed before them, exhibiting to us their image. The lecturer then referred to the lenses of a microscope. The property of those which had a convex surface was to collect the rays of light to a focus; and those which had a concave surface to disperse them. Lenses which had one side flat, and the other concave or convex, were called plano-convex and plano-concave. The focus of the former was at the distance of the diameter of a sphere of which the convex surface of the lens formed a portion. Parallel rays were brought to a focus by the plano-convex lens at a point. A concave lens, so far from possessing magnifying power, if anything, rendered objects smaller. The single microscope consisted simply of a convex lens, in the focus of which the object was placed, and through which it was viewed; but a double microscope was a more complicated instrument, in which you looked, not directly at the object, but at a magnified image of it. In this microscope two lenses were employed: the one was placed so near the object that the image which it formed was farther from the lens than the object itself was; the image, therefore, was larger than the object itself, and it was further magnified by being viewed through another lens, which acted on the principle of the single microscope, and was called the eye-glass. The pocket lens, he said, was most useful and indispensable to botanists, naturalists, and students of other sciences. The proper use of these lenses was to place the eye and the object at precisely the same distance from the glass. For instance, if it was an inch glass the eye must be an inch from the glass, and the object also an inch from the glass, and so on with respect to larger or smaller glasses. The lecturer then explained the difficulties which opticians encountered in getting rid of spherical and chromatic aberration. Spherical aberration, he said, may be known by the want of sharpness when a fine line, or small spot, or body with a well-defined circular line is examined. Instead of the lines appearing sharp and distinct and definite, they seemed to be blurred and foggy, even when focussed with the utmost care; and when there are several lines or spots near to one another, they appear to run together, producing a general shadow, instead of each one being distinctly defined and separated from its neighbours. If the glass has not been properly corrected for chromatic aberration, lines are seen with coloured fringes, blue if the lens is "under-corrected," and reddish if "over-corrected." These aberrations had been removed by combining two glasses containing opposite properties, and this was the secret of the manufacture of achromatic glasses. Mr. Suffolk then explained three methods of varying the magnifying power—1st, by using a more powerful object glass; 2nd, by using a deeper eye piece; and 3rd, by elongating the body of the microscope. There are two kinds of eye-pieces, namely, the Huyghenian, invented by a Dutch astronomer, consisting of two plano-convex glasses, the flat surfaces of which are directed upwards, the one nearest the eye of the observer being the "eye-glass," and the one at the greater distance the "field-glass." The other eye-piece is that invented by Ramsden, and is called the "positive" eye-piece, which only shows an object well in the centre, and is used in transit telescopes, theodolites, &c. It differs from the Huyghenian eye-piece, inasmuch as, by it an object may be viewed beyond itself. Referring to microscope stands, Mr. Suffolk strongly recommended that invented by Wenham, and then passed on to consider the action of binocular prisms, and the arrangements which had been perfected by Mr. Wenham, which that gentleman had considerately given to the public, instead of realising a large fortune, as he might have done by patenting his valuable invention.

At the termination of the lecture, the President accorded, in the name of the Club, a cordial vote of thanks to Mr. Suffolk for the valuable instruction he had imparted.

The following members exhibited their microscopes, viz:—T. R. Adams, M.D., P. Crowley, J. S. Johnson, H. Long, G. Manners, G. Perry, and J. G. Price. It was stated during the evening that Mr. Mc Kean had consented to undertake the duties of Hon. Secretary in place of Mr. Henry Long.

April 15*th*, 1874.—Henry Lee, Esq., President in the chair. The minutes of the previous meeting having been read and confirmed, the following gentlemen were ballotted for and duly elected:—Mr. Edward Mallett, Mr. John H. Ley, and Mr. John H. Baldock. The following were proposed for membership:—Mr. George Curling and Mr. Jesse Curling.

Mr. D. E. Goddard gave a lecture on the "Spectro-microscope," and illustrated his subject with numerous diagrams. At its conclusion, a hearty vote of thanks was passed to him. The following members exhibited their microscopes:—Messrs. J. Gregory, J. S. Johnson, E. Lovett, G. Manners, J. G. Price, A. D. Taylor, and the President.

May 20*th*, 1874.—Henry Lee, Esq., President, in the chair.—The minutes of the previous meeting having been read and confirmed, Mr. George Curling and Mr. Jesse Curling, both of Elgin House, Addiscombe, were ballotted for and duly elected members. Captain John Coare Swaine was nominated for membership.

The President stated that this was the last night of their season, according to the bye-laws, but in accordance with a wish which had been expressed, the committee had consulted together as to the best way of doing something more than expressing their thanks to their retiring Secretary (Mr. H. Long), for his exertions during the time he had held that office. It was his advertisement in the local papers that first brought them together, and most punctually and admirably had he performed his duties. This had decided them to prolong their stay with each other, and instead of separating for the season to-night, to carry on their meetings till the 17th of June, when, instead of having their ordinary meeting, they would have a friendly supper, and would take advantge of the occasion to present to their late Secretary a testimonial, consisting of a very handsome stand for a microscope, to which apparatus might be added according to convenience. Due notice would be given of the supper and the presentation.

Frank S. Paul, Esq., of Guy's Hospital, then read a paper on "The Preparation of Animal Tissues for Microscopical Examination."

Mr. Paul said—I am about to bring before your notice this evening a branch of Histological study with which it is probable many of you are not very familiar; for amongst the daily-increasing number of Histologists, only a few—and that few, almost without exception, students of medicine—have devoted themselves to the investigation of animal tissues in their higher and more elaborate forms. The beautiful shells of the foraminifera, the brilliant scales of the butterfly, or the glittering colours of the polariscope, too frequently give to the young microscopist an unworthy conception of beauty, leading him to preserve the shell of an insect, while he ignores its organisation; or to make pretty pictures with the scales of the butterfly, while he remains in ignorance of its alimentary canal; his object being for ever to prepare specimens which, by the brilliancy of their colours, or the boldness of their structure, are able to be appreciated by the outside world, rather than to search out the arrangement of complex structures which could only be admired by himself and his fellow-workers. Yet it is evident that this is passing away, for one sees now, side by side with the beetles and flies of the shop, slides of muscular fibre, cartilage, or nerve tissue. You will agree with me that it is a move in the right direction; and that it is more scientific to examine the secreting structure of the kidney as a whole, than to make a pretty specimen showing only the red vessels with their malpighian tufts. Not that I intend to depreciate for one moment the value of injections of these tufts, but that I would impress upon you the necessity of studying them in conjunction with the tissues in which they are embedded; for their purpose is to keep these tissues in repair, and they are, therefore, inferior to them—inferior, not only in function, but, if you will believe me, in beauty also. But it behoves me to enter, without loss of time, more immediately upon the plain facts of my subject. First, however, let me explain, that I have supposed the study of compound animal tissues to be far from general, and therefore propose to enter into elementary details concerning their preparation. If, however, I have been mistaken in this, I shall have to regret a sad failure in bringing before you this paper, which is only intended as a guide to those who have not studied, but are willing to study a subject, perhaps more than all others, replete with scientific interest. To commence, then, at the very beginning, let us suppose we have obtained a portion of some solid organ—the kidney for instance. We must, in the first place harden it. Now, for hardening tissues, as well as for cutting, staining, and mounting them, there are a great variety of methods; so many, in fact, that were I to attempt a short description of each, I should leave no time for the rest of my subject. Therefore I propose in this, as in other steps of preparation, to describe only those which, having seemed to me the best, I have usually adopted. First, then, we place our piece of kidney, which should be about the size of a filbert, in equal parts of methylated spirit and water. In this it should remain for about 24 hours. Then transfer to a weak solution of chromic acid, 1 per cent., or only half this strength for nerve tissues. In the course of a day or two, the chromic acid solution must be changed, and again in two or three days more, and even a third time in the course of a fortnight, should the hardening not progress satisfactorily. At the end of this time the tissue should have become hard and tough, for both these properties are indispensable, since it is easier to cut soft substances than those which are hard and brittle. Well, supposing the chromic acid stage to have been satisfactory, we place it in methylated spirit for a few days to complete the process of hardening; this final change adding very considerably to the firmness of the tissue. It is well, perhaps, to explain the object of these various changes during the process of hardening. First, it is intended, by placing the tissue in spirit and water, to avoid any softening through decomposition in the centre of the substance, since chromic acid does not permeate the tissue sufficiently rapidly to preserve it from decomposition in the centre of a thick piece. Moreover, the spirit and water washes out a quantity of blood and serous fluid which would, by the chromic acid, be rendered solid, and so give rise to a false appearance in the section. Next we must consider why the hardening should not be continued in spirit, since so the process would be easier and much more rapidly completed. The reasons are not numerous, perhaps, but they are powerful. Spirit will harden sufficiently and much more rapidly, but it interferes with the shape of the individual cells of the tissue, acting differently upon different cell contents; while chromic acid simply permanently fixes whatever the tissue contains. Chromic acid, moreover, itself stains the tissue, so that very good specimens are obtained by at once mounting sections in glycerine, which cannot be the case with spirit, for the tissue having been in part hardened by abstraction of water, when placed in glycerine becomes in some parts at once unduly distended, especially the connectiæ tissue, and in others too transparent for observation; so that chromic acid seems to have weighty advantages over spirit for hardening animal tissues. But when all the elements of the tissue have been permanently fixed by it, a return to spirit is very successful. The substance becomes harder, more easy to cut, more easy to manipulate, and stains more readily. So that for converting a soft animal tissue, of which in its fresh state it is impossible to cut fine sections, into a tough, hard block, from which the finest shavings can be cut, we have only to place it first for 24 hours in equal parts of spirit and water, then for about a fortnight in 1 per cent. solution of chromic acid, changed three or four times, and finally into methylated spirit for a few days. And this is the method I should certainly recommend in all ordinary cases. There is, however, another method frequently of great service, especially for cutting sections of carmine gelatine injections, and that is freezing. The method is very simple. It is only necessary to make an ordinary freezing mixture with ice and salt, and to throw the substance to be cut into it for a few minutes, when it becomes as hard as a board, and yet very easy to cut. These are the only methods of hardening that I use, except when it is not convenient to freeze carmine injections, when spirit must be used instead, for chromic acid destroys the colour; therefore I will pass on to the consideration of the next stage, that of cutting the sections. This is to be done either with a section-cutting machine, or a razor. Some very good machines have lately been constructed in which sections may be cut of hardened tissues embedded in paraffin, or fresh ones frozen; but for ordinary purposes a good razor answers admirably. Some difference of opinion exists as to the form of razor to be used. One ground flat on its under-side is generally recommended, but I think this to be a mistake, for with a little practice you will be able to rely on the steadiness of your hand for cutting an even section, when a razor ground hollow on both sides is infinitely superior on account of the beautiful edge which can always be so easily produced upon it.

The razor should always be dipped in spirit first, and the sections cut obliquely towards the operator. The tissue having been hardened, and the sections cut, we have next to consider the most advantageous way of exhibiting them under the microscope, and for this, in most cases, they must be stained. The chromic acid, as I have before said, itself stains sufficiently for mounting in glycerine; but it has the disadvantage of colouring all parts alike. The nuclei, the cells, and the stroma, are all of the same pale yellowish-brown. Nevertheless, very good specimens may be obtained by simply mounting chromic acid sections at once in glycerine, and many microscopists still adhere to this method. If, however, as I recommend you to do, you take the additional trouble of a further staining, you must, in the first place, select a colouring fluid. There are many open to choice, none, perhaps, more beautiful than the aniline dyes, yet none that you will do better to avoid, for they soon fade, and what might otherwise have been a valuable specimen is irretrievably lost. Of the others, I would recommend a selection to be made from carmine, logwood, or some inks, as Field's chemical ink, or Stephen's blue-black writing fluid, and of these I usually employ logwood. The application of gold and silver to staining purposes I shall refer to presently. Of the carmine fluids there are two forms in use; Beale's, which is made up with glycerine, and the aqueous solution, recommended by Klein. They are too well known for it to be necessary for me to repeat the formulæ. The logwood fluid is usually prepared after the manner recommended by Dr. Green, of Charing Cross, in his Pathology, namely, by triturating the extract of logwood in a mortar, with an excess of alum and water, and subsequently adding a little rectified spirit to keep it. But I prefer to prepare it by dissolving the colouring matter contained in a drachm of powdered extract of logwood in two ounces of water, to which two or three drachms of dilute hydrochloric acid have been added. This is then filtered into about half-a-pint of water, and liquor ammonia is added until a thick purple precipitate forms, which is re-dissolved by shaking up with alum. A little spirit may then be added to preserve it. The inks mentioned stain many tissues well, and require nothing more than dilution in water. Well, to return to the sections. As they are cut, they are washed off the razor with a paint brush dipped in methylated spirit into a watch-glass, until about a couple of dozen have collected. From these the best are picked out and transferred to the staining fluid with a needle in a handle, or a small paint brush; I prefer the former since it carries less fluid. As to the strength of the staining fluid, that I think can only be ascertained by experience, since it depends upon the number of sections as well as the quantity of fluid used. One must be guided chiefly by the time taken to stain sufficiently, which should not be less than 12 hours; for in rapid staining all the elements of the tissues acquire the same tint, when the main object of colouring is defeated, namely, to isolate the individual cells and fibres by different shades of colour. It sometimes happens, however, that the chromic acid is so permanently fixed in the tissue that logwood cannot displace it, however strong the solution you use may be. In this case it is only necessary to soak the section for a few hours in very dilute solution of potash, say one per cent. of liquor potassœ, or even less ; then, after washing in spirit and water, again transfer to logwood, and they will stain rapidly and well. I may mention that I find the nests of palettes used by painters to be the most convenient and the cheapest articles for holding the staining fluid ; for, at the same time that they are a useful size and shape, by fitting one upon the other, they effectually preserve from dust. I procure mine at Mr. Stanley's, opposite London Bridge Station, and I have brought a nest down for your inspection. When the sections appear to have received sufficient colour they are transferred, on a needle, to a capsule containing water, and gently washed, then to methylated spirit, which must be changed in a few minutes, for deliquoration before they are transferred to the centre of a glass slip—one, two, or three according to size—and a drop of oil of cloves or oil of lavender is allowed to run under the sections, taking the place of the spirit as it evaporates, and permitting the chloroform balsam or dammar in which they should be mounted to thoroughly permeate the tissue. The sections should always be transferred from the spirit to the glass slip with a nice sized paint brush, since in this way large sections of the most delicate tissues, such as brain or lung, can be smoothly placed in the centre of the glass without any fear of breaking. The spirit is then drained off before the drop of oil is allowed to run under. The oil of cloves is generally used, but I prefer the oil of lavender, since it seems to mix more readily with spirit, and so the section is not rendered quite so transparent, I think, as with oil of cloves. This, however, may only be fancy. Dammar also appears to be preferable to chloroform balsam, since it is not so highly refractive, that is for stained sections. The balsam is as good, or better, for simple carmine injections. I ought, perhaps, to mention glycerine jelly as a medium for mounting stained sections in, but I believe that it is applied to better purposes, and that it is inferior to dammar. Still good specimens are so mounted, and it is a favourite with some. So much for cutting, staining, and mounting hardened animal tissues. A few words now in reference to tearing sections. The process is simple enough, but requires practice to accomplish it successfully. The tissues arranged in longitudinal bundles are those to which it is most applicable, such as tendons, nerves, muscles, &c. A small piece is snipped off with a pair of scissors and placed in the centre of a glass slip with a drop of fluid, the half per cent. salt solution answers very well ; then fixed at one end with one needle, while with the other the fibres are separated longitudinally into as fine a fasciculi as possible. A drop of the fluid in which it is to be mounted is then placed on the under side of the cover glass, which is then allowed to quietly settle over the specimen. The process of tearing is much facilitated by first macerating the tissue in a very weak solution of bichromate of potash for a few days ; or even in half per cent. solution of common salt. Next, in reference to some of the uses of gold and silver for staining purposes ; let us take the latter first. Its great feature is, that it first stains the crevices or interspaces of the tissue, and it is for this that it is so useful. For instance, let us take a piece of peritoneum, the transparent membrane which lines the abdominal cavity, and is reflected over all the organs it contains, and stain one portion with nitrate of silver, another with carmine or logwood, and examine a third portion in its fresh state. The fresh will show no appearance of cells or nuclei on the surface of the membrane ; that stained with logwood will show nuclei only ; and that with nitrate of silver a flat layer of cells only ; while if the silver and logwood stainings have been combined, a perfect layer of nucleated cells will be found covering the internal layer of the membrane. The method of staining with silver is as follows :—Take a piece, say of the mesentery of a cat, that portion of the peritoneum which retains the intestines in place, and steep it in a solution of nitrate of silver for a few minutes ; then remove it and wash it thoroughly in repeated changes of common water until it ceases to cause a white precipitate of chloride of silver. Then expose it in a capsule of water to light until it assumes a bronze tint. Mount in glycerine —the best medium for silver and gold stainings—and a perfect layer of flat cells will be seen, by focussing, to line both sides, for the membrane here is double. The preparation is more beautiful and valuable if, before mounting it, it is placed for a few hours in the logwood staining fluid, since not only are the nuclei rendered visible, but also the other structures of the peritoneum, such as the connective tissue, cells, vessels, &c. The omentum, mesentery, parietal peritoneum, centrum tendineum, and cornea, form excellent subjects for staining with nitrate of silver. The half per cent. chloride of gold solution is very useful and often yields good results. But time will only permit me to draw your attention to one instance of its value, and that is for bringing out the corneal corpuscles and nerves. This specimen is best obtained by procuring a fresh frog's cornea, and, having scraped off the epithelium which lines the upper and under surfaces, by placing it in a half per cent. solution of gold until it assumes a straw colour. This usually takes from a quarter to half-an-hour. It is then washed and exposed to light in a capsule containing slightly acidulated water for one, two, or three days according to the light, until the yellow colour has changed into a reddish purple ; it is then mounted in glycerine and presents the appearance seen in the specimen under the microscope, with more or less clearness according to the success of the staining. This is a somewhat difficult preparation, and I believe rarely succeeds unless the frog's cornea has been first inflamed. When you remember that the cornea examined fresh shows no structure at all, and by this method large cells with numerous processes ramifying in every direction, and bundles of nerve fibres crossing and recrossing fill the field of the microscope, you will, I am sure, have no hesitation in according to chloride of gold no mean position amongst your reagents. I have but a short space left at my command, and that I should like to occupy by a brief consideration of a very important aid to the study of animal tissues. I allude to injection of the blood vessels with some coloured material. It is impossible for me to go at all deeply into this process, and therefore I will only describe one variety—injection with the carmine gelatine mass, passing over Beale's glycerine fluids and numerous other preparations. I prepare the carmine mass after the manner recommended by Dr. Carter. Three drams of gelatine are dissolved in two ounces of water; to one ounce and a half of this a solution of carmine is added, made by dissolving one ounce of pure carmine in two drams of strong liquor ammonia and diluted with an ounce and a half of water. To the remaining half ounce of gelatine solution one and a half drams of glacial acetic acid is added, and the two are mixed by gradually pouring gelatine solution with the acetic acid into that containing the carmine. The smell of ammonia should disappear, and the colour become lighter and redder. If this is not the case a little more acetic acid must be added, and its preparation is completed. Let us suppose, then, that we are about to inject some small animal. An incision is first made in the skin over the front of the chest just to the left of the middle line. The left costal cartilages are then cut through to a sufficient extent to get at the heart, which is then drawn out of the opening, and kept out by a thread passed through its apex, which may be held by an assistant or fixed. A hole is next made in the left side of the heart through which the nozzle is introduced, and passed up into the large vessel leading from the cavity on this side and called the aorta, in which it is fixed by a stout thread. The nozzle may or may not have a stop-cock attached. The syringe then having been first warmed by warm water, is filled with injection, which should be only just warm or it is sure to extravasate, and the process is steadily but rapidly completed. The body is then opened at once, and any extravasated injection washed out with ice-cold water, which sets at once the injection. Portions of transparent organs, as the intestines of a mouse or a frog, may be spread out at once on the centre of glass slips and allowed to dry on, and then mounted in balsam; while the solid organs, first having ascertained those which are properly injected, should be thrown into the freezing mixture, and sections rapidly cut and washed off the razor into cold water, in which they may remain some hours without harm, if thoroughly cold. When sections of all the good organs have been so cut, the best are picked out and dried on the centre of glass slides, and mounted in balsam. The reason that I recommended freezing and cutting the section at once is, that if hardened in spirit, the only alternative with carmine injections, the gelatine in the vessels contracts so much as frequently to mar the beauty of the specimen; while by drying fresh sections little if any of the calibre of the vessel is lost. But there is a better mode of preserving injections, and that is by first staining them, when the other elements of the tissue, as well as the capillaries, are brought into view. It is one that I recommend you to adopt, and one that I shall put into practice more frequently in future. But I fear that I have already exceeded the allotted time, so I must leave further arguments on behalf of the animal tissues to the specimens under the microscopes, staying only to add one word of apology for them, in that for the last two or three years I have worked almost entirely at pathological specimens, and have therefore only a few fairly-mounted specimens of normal tissues. To these, such as they are, I now direct your attention.

A short discussion ensued, on the termination of which the President accorded to Mr. Paul the thanks of the Club for his valuable paper.

The PRESIDENT and the following members exhibited microscopes:—H. Ashby, J. S. Johnson, G. Manners, K. McKean, Geo. Perry. After reading his paper, Mr. Paul gave the members a practical demonstration in cutting sections of animal tissues.

Wednesday, June 17th, 1874, about 60 of the members, with their friends, met at the Greyhound Hotel, for a friendly supper, on the occasion of presenting the testimonial to the late secretary, Mr. Henry Long.

HENRY LEE, Esq., President, was in the chair, and HENRY J. STRONG, Esq., M.D., in the vice-chair.

After the usual loyal toasts, the Chairman said—About four and a-half years ago there appeared in the Croydon papers an advertisement requesting gentlemen who were desirous of joining the Croydon Microscopical Club to send their names to Mr. Henry Long, of 90, High-street, Croydon. Mr. Long having observed that I was connected with the Royal Microscopical Society, asked me to give my name, and I promised Mr. Long, as a fellow of that

Society, that I would join the Croydon Club, and do all in my power to advance its interests. A few gentlemen enrolled their names, and so small did their advancement seem likely to prove, that it was proposed at first to meet at each other's houses, and several meetings were held in my house. As our number increased, it was felt that the meeting at each other's houses was a source of inconvenience and discomfort, and therefore it was considered advisable to have another place for our meetings. You know the rest; you also know that Mr. Long became our hon. secretary, and worked for us as all members of a Society which was intended to be a success should work. Perhaps I am in a better position to speak of the able way in which Mr. Long has discharged his duties than any other member; for I have had frequently to confer with him on matters connected with the Club; and sometimes, without calling a committee meeting, we have acted upon our own responsibility, and I am pleased to say that what we did has in every case been thoroughly endorsed by the Club. I can therefore testify to the energy and ability which Mr. Long has infused into his labours, and to the courteous and genial manner in which he has concurred in any suggestions that have from time to time been made, not only by me, but by members of the committee and by the club generally. Mr. Long's professional engagements having necessitated his retirement from the duties of the post he has so long and so faithfully discharged, it has been proposed by the Club to present him with some tangible mark of the respect in which he is held by them. Mr. Long having been asked to select something he would prefer, has chosen the handsome microscope which is now on the table. I have now the greatest pleasure in asking, on behalf of the Club, Mr. Long's acceptance of that instrument; I hope it will assist him in his studies at home; that it will be useful to him, and advantageous to science; that he will bring it to the Club and place it at the disposal of gentlemen who read papers from time to time; and that he will continue to meet us with that hearty good will which I am sure we all feel towards him. (Applause.)

The testimonial consisted of a handsome binocular microscope, by *Crouch*, which bears the following inscription:—

Presented to Mr. Henry Long, by the Croydon Microscopical Club, in pleasant remembrance of his having ably fulfilled the duties of Honorary Secretary, from the establishment of the Club, March 16th, 1870, to June 17th, 1874.

Mr. Long, on rising, thanked Mr. Lee for his kind expressions, and for the great cordiality with which his name had been received by the Club. Without wishing to depreciate the credit Mr. Lee had kindly given him for the part he had taken in the formation of the Croydon Microscopical Club, there was one matter for which he could take greater credit, namely, his being successful in securing the valuable services of Mr. Lee as President. (Applause.) He had in his possession a letter written by one member to another, in which the writer said—"It shows Long's common sense in soliciting Mr. Lee to become the President of your Club, for although we have a population of upwards of 60,000 in Croydon, I do not know one who is so well qualified to take the Chair." The experience of the last four years had fully endorsed that sentiment. (Applause). With regard to himself, it was a source of much pleasure to him to receive, through their President, a practical assurance that the duties which he had much pleasure in performing for the Club had met with their approval. In social gatherings of this kind, and under similar circumstances, it sometimes happened that the recipient of a testimonial was about to say farewell to those with whom he had been associated; but that was not the case this evening. He hoped still to be able to attend the meetings of the Club, and take an interest in its proceedings. If it was acceptable to the Club, he should like to place at the disposal of the committee a book prize of £2, for the best 12 objects mounted by any member, on such terms as the committee might determine. (Hear, hear.) He also took this opportunity of thanking the Club for their cordial co-operation and assistance ever since he had been a member.

Several toasts followed, and the proceedings were enlivened by a number of excellent songs contributed by Messrs. Goldsmith and Lucas, and by several of the company.

September 16*th*, 1874.—Alfred Carpenter, Esq., M.D., in the chair. The minutes of the last meeting were read and confirmed. Capt. J. C. Swaine, of Fairfield-road, was ballotted for and duly elected a member. The following gentlemen were nominated for membership:—Thos. Henry Barnes, M.D.; Herbert Jas. Ilott, M.B.; Chas. H. Lister, David Mackenzie, Edwin Roper, Walter Rosser, M.D.; and James Russell, M.B.

The Chairman announced that at the invitation of the President (who was unavoidably absent from this meeting) an excursion to the Brighton Aquarium had been arranged for Saturday, 26th of September. He then alluded in feeling terms to the melancholy death of an industrious and much respected member of the Club—Mr. N. Lawrence Austen. It was resolved unanimously that the President be requested to write, on behalf of the Club, a letter of sympathy and condolence to Mrs. Austen.

A copy of "SPECTRUM ANALYSIS" by Mr. W. T. SUFFOLK, was presented to the Club by the Author, to whom a vote of thanks was passed.

Dr. CARPENTER then referring to a plant which was a conspicuous object on the table, said it was a plant which was foreign to this country but was discovered last year growing in a shrubbery at Shirley. How it came there no one knew. There were several of them, and as the plant seemed to be of a very handsome shape, he cut down a branch of it, and took it home to his house. A lady afterwards came and inquired the name of the plant. Upon his telling her, she said it was very curious, but there was one growing at Streatham in a gentleman's garden, and how it came there they did not know. The plant was called the *Phytolacca Decandria*, or American Poke Weed. It was a common weed in America, but had lately become acclimatised in Southern Europe. He did not know of any plants which approximated to it in its botanical character, but it belonged to an order with which they were well acquainted—namely, the beet-root, which was the one redeeming exception to a large lot of useless rubbish. In America the fresh young shoots were used instead of asparagus or spinach, and were cooked very much in the same way. The plant bore a curious fruit, very much like raspberries or blackberries, but growing in spikes instead of being single berries. They were nauseous to the taste, and contained a strong tinted juice, said to be used by the Portuguese for colouring port wine. This might account for the acclimatisation of the plant in some portions of Portugal, Spain, and Italy. If the tint were capable of being fixed, it would make a beautiful dye. The plant was a prolific bearer of fruit, and grew to a considerable size. Last year it was killed down by the frost, but it shot up again, and probably from the ease with which it had taken root, it would become acclimatised in this country.

The Rev. R. R. SUFFIELD asked if the juice were medically wholesome?

Dr. CARPENTER said he hardly thought it was. It was a violent purgative, and the leaves had the reputation of curing cancer. Many things had that reputation, but he did not know of any cures that had ever been effected by them. As the birds were said to be fond of the seeds, the probability was that they would get well distributed, and some day the plant would prove a valuable one.

Mr. JONES asked if the plants were not mentioned in homœpathy?

Dr. CARPENTER was not aware that it was. The term "lac" was derived from the juice being of a beautiful red colour.

The attention of the members was next directed to some remarkable shells brought from the River Orinoco by Mr. Smith. In answer to a question, Mr. Smith said he had only seen the shells in the delta of the Orinoco, where they were to be found in thousands on the muddy banks, and on the eastern coast of Trinidad.

Mr. Taylor referred to some snakes which had been found in the neighbourhood of Surrey-street, living in a dust-hole, and raised a question as to the kind of diet they were seeking. He also mentioned that in turning out the dust-hole a large batch of eggs was found.

The Chairman appeared to be of opinion that there was some mistake as to facts in regard to the snakes; he did not think they were scavengers that would dispose of any kind of garbage; if they were proved to be so, it would certainly be a new feature in natural history.

The meeting then resolved itself into a conversazione, and the following members exhibited their microscopes:—J. Berney, Fred. Fletcher, J. S. Johnson, Geo. F. Linney, H. Long, E. Lovett, K. McKean, and Dr. Strong.

September 26*th*, 1874.—Visit to the Brighton Aquarium.—A party, consisting of members and their friends (as well as the representatives of the Croydon Press) to the number of 54, assembled at the East Croydon Station, and proceeded to Brighton by the 11.41 train. On arriving at the Aquarium, the party was welcomed by Mr. Lee, and conducted through every part of the building. Almost the first object of interest was a preserved specimen of the *Sturgeon*, and Mr. Lee explained the fallacy of the notion that the flat-nosed and the sharp-nosed are two separate species; he said the shape of the nose underwent an alteration as the animal developed in age and size; *Acipenser huso* was, however, a distinct species. The tank containing the *Sterlets* was then visited, and an account of their passage from the interior of Russia to this country was narrated by the President. The *Octopus* came in for a large share of attention, Mr. Lee having kindly arranged that it should be fed in presence of his guests. The "rough-hound" *(scyllium canicula)*, and the "nurse-hound" *(scyllium stellare)*, two species of dog fish, with a number of the sham gorgonias having eggs attached, were of special interest to the Club; the habits of these fishes having formed the subject of a paper read by Mr. Lee, at a meeting of the Club on the 19th of February, 1873. After having inspected the seals, the mackerel, and the herrings, and in short the whole of the tanks, and everything of interest in the Aquarium proper, the visitors were shown the engines, the laboratory, and the store tanks, all of which are closed to the general public.

Having re-assembled in the reading-room, the party proceeded with Mr. Lee to Mellison's Restaurant in West-street, where a cold luncheon was served. Dr. Carpenter, on behalf of the Club, having cordially thanked the President for his kind invitation and for the instruction he had so pleasantly imparted, the company separated, and did not return to Croydon till late in the evening, having passed a most enjoyable day, towards which the magnificent weather contributed in no small degree.

October 21*st*, 1874.—Henry Lee, Esq., President, in the chair. The minutes of the previous meeting were read and confirmed, after which the following gentlemen were ballotted for and duly elected members, viz. :—Thomas Henry Barnes, M.D. ; Herbert J. Ilott, M.B. ; Charles H. Lister ; David Mackenzie ; Edwin Roper ; Walter Rosser, M.D. ; and James Russell, M.B.

The following were nominated for election :—Alfred Eastty ; Walter Paton Hindley ; Frederick Hirtzel ; Joseph Toms ; and Captain John Davis Wake.

The President stated that he had received a letter from Mrs. Austen in reply to the letter of condolence which was addressed to that lady, who expressed her gratitude for the kind sympathy evinced towards her.

Mr. Lee said, with regard to Mr. H. Long's prize of books (value £2) for the best dozen slides prepared and mounted by any member of the Club, competitors would be required to send in their slides to his (Mr. Lee's) house before 1st January, 1875. Two members of the Council of the Royal Microscopical Society would act as judges, and the winner would be named at the annual meeting. A letter was read from Dr. Anderson, expressing his great regret that severe indisposition precluded the possibility of his reading the promised paper that evening.

The President expressed a wish to see the string of shells which were exhibited at the previous meeting, and on their being shown to him remarked that, as he had suspected, they were true *Gorgonias*—not shells, the supposed "shells" being groups of spicules, and the "string," the horny axis of the organism. The meeting then became conversational, and several members gave their experience as to the best method of mounting various objects.

The following members exhibited their microscopes :—The President, and Messrs. J. Gregory, J. S. Johnson, H. M. Klaassen, E. Lovett, K. McKean, G. Perry, J. G. Price, H. J. Strong, and A. D. Taylor.

November 18*th*, 1874.—HENRY LEE, Esq., President in the chair. The minutes of the previous meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members :—Alfred Eastty ; Walter Paton Hindley ; Frederick Hirtzel ; Joseph Toms ; Captain J. D. Wake ; and the following were nominated for election :—Robert A. James ; William Frederick Miller ; S. G. Marks ; and C. Jarrett.

One dozen slides were presented to the Club's cabinet by Mr. J. S. Johnson, and one dozen by Mr. E. Lovett. The thanks of the Club were voted to the donors.

The PRESIDENT then called upon Dr. Anderson to read his paper "ON THE MINUTE ANATOMY OF THE HUMAN LUNG." The lungs in man, said Dr. ANDERSON, consist of two conical organs, called, by Kölliker, racemose glands, situated—one on each side of the chest. Each lung is divided into two lobes by a long and deep fissure, and in the right lung the upper lobe is sub-divided by a second fissure ; there is also a further division into small polyhedral portions called lobules, connected by areolar tissue. These lobules are again sub-divided into smaller lobules or lunglets. In structure the lungs are composed of ramifications of the bronchial tubes with their terminal air-sacs and air-cells, intercellular passages, the pulmonary arteries and veins, bronchial arteries and veins, lymphatics and nerves—all these being held together by areolo-fibrous interstitial tissue, and constituting the parenchyma of the lungs. The nerves are derived from the pneumo-gastric and sympathetic ; they form two plexuses, the branches from which follow the course of the bronchial tubes, and are distributed to the intercellular passages and air-cells. The vascular system of the lungs consists of two distinct sets of blood-vessels, namely, pulmonary arteries and veins for the special function of the lungs, and bronchial arteries and veins for the nourishment of the bronchial tubes, the areolar tissue, &c. Some of the bronchial arterial capillaries discharge themselves into the corresponding bronchial veins, whilst others terminate in the pulmonary system. Special attention may now be directed to the bronchial tubes and their ultimate terminations. The two large bronchi, more or less cartilaginous in structure, proceeding from the bifurcation of the trachea, and passing one to each lung, divide and sub-divide like the branches of a tree, and diminish in size until they are no larger than the 30th to the 50th of an inch in diameter. Each bronchial tube is distinct from the other, and is lined by mucous membrane, which is invested with a ciliated columnar epithelium. These minute tubes each terminate in a slight dilatation, into which open a number of orifices leading into somewhat elongated cavities, termed by Waters, air-sacs. From six to eight or ten of these air-sacs, the size of each of which varies from the 45th to the 85th part of an inch, are clustered round the extremity of every bronchial tube, forming a lobulette or lunglet. These air-sacs possess exceedingly delicate walls, and do not appear to communicate with one another, otherwise than by their common origin from the bronchial tube. They generally increase in size slightly towards their closed extremity, and often bifurcate. The internal surface of every air-sac, and even of the bronchial tube, for a short distance before it terminates, presents an alveolated or honeycombed appearance. These minute, shallow, cup-like depressions constitute the air-vesicles or air-cells of the lung, and from eight to twenty may be counted on the interior of each air-sac. It will thus be seen that each terminal bronchial tube is connected with an entire group of air-cells, and does not end in a single air-cell, and that these fine terminal ramifications of the bronchial tubes never join each other. According to Rainey, the minute bronchial tubes when they arrive at within about one-eighth of an inch of the surface of the lung become changed in structure, and are continued onward under the name of intercellular passages, the walls of which are formed by the air-cells between which they pass, and by which they are surrounded. Suggestions for the microscopic investigation of the human lung, and the method of preparation of the same, will be interesting to the members of a microscopical club. In order to examine the air-sacs and air-cells, or alveoli (1) a thin slice should be cut off the surface of a portion of lung which has been injected, inflated, and dried, and the portion itself (not the slice) should then be placed under the dissecting microscope. The cut orifices of the air-sacs will then be observed; or (2) soak a piece of lung that has been injected, inflated, and dried in spirit for some time, and when the piece is well saturated, dissect it under the microscope. By imbibition of the spirit, the mass of lung swells, and the air-tubes and air-sacs remaining distended, the parts assume nearly the same shape and size they have in life; or (3), without making any section, the ultimate air-tubes may be seen by a magnifying power of from 10 to 20 diameters, and they can be followed to their termination if the lung has been properly prepared previously. This preparative process may be accomplished in several ways, namely (1), by inflation of the lung through a bronchus, and subsequent desiccation; (2), injection of the air-tubes with mercury or wax, &c.; (3), injection of the blood vessels with some opaque materials, such as a coloured solution of gelatine, red, yellow, or blue, and inflation of the air-tubes, with subsequent desiccation; (4), injection of both vessels and tubes with a transparent substance which becomes solid on cooling, such as a solution of gelatine, or a mixture of turpentine and wax. The diameter of the air-cells of the human lung varies from about the 70th to the 200th part of an inch; their shape is described as being angular, globular, and irregular. Kölliker says that they are invariably polygonal, and that their external sides are always nearly plane. Jones and Sieveking say that the vesicles are never angular nor polygonal until subjected to pressure from some pathological process. It has been calculated by Rochoux that the total number of air cells in the human lung amounts to 600 millions. Keil computes the number at three billions and 488 millions, and the expanse of membrane represented by them Lieberkuhn reckons as equal in area to 1,500 square feet. Hales gives an area of 289 square feet, and Keil an area of 21,906 square inches; but nothing in the way of number or measurement is really reliable; this fact, however, is certain: that the extent of surface is very great. It is in these air-cells that the deposit of tuberculous matter takes place primarily and chiefly—first, on their lining membrane or wall, and then gradually extending to the entire cell, and probably to the minute bronchial tubes and the intestinal tissue of the lungs. In Dr. Clarke's preparations, illustrative of the seat of tubercle, he shews that the deposit extends to the walls of the air vesicles, the areolar tissue around the blood vessels and bronchi, and between the lobules only, at an advanced period of growth, and that it does not occur indifferently at any part external to the blood vessels. The observations of Jones and Sieveking imply that the primary deposit of tubercle takes place in a semi-fluid form in the vesicular cavity, which it distends so as to form a round point, of the size of a small pin's head, visible to the naked eye. Rainey says that in tuberculous lungs, successfully injected, it can be seen that the tuberculous matter is poured from the free surface of the pulmonary membrane into the interior of the air-cells; the pale colour of the tuberculous matter contrasts so strikingly with the red capillaries, that the exact form and limit of the former can be seen if only one, or part of one, cell be filled. It is right, however, to state that opinions are now somewhat divided on the subject, and future investigations may, to some extent, modify the foregoing statements. Each air-cell contains more or less pigmentary matter, and has a pavement of epithelium without cilia, composed of minute polygonal cells, which forms a simple layer, and rests immediately on the lining membrane which forms the true wall of the air-cell. These epithelial cells derive additional interest from the fact that, in them, by fatty degeneration, the first elements of tubercle are made manifest. A beautiful net-work of yellow elastic fibrous tissue, to which the elasticity of the whole lung is due, connects and yet separates the air-cells, forming, in fact, their defined and protecting frame-work, and giving support to the blood vessels which form minute capillary plexuses (each air-cell having its own plexus) so arranged between the walls of each cell, that the contained air shall have the fullest opportunity thoroughly to aerate the blood. This net-work of pulmonary capillaries is spread out so densely that the interspaces or meshes are even narrower than the vessels, which are, on an average, the three thousandth part of an inch in diameter; whilst the pulmonary vesicle itself is twenty times greater in diameter than that of one of the capillaries which are distributed on its walls. Between the atmospheric air in the cells, and the blood in those minute vessels, nothing intervenes but the thin membranes of the cells and capillaries and the delicate epithelial lining of the former; and the exposure of the blood to the air is the more complete, because the folds of membrane between contiguous cells, and often the spaces between the walls of the same, contain only a single layer of capillaries, both sides of which are thus at once exposed to the air. To summarise, in conclusion:—It has been shewn that, as regards the minute structure of the human lung, each terminal bronchial tube is connected with an entire group of air-cells, not ending in a single air-cell, nor the tubes themselves anastomosing with each other; also that the ciliated epithelium of the bronchial tubes does not extend to the air-cells, but that each air-cell has a single layer of pavement epithelium composed of minute polygonal cells. Such, then, is the respiratory apparatus in man—complicated, and yet, when unravelled by the aid of the microscope, and studied in the light of comparative anatomy and embryology, beautifully simple in structure. In its multitudinous air-sacs and air-cells, it affords a very large amount of surface for the aeration of the blood in a comparatively small space; and so important is this apparatus in its relation to the well-being of the system generally, that the smallest alteration of its structure leads to the most serious functional disturbances, and eventually, if unchecked, to formidable disease and death.

Dr. Anderson's paper was profusely illustrated by diagrams.

Mr. Henry Ashby made a few observations respecting the similarity that existed between the brain of man and that of the lower animals; and said that, as had been shown by Dr. Anderson in his introductory remarks, the gradual complication of the structure of the lung in the lower animals had kept pace with the development of the same organs in the human embryo; and this probably had led to the evolution theory propounded by Darwin in his famous work.

A cordial vote of thanks to Dr. Anderson was accorded by the President, on behalf of the Club.

The President and nine other Members placed their microscopes at the disposal of Dr. Anderson to illustrate his paper.

November 25th, 1874.—The Fifth Annual *Soirée*.

The Fifth Annual *Soirée* was held at the Public Hall, George Street, on Wednesday evening. The Club is indebted to several Societies for their kind assistance. The following is a list of the exhibitors :—

The Royal Microscopical Society.—Dr. Bossy; Messrs. Thomas Crook, H. H. Dobson, F. W. Gay, James Smith, W. T. Suffolk, John S. Townsend, Charles Tyler, T. Charters White, and James F. Wight.

The Quekett Club.—Dr. Matthews (President), Dr. Daniel Moorè; Messrs. Frederick William Andrews, Alfred Aubert, E. Bartlett, W. F. Brown, F. Coles, J. Wallinger Goodinge, G. Green, J. H. Hadland, William Hainworth, jun., John E. Ingpen, George Pearce, B. W. Priest, Alpheus Smith, G. J. Smith, J. A. Smith, A. Topping, and J. R. Williams.

Margate Microscopical Club.—Mr. F. B. Kyngdon.

Tower Hill Club.—Messrs. J. Alston, James B. Crosfield, J. Crosfield, J. H. Crossland, F. Doeg, J. Everett, J. Harrod, Thornhill Langton, Charles N. Levien, J. Macdonald, Richard Sedgwick, and J. Thompson.

South London Club.—Messrs. J. G. B. Brewer, William G. Cocks, E. Dadswell, James Deane, Edward Gibson, William Goode; W. Goodinge, Ridley Hilder, F. W. Hembrey, C. W. Hovenden, Frederick Hovenden, B. D. Jackson, W. G. Parks, S. H. Roberts, Henry Robinson, T. D. Russell, J. A. Smith, C. W. Stidstone, W. T. Suffolk, W. West, G. Wilkinson, and J. W. Worster.

Forest Hill Club.—Messrs. R. Beeton, W. Britten, A. Brown, C. W. Burt, J. W. Deacon, W. R. Furneaux, E. George Hart, F. Hind, E. F. Jones, M. D. Northey, E. Simpson, J. Terry, E. Westbrooke, and W. Fell Woods.

Croydon Club.—Mr. H. Lee (President), Capt. J. D. Wake, Dr. Anderson, Dr. Adams, Dr. Carpenter, Dr. Owens, Dr. Strong, and Dr. Rosser; Messrs. Albert d'Archambaud, Henry Ashby, J. H. Baldock, John Berney, Thèo. Bindley, Charles Bonus, Robert Brodie, John Corry, Alfred Crowley, Philip Crowley, Thomas Cushing, A. W. B. Drummond, Frederick C. Fletcher, Herbert J. Ilott, R. Hingston, Robert A. James, J. S. Johnson, Kenneth M'Kean, George F. Linney, William Lee, Henry Lee, jun., E. Lovett, Henry Long, George Manners, Thomas B. Moseley, W. J. Nation, George Perry, G. N. Price, George Purser, Edwin Roper, James Russell, W. B. Snelling, Edward Sturge, R. D. Taylor, Henry Turner, Fred. West, jun., and John Woodward.

Opticians.—Mr. C. Baker, six microscopes; Mr. John W. Bailey, three ditto ; Mr. Crouch, ten ditto ; Mr. Moginie, two ditto ; Mr. E. Richards, two ditto ; Mr. Stanley, seven ditto ; Mr. James Swift, four ditto, with a new high and low achromatic condenser ; and Mr. Edmund Wheeler, three ditto.

Altogether 172 microscopes were exhibited. In the Large Hall, there were shown, in addition to the microscopes, a case of exquisitely prepared British starfishes by the President ; a case of skeleton leaves comprising 36 different plants and 20 varieties of ferns, lent by Mrs. Austen ; a collection of moths, butterflies, dragon flies, and beetles, from the neighbourhood of Croydon, by Dr. Carpenter ; an instrument called the "Crystal Designer," by Mr. W. J. Glover ; several cases of medals, by Mr. G. Manners ; an ingenious model of a section of the Brighton Aquarium, containing fish, water-beetles, worms, &c., in full life, by Mr. A. D. Taylor.

In the smaller Hall there were shown :—Cast shells of cray-fish and lobsters from living specimens in the Brighton Aquarium, by the President ; several trays containing fungi and lichens from the Addington Hills, collected by the Misses Sturge ; 25 volumes of Gould's "Humming Birds," also many cases of eggs of British birds, by Mr. A. Crowley ; a model hydraulic machine, exhibited and worked by Mr. Cushing ; Japanese curiosities by Captain Wake ; a collection of North American Indian dresses and weapons by Captain Mackenzie, &c., &c.

In the Old School of Art, Mr. George Manners kindly exhibited a series of dissolving views, which were much appreciated.

Amongst those who accepted the invitation of the President to attend were the Syrian Patriarch of Antioch and the Bishop of Jerusalem and *suite* ; the Solicitor-General, M.P. for Preston, and Mrs. Holker ; the Mayor of Brighton ; the President of the Brighton Natural History Society ; the President of the Sussex and Surrey Branch of the British Medical Association ; the Chairman of the Brighton Aquarium Company ; the Secretaries of the Royal Microscopical, Quekett, South London, and Margate Microscopical Societies ; the President of the Croydon Chamber of Agriculture ; and Mr. Frank Buckland. Number present, 625, of whom 186 paid for admission.

December 16*th*, 1874.—Henry Lee, Esq., President, in the chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members :—Messrs. Robert A. James, Frederick Miller, S. G. Marks, and C. Jarrett ; and the following were nominated for membership :—Messrs. W. W. Baynes, D. L., J.P., A. Allen, Chas. Waite, Edward Moore, Howard W. Bishop, S. Hollis Anthony, W. G. Stoneman, and Nat. Bogle-French, jun.

The PRESIDENT said that the Committee had under their consideration the best means of using the accumulated funds of the Club for the benefit of the present as well as of the future members. The Committee considered that while they ought to keep in hand a balance sufficient to meet all contingencies, it was only fair that the present members and subscribers should have full value for their subscriptions. The Committee had therefore proposed to engage a paid lecturer, Professor Morris, than whom no man was a better geologist. The hall would be engaged for the delivery of the lectures, and members would have the privilege of introducing four or more friends—ladies or gentlemen—gratuitously. He hoped this arrangement would infuse new life into the Club, and give it a fresh start altogether. (Applause.)

Mr. LEE then announced that the annual meeting of the Club would be held on the third Wednesday in January, when no paper would be read, but the officers for the ensuing year would be elected. He therefore called upon the Club to nominate the officers for election at the next meeting.

The President, Treasurer, and Secretary were at once nominated for re-election; and Mr. LEE said he had some thoughts of retiring from the position of President, but as there was to be an invigorating movement in the Club, and as he had received a strong request that he should continue to be the President, he had consented to retain that position—(Hear, hear)—and he was authorised by the Secretary and Treasurer to state that they would be happy to serve during the ensuing year. (Applause.)

Mr. Brodie and Mr. A. D. Taylor having been appointed as auditors, the present Committee were nominated for re-election, the PRESIDENT remarking that some of them were ready to give way in favour of any other gentlemen who might be proposed. No fresh names, however, were submitted, the prevailing opinion being that the present Committee had discharged their duty in such an exemplary manner that it was unnecessary to infuse any "new blood" into that painstaking body.

The President then called upon his friend, Captain Tyler, to deliver a lecture on "Sponges," and expressed his regret that the state of the weather had so much diminished the attendance.

Captain TYLER—after intimating that he wished his remarks to be divested of the formalities of a lecture, and to partake rather of a conversation—said that "sponges" was a subject but little known, except to a comparatively small number of persons, and yet it was a subject that had held a position of great importance as regarded the structure of the globe we inhabited. After explaining that there was an affinity between the sponge, the gorgonia, and the coral, Captain Tyler said that sponges were of three orders, which were sub-divided into numerous classes, thus showing that there was something more to be learnt about a sponge than at first sight might be supposed. He said that there was no doubt that sponges were included in the animal kingdom, and that there was to be found a large variety around our own coast. Having explained the organism of the sponge, he said that if two specimens of the same character came together, they grew into each other and became one; but this was never the case with two specimens of an opposite character. Of the large number of specimens lying on the table, Captain Tyler specially referred to several in illustration of his remarks. He exhibited a sponge growing on a coral; another growing over a shell; varieties of the same kind of sponges growing together; and a number of flints which were thought at one time to be sponges; although this was at present an undecided point. He said that sponges were of all colours, and exhibted specimens of various tints, one being of jet black. He said he had a piece of sponge which, if immersed in 50 gallons of water for an hour, would produce a bright purple liquid. He also pointed that the form of sponge was no guide to species, and that the nature and embryo of the sponge was an unsettled question. He offered to place at the disposal of the Club a number of specimens for mounting, and described the method of mounting as follows:—Cut a thin slice at right angles to the surface, which will give you dermal spicules; then take a slice, also thin, at right angles to the surface, soak it in spirits of turpentine, mount it in Canada balsam, and put it by to dry for examination. Afterwards take a portion to boil in nitric acid, which will give you the whole of the spicules previously seen in section, but do not be in a hurry to pour off, as some of the minutest may be found in portions of the film removed. Take a portion of the material, put it under a glass slide, and mount in Canada balsam as usual. In addition to the large specimens of sponge, Captain Tyler exhibited a number of diagrams illustrative of his subject, which was of great interest to all who had the pleasure of hearing it, but incapable of reproduction, as a report, in an intelligible form.

The PRESIDENT said that "sponges" had been a favourite study of his, for his introduction to which he was indebted to his friends, Dr. Bowerbank and Captain Tyler. He also mentioned that he was instrumental in inducing Dr. Bowerbank to publish the third volume of his valuable work on British Sponges, which had been completed, and if it was the intention of the Club to take up the study of sponges, he should recommend that the work be purchased, as it would be a valuable addition to their library. Mr. Lee then accorded to Captain Tyler, in the name of the members, their hearty thanks for his kindness in coming forward to discourse on a subject so full of interest.

Captain Tyler said it had given him much pleasure to come down to serve his friend Mr. Lee, with whom he had spent many happy hours in scientific researches. The greatest trouble to him was a doubt whether his lecture would be satisfactory to the Club. It was difficult to convey his meaning on such a subject in an intelligible form unless he had a microscope, several bottles, and other paraphernalia at his fingers' ends. But if the members present were satisfied with the few remarks that he had been enabled to make, he was more than repaid for any trouble he had taken.

CROYDON MICROSCOPICAL CLUB.

RULES.

OBJECTS OF THE CLUB.

The Club is constituted for the mutual help of its Members; for the discussion of subjects connected with, or dependent upon, Microscopical research; for the exhibition and exchange of Microscopic Objects and Preparations; and for the promotion of the study of Microscopy and Natural History generally.

MANAGEMENT OF THE CLUB.

The business of the Club shall be conducted by the President, Treasurer, and Hon. Secretary (*ex-officio*), and nine other Members, who shall be elected by ballot at the Annual General Meeting. Three to form a quorum.

MEMBERSHIP.

1.—Every candidate for Membership shall be proposed by two or more Members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the Form appended. The certificate shall be read from the chair, and the candidate therein recommended ballotted for at the following meeting. Three black balls to exclude.

2.—The Annual Subscription shall be 10s., payable in advance on the 1st of January, and no person shall be entitled to the privileges of the Club until his Subscription shall have been paid.

3.—Distinguished men may be elected Honorary Members of the Club, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subject to any of the expenses of the Club, and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall by their merit satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No Member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any Member from the Club, the same shall be done by a resolution of the Committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the Members present shall vote for such Member's expulsion, he shall no longer be considered a Member.

7.—Any Member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the Member by whom he is introduced, in a book to be kept for that purpose.

ORDINARY MEETINGS.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at seven o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other time as the Committee may appoint.

2.—The ordinary course of proceedings shall be as follows :—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.

II.—The names of candidates for Membership shall be read, and the ballot for the election of Members shall take place.

III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the Members present at any ordinary meeting shall elect a chairman for that evening.

4.—No paper shall be read which has not received the sanction of the Committee ; and, whenever it is possible, early notice of the subject of the papers to be read shall be given, by the Secretary, to the Members. No paper shall exceed fifteen minutes in the actual reading, unless by the especial permission of the Chairman.

BUSINESS MEETINGS AND ELECTION OF OFFICERS.

1.—The accounts of the Club shall be audited by two Members appointed at the ordinary meeting in December. No Member of the Committee shall be eligible as an auditor.

2.—At the same meeting notice of the Annual Meeting in January shall be given from the chair.

3.—An Annual Meeting of the Club shall be held, in the place of the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the committee on the affairs of the Club, and the balance-sheet, duly signed by the auditors, shall be read.

4.—No permanent alteration in the rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or addition must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

CROYDON MICROSCOPICAL CLUB.

Mr.

of

being desirous of becoming a Member of this Club, we beg to recommend him for Election.

(on my personal knowledge).

This Certificate was read 187

The Ballot will take place 187

NOTE.—Original Rules, drawn and adopted at a meeting held on the 16th March, 1870.

Rules, as to Election of Officers, and number of Committeemen, revised January, 1872.

THE LIBRARY.

RULES FOR THE CIRCULATION OF BOOKS.

1.—Books to be lent out to Members at any time when the Library of the Literary Institution, at the Public Hall, is open, on application to Mr. PUSEY, the Librarian.

2.—All books and periodicals to be marked with the stamp of the Club and numbered before being circulated, and kept in such a place as shall from time to time be determined by the Committee.

3.—Members may obtain books by making personal or written application for them, and by signing a receipt for the same, which shall be held by the Librarian until the book is returned. No Member shall have more than one work at a time, nor shall he keep any work for a longer period than one month; but it may be returned for exchange any time within that period when the Library may be open.

4.—When a book is returned by a Member it may be borrowed by him again, provided it has not been bespoken by any other Member. Books which have not been bespoken shall circulate in rotation, according to priority of application.

5.—Standard works, as shall be named by the Committee, to be kept for reference, and not to be lent out.

6.—Members retaining books longer than the specified time shall be subject to a fine of one penny per day. If any book be retained by a Member for two months, and be not returned after written application has been made for it, the Committee may order it to be replaced and charge the Member in default with the amount thus incurred, in addition to the fine. If any book, when returned by a Member, is found to have been damaged during the period such Member has had it, a fine equivalent to the injury shall be paid by the Member.

LIST OF BOOKS BELONGING TO THE CROYDON MICROSCOPICAL CLUB.

Achromatic Microscope	*Beck.*
Address before the Royal Microscopical Society ...	*Rev. J. B. Reade.*
British Diatomacœ (vol. 1.)	*Smith.*
British Diatomacœ (vol. 2)	*Smith.*
British Shells	*Turton.*
Collection and Preparation of Algœ	*John Nave.*
Cryptogamic Botany	*Berkley.*
Foraminifera	*Dr. W. B. Carpenter.*
Flora (vol. 1)	*Bentham.*
Flora (vol. 2)	*Bentham.*
How to Work with the Microscope	*Dr. L. Beale.*
Human Microscopic Anatomy	*Kölliker.*
Lectures on Histology	*Quekett.*
Marvels of Pond Life	*H. J. Slack.*
Microscopical Manipulation	*Suffolk.*
Polarized Light	*Woodward.*
Preparation and Mounting of Microscopical Objects	*Davies.*
Spectrum Analysis	*Suffolk.*
The Microscope	*Dr. W. B. Carpenter.*
The Microscope	*Quekett.*
Opticians' Catalogues	*Beck and others,*
Journals of Quekett Club.	

THE CABINET.

Slides of various objects, presented to the Club by Members and others.

Wheldon

LECTURE

ON THE

GEOLOGY OF CROYDON,

IN RELATION TO THE

GEOLOGY OF THE LONDON BASIN

AND OTHER LOCALITIES,

BY

J. MORRIS, F.G.S.,

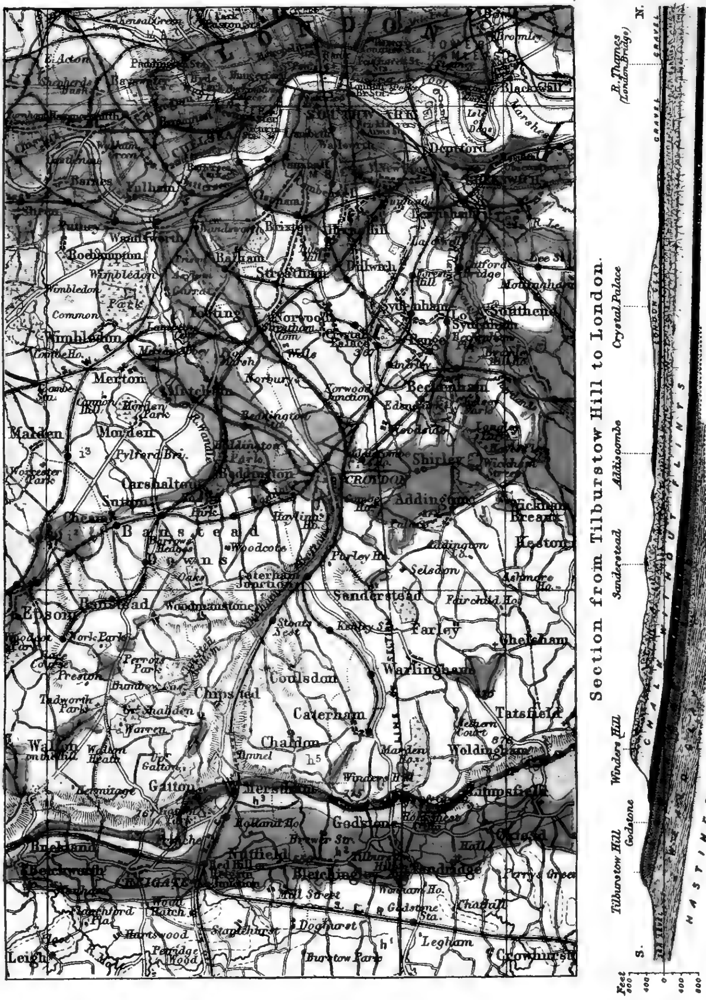
Delivered before the Members of the Croydon Microscopical Club, with additions and notes,

ON WEDNESDAY, FEBRUARY 17TH, 1875.

PRICE ONE SHILLING.

F. BALDISTON, PRINTER, "CHRONICLE" OFFICE, CROYDON.

Issued by the Club & part from a sort of Supplement to the report for the year



THE GEOLOGY OF CROYDON AND ITS NEIGHBOURHOOD

From the Geological Survey.

BY W. TOPLEY, F.G.S.

Scale of Miles

0 1 2 3 4 5 6 7 8 9 10

	Alluvium	l^2	*Lower London Tertiaries*	h^3	*Gault*
	Gravel & Brickearth (of Thames Valley)	h^5	*Chalk*	h^2	*Lower Greensand*
l^3	*London Clay*	h^4	*Upper Greensand*	h^1	*Weald Clay*

J. Bartholomew, Edin.

Croydon Micro. + Nat. Hist. Club.

X 24

LECTURE

ON THE

GEOLOGY OF CROYDON,

IN RELATION TO THE

GEOLOGY OF THE LONDON BASIN

AND OTHER LOCALITIES,

BY

J. MORRIS, F.G.S.,

K

Delivered before the Members of the Croydon Microscopical Club, with additions and notes.

F. BALDISTON, PRINTER, "CHRONICLE" OFFICE, CROYDON.

THE GEOLOGY OF CROYDON.

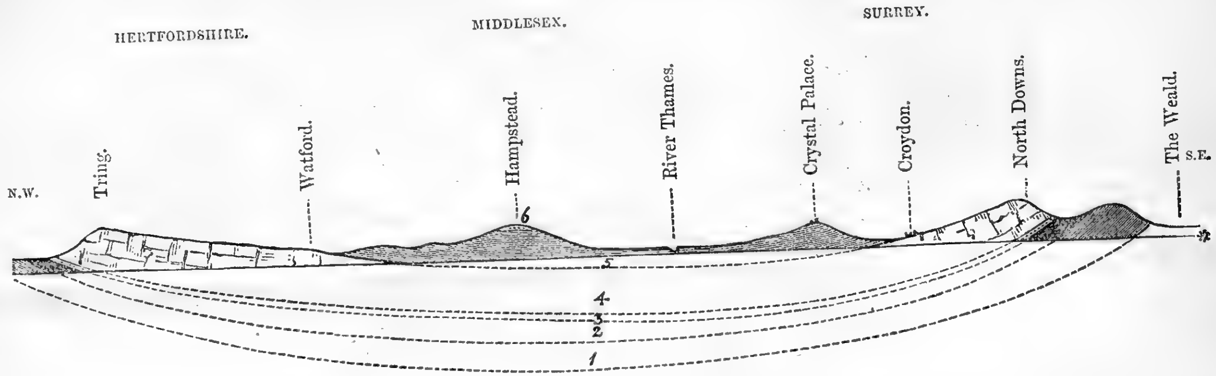
One among the many interesting objects of geological enquiry, is the attempt to restore, or realize in idea, the conditions under which the various sedimentary strata constituting the surface of the globe were formed. Buried, as some are, under newer sediments, their edges only seen, perhaps altered by long continued physical changes, and portions partially removed, are occurrences which involve the enquiry in some difficulty, but leave it still of interest. Imperfect as the geological record frequently is, and though the line of continuity in certain areas is broken, this imperfection may be compared to a volume in which sometimes leaves and sometimes whole chapters are destroyed, but which in other and separate volumes are more perfectly preserved, so that the story or history is continuous.

This, to some extent, is found to be the case in studying the geology of Croydon; for although the strata in this locality are apparently continuous, yet, between certain portions of them, there is good evidence (based upon geological knowledge) of a long lapse of unrepresented time, during which, in other areas, thick marine accumulations were taking place and great physical changes were being produced.

I propose, therefore, to treat the geology of Croydon as a means, not only of explaining the origin of the strata here, but of showing their relations to the strata forming the London basin, as well as to other and more distant districts. The rocks which constitute the crust of the globe, are chiefly of Igneous and Aqueous formation; around Croydon they belong to the latter division, and consist of gravel, sands, clays, and chalk, which are either of marine or estuarine origin. Geologists have divided the water-formed, or sedimentary rocks, into three great periods, dependent on the peculiar forms of ancient life found in them or on their relative positions, namely—Primary, or Palæozoic; Secondary, or Mesozoic; Tertiary, or Kainozoic. See Section, Fig. 4, p. 27. Now the beds in this neighbourhood belong to the later portion of the second and to the earlier part of the upper period, as shown in the following descending order:—

Pleistocene—Gravel	Tertiary.
Eocene—London Clay, Oldhaven or Blackheath Beds, Woolwich Beds, Thanet Sands	
Cretaceous—Upper, Middle, and Lower Chalk	Secondary.

FIG. 1.—*Section across the London Tertiary Basin.*



6. Bagshot Sands.
5. Lower Eocene (London Clay. Oldhaven, Woolwich and Reading Beds, and Thanet Sands).
4. Chalk.
3. Upper Greensand.
2. Gault.
1. Lower Greensand (possibly thinning out under London.

* Sea-level.

Thus the several local groups of strata belong to one or other of these formations, but they are not so extensively distributed as in other districts.

Making a rough diagram from south to north through Croydon, we should find, as shown in the diagram (exhibited), copied from a section by Mr. A. Tylor, in Mr. Smee's interesting book, "My Garden," 1st, The Chalk; 2nd, Thanet Sands; 3rd, Woolwich Beds; 4th, Oldhaven Beds; 5th, London Clay; and if continued across London, the chalk of Hertford would be found again overlain on its southern side by strata nearly similar to those which overlie the northern side of the chalk of this district, thus proving a basin-shaped arrangement of the strata forming the London basin. This arrangement I hope to show is favourable for obtaining water by means of deep Artesian wells, while the gravel which covers the surface, from its geological position, is another source of water-supply; hence, therefore, in sinking anywhere within the London area, we should find the chalk at various depths. But if the section was continued southwards, from Merstham to Brighton, although the chalk would be found again in the South Downs, *no deep sinking* would reach the chalk in the intermediate area, in consequence of its having once covered that area, and having been subsequently removed. This arching over and former continuity of the chalk of the North and South Downs, previous to denudation, being due to a general folding, or undulation which the chalk and some of the subsequent strata have undergone, and by which the London and Paris troughs or basins were formed. For broken through as the chalk is by the Channel, it is continued in France, where the folding is again found, so that it underlies Paris, forming the Paris basin, which contains some beds of the same age as those of London, and are also synchronous with those near Croydon.

The Chalk which forms the last of the great series of secondary deposits—although not fully represented in the British area—is a soft white earthy limestone, attaining a thickness in some localities, as at Mr. Colman's well, at Norwich, 1,000 feet; and in this neighbourhood it is calculated to be from three to 500 feet thick, by Mr. Caleb Evans, whose published section of the chalk from Oxted to Purley is of much interest.

Mr. C. Evans, in his paper * "On some Sections of Chalk between Croydon and Oxted," on the Surrey and Sussex Railway, shews that the following zones appear to be well marked, the highest part of the chalk (about 50 feet) not being included :—

1.—Purley Beds: Chalk with nodules and bands of flint. Zone with *Micraster cor-anguinum* in upper part and *Inoceramus Cuvieri* below.

* Proc. Geol. Association, January, 1870.

2.—UPPER KENLEY BEDS: Chalk with bands of flint. Zone with *Micraster cor-anguinum* in the upper part and *Ananchytes ovata* and *Spondylus spinosus* below.

3.—LOWER KENLEY BEDS: Chalk with fewer flints (dispersed). Zone with *Holaster planus* and *Micraster cor-bovis.* Whiteleaf Beds: Chalk with bands of marl and very few flints. Zone with *Inoceramus Brongniarti* and *Galerites albogalerus*, about 75 feet.

4.—UPPER MARDEN PARK BEDS: Chalk without flints, but with layers of marl. Zone of *Ammonites peramplus* and *Inoceramus mytiloides.*

5.—LOWER MARDEN PARK BEDS: Chalk marl and grey chalk. Zone of *Ammonites varians* and *Belemnitella plena.* Estimated thickness of last two beds about 190 feet.

The Chalk is of marine origin, and indicative of a rather deep sea, and of a warmer period than obtains at present in our area. The old Cretaceous sea was of great extent, occupying a fair area in England, it can be traced by its organisms over a considerable portion of Europe, extending about 1,100 miles from east to west and 840 miles from north to south. Cretaceous beds occur, in some parts of India, within 10 or 12 degrees of the equator; along the eastern, southern borders, and part of the western territories of the United States; also in South America, where, along the Chilian Andes, beds of this age are now elevated 14,000 feet, as they are also in the Rocky mountains to the extent of 6,000 feet above the sea level; while, in our area, the chalk at Ingpen reaches only 1,100 feet above thesea, showing the movements which have taken place since the formation of the chalk.* I need not, I am sure, describe here those minute forms which constitute a large portion of the chalk, as they have, doubtless, been objects of frequent examination by the members of the Croydon Microscopical Club; but those who are not so conversant, may be informed that they belong to the lowest division of the animal kingdom, the Protozoa, which includes besides them the sponges, infusorial animalcules, and some other forms. But this contribution of minute life in building up the present solid chalk, is of further interest when compared with the accumulations now taking place over a considerable portion of the Atlantic; for as many of you must be aware, owing to the researches of Dr. W. B. Carpenter and Professor W. Thompson, and the still earlier investigations of Professors Ehrenberg and Bailey, that accumulations are now taking place in its depth of nearly the same nature as the

---

* Hence, the whole rise since the Cretaceous period, about the central region of the Rocky Mountains, has amounted to nearly 7,000 feet, and from this it decreased eastward towards the Mississippi and westward towards the Pacific.—DANA, *Manual of Geology,* p, 504.

The Cretaceous formation has a thickness in New Jersey of 400 to 500 feet; in Alabama 500 to 600; in Texas (including compact limestones with chert) about 800; and in the region of the Upper Missouri of 2,000 to 2,500 feet. Cretaceous rocks have been found on tue Pacific coast at Vancouver's Island, at various points in the Coast range in California, and along the Sierra Nevada.—DANA, *ibid.*, p. 468.

white chalk, and formed not only by the same genera of Foraminifera, but even by the same species which Croydon microscopists have washed out of their chalk; associated with these, are silicious parts of sponges, diatoms, &c., which hereafter may become aggregated together and form bands of flint, as similar organisms in the old cretaceous sea have partly contributed to produce the flint nodules so characteristic of the upper chalk.

The following species of Foraminifera, according to Professor T. R. Jones, are found both living and in the Cretaceous rocks:—

I.—Arenaceous Foraminifera.

Lituolida—

Webbina rugosa, *D'Orb.*

II.—Perforate, or Hyaline Foraminifera.

Lagenida—

Lagena globosa, *Mont.*
,, sulcata, *W. & J.*
Glandulina lævigata, *D'Orb.*
Lingulina carinata, *D'Orb.*
Nodosaria radicula, *Linn.*
,, raphanus, *Linn.*
,, acicula, *Lam.*
,, glabra, *D'Orb.*
,, ovicula, *D'Orb.*
Dentalina communis, *D'Orb.*
,, pauperata, *D'Orb.*
Cristellaria Italica, *Defrance.*
,, triangularis, *D'Orb.*
,, cultrata, *Montf.*
,, rotulata, *Lam.*
,, crepidula, *F. & M.*

Polymorphinida—

Polymorphina lactea, *W. & J.*
,, communis, *D'Orb.*
,, compressa, *D'Orb.*
,, Orbignii.

Buliminida—

Bolivina punctata, *D'Orb.*
Virgulina Schreibersii, *D'Orb.*
,, Hemprichii, *D'Orb.*

Textularida—

Textularia globulosa, *Ehr.*
,, gibbosa, *D'Orb.*
,, agglutinans, *D'Orb.*
,, trochus, *D'Orb.*
,, turris, *D'Orb.*
Vulvulina pennatula, *Batsch.*
Spiroplecta biformis, *P. & Jones.*
Verneuilina triquetra, *v. M.*
,, pygmæa, *Egger.*

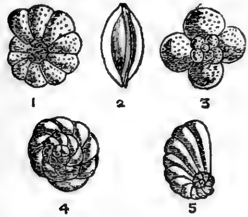
Globigerinida—

Globigerina bulloides, *D'Orb.*
,, pelagica, *D'Orb.*
Rotalia Beccarii, *Lin.*
,, umbilicata, *D'Orb.*
Planorbulina farcta, *F. & M. var.*
,, Haidingeri, *D'Orb.*
,, Ungeriana, *D'Orb.*
,, ammonoides, *Reuss.*
,, globulosa, *Ehr.*
,, ariminensis, *D'Orb.*
,, lobatula, *W. & J.*
Pulvinulina crassa, *D'Orb.*
,, Menardi, *D'Orb.*
,, Micheliana, *D'Orb.*
Calcarina Spengleri, *Gmel.*

"With the Rotalinæ, as with Globigerina, the chief distinction between the Cretaceous and existing groups is in the progressively increased number of modifications, and among them the incoming of important variations, though few of them are of generic, or even of specific value—a distinction strong enough, when supported by other known geological and palæontological considerations, to mark the impropriety of calling the Atlantic ooze 'Chalk," except in the sense of a calcareous rock of marine organic origin." *

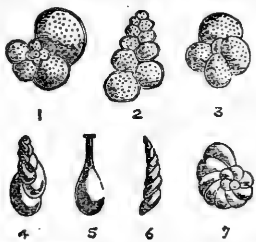
* "Cretaceous Rotalinæ," Jones and Parker, Quart. Journ. Geol. Soc., May, 1875.

Fig. 2.—*Foraminifera (recent).*



1. Planorbulina Ungeriana
2. Triloculina tricarinata
3. Globigerina bulloides
4. Rotalia Beccarii
5. Nonionina turgida

Fig. 3.—*Foraminifera (fossil).*



1. Globigerina cretacea (imperfect)
2. Textularia globulosa
3. Globigerina bulloides (under side)
4. Virgulina punctata
5. Lagena lœvis
6. Vaginulina legumen
7. Discorbina parisiensis

The Diatomaceæ which occur in the English Chalk are referred to Fragillaria, F. capucina, F. pinnata; there are also many minute bodies called crystalloids and morpholites, by Ehrenberg, which have been regarded as belonging to simple Protozoa or to Algæ.

The recent and previous deep sea explorations have shewn that the mud forming at the bottom of the Atlantic is not of uniform character throughout or due to the same organisms, for in the circumpolar Arctic and Antarctic areas a silicious deposit is being formed, chiefly derived from the diatomaceous plants and radiolarian animals which throng the surface, and from the spicula of the sponges which live at the bottom, while in the intermediate zone, occupying some 100 degrees of latitude, the composition of the deep-sea mud is entirely different from that of the circumpolar regions.

Thus, in the whole of the "intermediate zone," the silicious deposit which is being formed there, as elsewhere, by the accumulation of sponge-spicula, *Radiolaria*, and Diatoms, is obscured and overpowered by the immensely greater amount of calcareous sediment, which arises from the aggregation of the skeletons of dead *Foraminifera.* The similarity of the deposit, thus composed of a large quantity of carbonate of lime and a small percentage of silex, to chalk, which was first pointed out by Ehrenberg, is now admitted on all hands; nor can it be reasonably doubted that ordinary metamorphic agencies are competent to convert the "modern chalk" into hard limestone, or even into crystalline marble.*

Although the *Globigerina* ooze is the most widely-spread material of the sea-bottom in the intermediate zone of the Atlantic and Pacific oceans, other deposits of green sand, dredged up by Count Pourtales off the coast of Florida, when examined by Professor Bailey were found to be casts of Foraminifera, consisting of a mineral resembling Glauconite. Messrs. Parker and Jones discovered similar casts in process of formation in specimens of the sea-bottom of the Australian seas, and during the cruise of the "Challenger" a similar deposit has been observed in the course of the Agulhas current near the Cape of Good Hope. As bearing upon this, Ehrenberg had discovered that many of the green grains of the green sand of Lower Silurian age of Russia consist of silicious casts of Foraminifera.†

Further, the recent observations of the "Challenger" have shewn the interesting fact that in the midst of the intermediate zone, at depths of 3,000 fathoms and more, the sea-bottom no longer consists of *Globigerina* ooze, but of an excessively fine red clay.‡ Professor Wyville Thompson states that the first four stations in the first section between Teneriffe and St. Thomas, at depths from 1,525 to 2,220 fathoms, show *Globigerina* ooze. From the last of these, which is about 300 miles from Teneriffe, the depth gradually increases to 2,740 fathoms at 500 miles, and to 2,950 fathoms at 750 miles from Teneriffe. The bottom in these two soundings might have been called "grey ooze," for although its nature has altered entirely from the *Globigerina* ooze, the red clay into which it is rapidly passing still contains a considerable admixture of carbonate of lime. The depth goes on increasing to a distance of 1,150 miles from Teneriffe, when it reaches 3,150 fathoms; there the clay is pure and smooth, and contains scarcely a trace of lime.§ This red clay has been traced for a distance of 1,900 miles from east to west, and chiefly consists of silicate of the red oxide of iron and alumina.

It may be interesting to enquire whether the red chalk of Lincoln and Yorkshire may have any relation to this red clay, and

* Prof. Huxley, "Contemporary Review," March, 1875, p. 646.

† Brit. Assoc. Report, 1854, Sections, p. 84. Proc. Berlin Acad., June, 1858. Murchison, Siluria, 1867, p. 356.

‡ Huxley, ibid., pp. 651, 652.

§ Proc. Royal Soc., vol. xxiii., p. 44.

be due, as suggested by Professor Thomson and his colleagues, to the insoluble residue of the calcareous organisms of the *Globigerina* ooze, or to the suggestion of Dr. Carpenter,* that the red clay is the result of the decomposition of previously-formed green sand.†

Nor are the Foraminifera the only organisms which ally the Atlantic deposit to the old chalk sea; for a species of coral, the Caryophyllia cylindracea, some genera of Echinoida, as Salenia, Cidaris, Pourtalesia; ‡ also Mollusca, Crustacea, and the Crinoids, Rhizocrinus and Pentacrinus, and Beryx, a ctenoid fish, first commencing in the chalk, are either allied to or representative of the creatures of the chalk sea, which has led some naturalists to infer that we are still living in the cretaceous period; but other forms so characteristic of this period have long passed away—the numerous carnivorous cephalopods, with the exception of the nautilus; curious forms of predaceous fish related to the sharks and others, were the scavengers of the ocean, feeding on the numerous invertebrata and on the Teleostean fishes, which here first appeared as the Beryx and Osmeroides.§

---

* Proc. Royal Soc., vol. xxiii., p. 242.—M. Neumayr, Naturforscher, June, 1875.

† Prof. A. Church, F.C.S., of the Agricultural College, Cirencester, has examined the red chalk, and kindly furnished me with the following remarks:—An ordinary pale specimen of red chalk from Hunstanton contained, besides small rounded pebbles and grains of quartz of a dark coloured silicate, a quantity of fine red slime or mud. This substance, which constituted over 9 per cent. of the original rock, was separated in the following manner: The crushed fragments of red chalk were covered with weak Hydrochloric acid, until no lime was thereby removed. By careful washing, the residual fine red matter was separated from the acid solution on the one hand and from the silicious grains on the other. After thorough washing and drying, it was submitted to analysis, with the following results:—

	In 100 *parts.*
Silica	62·0
Alumina and ferric oxide	33·4
Magnesia	3·1
Undetermined	1·5
Lime and Manganese were absent.	100·0

The specimens of red chalk on which the above experiments were made were much paler in colour than the darker homogeneous specimens analysed by Prof. Church in the year 1863.

Mr. W. H. Hudleston, F.G.S., who has paid some attention to the subject, has suggested to me that the Iron in the Glauconite found in Cretaceous rocks is peroxidised to a very considerable extent, in spite of the green colour usually accompanying the protosalts of iron, therefore no additional oxidation is necessary on the supposition that the oxide of iron in the Red Chalk is the result of decomposed glauconite.

Mr. R. C. Clapham says—"It is an interesting question to consider what is the cause of the colour in Red Chalk. Prof. Phillips thinks that it is derived from decomposed glauconite or decomposed augite (both of which contain peroxide of iron and magnesia). It may also be caused by decomposed iron pyrites, as it will be observed the analysis shews a trace of sulphate of lime."—*The Geologist*, 1863, p. 29.

See also Prof. Church, "On Red Chalk and Red Clay," *Chemical News*, May, 1875.

‡ We cannot fail to be struck with the persistence of many of the types of the chalk up to the present time. This was of course known from the time Lyell first called attention to the similarity of the fossils of the Tertiary deposits with the present fauna; it has recently been brought up still more forcibly after several most marked Cretaceous genera, Salenia, Hemipedina, Phormosoma, and Pourtalesia were dredged from great depths in the West Indies, showing a much more intimate generic connection between the present and the chalk than had been admitted.—A. Agassiz, "Illustrated Catalogue of the Museum of Comparative Zoology," 1874, p. 752.

§ The curious genus *Echinothuria*, described by the late Dr. S. P. Woodward, and procured by the late Mr. W. Flower from the Chalk of Kent, is closely related to Calveria and Phormosoma; in all essential family characters they agree. Rhizocrinus belongs, with the Chalk genus Bourgueticrinus, to the Apiocrinidæ, which attained their maximum during the Jurassic period, when they were represented by species of the genera Apiocrinus and Millericrinus.—"The Depths of the Sea," pp. 164, 447.

Besides these, we have, however, in the chalk other forms no longer represented: the huge Ichthyosaur and Plesiosaur, the flying Pterodactyle, a gigantic lizard—the Mosasaurus, a genus represented in the American cretaceous, where it is associated with other extinct genera of Reptiles, and some existing types of Tortoises and Crocodiles. All these and other genera so characteristic of Mesozoic times, became extinct at the close of the Chalk period. Fragments are occasionally found of once floating wood, indicative of some adjacent land, bored, however, by the Teredo before it became waterlogged.*

Other evidences point, if rightly interpreted, to varying climatal conditions; for while the general nature of the deposit and its remains infer a warm or subtropical ocean, the discovery, about 18 years since in your neighbourhood, in the chalk-pit near Purley, of a block of granitoid rock with associated fragments of greenstone and sand, led Mr. Godwin-Austen to believe, from its size, that it was not floated in by means of drift wood or seaweeds, but that upon some ice-bound northern shore, and fallen from the cliffs above, it became encased in shore ice, with the sand of the beach, and was subsequently floated away and deposited in a more southern region, just as the boulders are now carried by icebergs from Greenland, and dropped when brought into the influence of the warm gulf stream. The mass of sand and blocks presented such an assemblage as now might be found on a beach on the coast of Norway, in latitude 60° north.† Nor is this a solitary instance, for, although sand, pebbles, and drift wood are not common in the white chalk, still pebbles are sometimes found; and some years since Mr. Willett noticed a rounded block, 13-lbs. weight, in the upper chalk of Lewes, to which were attached *Spondylus lineatus*, some Serpulæ, and Bryozoa; and in the lower cretaceous beds, near Cambridge, blocks of various sizes and of northern origin are frequently found, to which are attached some characteristic shells of cretaceous age.‡

---

* The scarcity of the remains of a land vegetation in the upper cretaceous rocks of England and France, and their comparative abundance and peculiar character in the equivalent strata of other parts of Europe and of the United States, is a suggestive and interesting fact; for the tertiary aspect of the upper cretaceous flora of Colorado (the Dakota group), and Greenland is also represented in Europe, in Bohemia, Saxony, the Hartz, and at Aix-la-Chapelle, where, in the Aachenian sands, Dr. Debey has noticed and described about 400 species of plants, the larger number belong to Dicotyledonous angiosperms, associated with some coniferæ (sequoia &c.), and about 80 species of ferns. (See Prof. Lesquereux, "The Cretaceous Flora of the Western Territories," 1874. Also the "Memoirs of Prof. Heer and Dr. Debey.")

† Quart. Journ. Geol. Soc., vol. xiv., p. 252.

‡ Rev. O. Fisher, in alluding to the change of the Lower Cretaceous rocks in Cambridgeshire, says:—"A glance at a geological map of England will show the out-crop of the secondary rocks thereabouts making a semi-circular sweep, having the old rocks of Charnwood Forest in the centre, We have also a Palæozoic slaty rock within about a thousand feet of the surface at Harwich. If these two points be joined by a line curving slightly northward, just parallel to the axis of the weald, such line will represent the direction of the slight elevation to which the curvature of the out-crop of the secondary rocks is due, and will pass through the area where the character of the Lower Cretaceous rocks changes from nodule bed and gault into Red Chalk. A second Palæozoic ridge following that direction would account for this change (several of the erratic pebbles of

Messrs. Sollas and Jukes-Browne, in their paper "On the included rock-fragments of the Cambridge Upper Green sand," state they are of different lithological characters, and derived from Palæozoic formations; among the most abundant are mica-schists, basalts, granites, felspathic shales, vein-quartz and coarse grits; and we may refer them to gneissic, volcanic, schistose, and sedimentary rocks, probably of Old Red Sandstone, and Carboniferous age. Many of the fragments are incrusted with coprolite, *Exogyra*, *Spondylus truncatulus*, *Plicatula sigillum* and *Ostrea vesiculosa*.*

Prof. Ehrenberg † many years since pointed out the identity of certain living forms of Foraminifera with those of the Cretaceous epoch, and which were noticed by Mr. Lonsdale,‡ Dr. Mantell,§ Prof. Bailey and the later and more extended investigations of other observers, Prof. Huxley, Count Pourtales, Dr. W. B. Carpenter, and Prof. Wyville Thompson.

The resemblance of the fauna and character of the Atlantic Bed has led the latter of the above naturalists to conclude that "we are still living in the Chalk period," a statement in which the late Sir C. Lyell ** did not, and Prof. Prestwich †† and Prof. T. R. Jones ‡‡ do not fully coincide. It is true that we find, as before noticed, both cretaceous and living, about 20 species of Foraminiferæ, some closely allied sponges, a coral *Caryophyllia cylindracea*,§§ five or six genera of Echinodermata, about 30 genera of Mollusca, probably two species of Brachiopoda, and species of Beryx; but the characteristic cretaceous forms are wanting, such as the Belemnitida and Ammonitidæ (the Nautilus being the only tetrabranchiate now living), the Lamellibranchiate Inoceramidæ and Hippuritidæ, the Gasteropodous *Nerinæa* and the extinct Lacertilia (Mosasaurus, Polyptychodon, &c.), and the orders Pterosauria and Enaliosauria.

The chalk period terminated, and with it became extinct its characteristic fauna, brought about, probably, by a great change in the physical geography of the area, by elevation of the sea-bed, or shrinking of the sea, which preceded the commencement of the Tertiary era, and which, in this vicinity, presents so marked a change,

---

the phosphate-bed may be matched from Charnwood); and we might look to the Trias, which on every side of Charnwood abuts upon the Cambrian rocks, to have furnished the ochreous deposit giving rise to the Red Chalk."—Quart. Journ. Geol. Soc., vol. xxix., p. 62.

* Quart. Journ. Geol. Soc., vol. xxix., p. 11.

† *See* Ann. and Mag. Nat. Hist., 1841, vol. vii., p. 296.

‡ Lyell, Ann. Address, Proc. Geol. Soc., vol. ii., p. 365.

§ Wonders of Geology, 1857, p. 305.

** Elements of Geology, 2nd ed., p. 272.

†† Anniversary Address, Quart. Journ. Geol. Soc., vol. xxvii., p. 69.

‡‡ Ann. and Mag. Nat. Hist., 1872, vol. iv., p. 295.

§§ Duncan, Quart. Journ. Geol. Soc., vol. xxvii., p, 434.

so great a break in the animal life, although, in other areas, there are better evidences of a transition state.*

The Lower London Tertiaries (see map) include the Thanet Sands, Woolwich and Reading Beds, and the Oldhaven Beds :—

"The Thanet Beds occur only in the south-eastern part of the London Basin, beginning from the neighbourhood of Leatherhead, where they thin out. Thence eastward they gradually thicken and take up more surface, but nowhere do they form a large tract. They are confined to the eastern part of Surrey, the southern part of Essex and Kent, throughout which last county they always overlie the Chalk, attaining their greatest development in the Eastern Division.

"The Woolwich and Reading Beds occur throughout the London Basin, at least it is but a very few spots in West Kent where the overlying Series has cut them off, and rest on the Chalk (in the absence of the Thanet Beds) over the greater part of the London Basin. Their outcrop is very narrow, especially where their dip is high, as along the northern flank of the Hog's Back. A multitude of outliers proves the former extension of this thin Series.

"The Oldhaven Beds are still more local than the lowest division of the Lower London Tertiaries, occurring only on the south from Croydon eastward, that is to say, at the most eastern part of Surrey and through Kent; and in this small range they are sometimes absent. Although of little thickness this series forms some comparatively broad tracks in the north-western corner of Kent, but in East Kent the outcrop is very narrow." †

The Thanet sands, the first of the tertiary series, have, however, but a limited extent near Croydon; they are seen in the railway-cutting, near Coombe Lane, and in the large pit beyond, at Duppas Hill, Croham Hurst, and probably the Waldrons, according to Mr. Whitaker, being a portion of the same beds which extend from Ashstead to the Isle of Thanet (hence their name), and where they attain their greatest thickness. Richborough Castle, the site of the Roman Ritupium, at the entrance of the Stour, and the Reculvers, near the ancient Regulbium, which guarded the north entrance of

* With regard to the relations of the Cretaceous and Tertiary periods to each other, Dr. Hayden observes, "There is no proof so far as I have observed in all the Western County, of a true non-conformity between the Cretaceous and Tertiary beds, and no evidence of any change in sediments or any catastrophe sufficient to account for the sudden and complete destruction of organic life at the close of the Cretaceous period."—Geol. Surv. Colorado, 1869, p. 169.

Prof. Cope in alluding to the transition series of the Rocky Mountain region, says, "There is, then, no alternative but to accept the result, that a Tertiary flora was contemporaneous with a Cretaceous fauna, establishing an uninterrupted succession of life across what is generally regarded as one of the greatest breaks in geologic time."—Bull. Geol. Surv., No. ii., p. 16.

This conclusion does not appear to exactly conform to facts, according to Prof. Lesquereux; at least on the point of view of vegetable palæontology.—Colorado Report, 1873, p. 372.

† Whitaker, Mem. Geol. Surv., vol. iv., p. 9.

the stream that separated the Isle of Thanet from Kent, are situated on the Thanet sands.

These sands, partly underlying London and the north of the Thames, here a permeable bed, form, from their geological position, a water-bearing stratum, the source in part of the London artesian wells. They are not found in the Hampshire basin, but are represented in Belgium by the Landenian sands, and in the Paris basin by the sands of Bracheux. They are of marine origin, and the fossils indicate, according to Mr. Prestwich, a comparatively temperate climate. In this vicinity, they are unfossiliferous; but Mr. Cooper has obtained a shark's tooth *(Lamna)* from them.*

These marine beds are succeeded by the next, or Woolwich and Reading series,† partly of fluviatile, estuarine and marine origin, showing a further change in the physical conditions of the district—evidence of land surfaces down which rivers flowed, teeming with molluscous life, which have left traces of the shell beds at Park Hill, Duppas Hill, East Croydon Station, and the Croydon Sewage and Gas Works, Waddon,‡ from whence

---

* This formation which up to this neighbourhood forms but a narrow tract between the other Eocene beds and the Chalk, now gets much thicker, takes up a larger space at the surface, and runs out in spurs with well marked features, and for the most part not capped by the Woolwich Beds. It may be well seen in the road-cuttings at Beddington, which have the usual picturesque look of the deep-cut lanes of a Thanet Sand country, and in a railway cutting south of the village.

Another spur spreads over Waddon Court to the southern side of the railway; and a third, with a small capping of gravel and of the Woolwich Beds forms Duppas Hill, on the western side of Croydon, and reaches to within a quarter of a mile of Hayling House, on the hill just to the east, where the sand is again hidden by gravel.

On the eastern side of the Croydon valley this formation and the Woolwich Beds together form one well-marked escapement. The junction of the former with the chalk is well shown in the railway-cutting on the northern side of Coombe Lane, and in a large pit about a quarter of a mile further east. At the former place the junction is rather irregular, and shows a slight dip to the north; at the latter it is even and regular. At both there are flints at the base of the sand, which in this neighbourhood is from 30 to 50 feet thick.—Whitaker, ibid, p. 61.

† This series so named by Prof. Prestwich, from the circumstance that the leading characters of the deposit are well seen at those two localities, is an intricate and curious series. At many places it consists of a bright red clay, mottled with various other colours; at others these clays are mixed with beds of sand; elsewhere the series is composed of beds of pebbles, with layers of sand and carbonaceous clays, and further east of silicious sands only. In some places eastward it contains entirely marine fossils; nearer London, a mixed group of brackish and fresh-water fossils prevail exclusively; whilst the mottled clays further westward contain no fossils at all (except Ostrea Bellovacina at their base), and all these are on the same horizon.—"The Ground Beneath Us," 1857, p. 58.

‡ At Duppas Hill, Croydon, a small outlier is for the most part hidden by the gravel that caps the hill. There was once a brickyard here, in the plastic clay.

Some very large and fine specimens of Ostrea Bellovacina were got from the bottom bed in the excavations for some new houses (1870) on the southern side of the Waddon Road, between the parish church and the railway, and with them a very fair specimen of a fossil lobster (Hoploparia gammaroides), the first I believe found in this bed, which is in the collection of Dr. A. Carpenter, of Croydon. The section was:—

Reading Beds. { Mottled plastic clay.
Clayey green sand.

Thanet Sand.

In the old gravel pit at the south-eastern corner of the outlier (and north of the road) there are the same beds beneath the gravel, but both the plastic clay and the green sand are very thin.

There is perhaps a patch of the Woolwich beds on the Croham Hurst outlier, south of Croydon, though any of this formation that may be present is hidden by the thick mass of flint-shingle, forming the top of the hill and belonging to the Oldhaven Beds.—Whitaker, Mem. Geol. Surv., vol. iv., p. 111.

Dr. A. Carpenter has obtained a crustacean similar to one found in the London clay above; traces of these beds are found at Sundridge Park, Woolwich, Bexley, and Erith; but at Upnor more marine conditions obtained, while to the westward, at Reading, they yield shells and plants, and further west are represented by unfossiliferous mottled clays, which clays are also found in the Hampshire basin, a distribution clearly worked out by Mr. Prestwich, in his communication to the Geological Society.* This old land, on the southern side, had also a river-course as shown by the fresh-water bed, with similar shells at Newhaven, Sussex. In the Paris area, similar conditions obtained, for around Epernay, and in the valley of the Marne, synchronous deposits were forming, containing nearly the same fauna, the shelly beds of which, and the associated lignite beds contribute to the fertility of the soil on which the vines grow from which the champagne is made.

It was from the presence of similar lignite, or carbonaceous beds in this formation at Lewisham and Blackheath which, many years since, induced the belief that good coal might be found there.

In the Belgian area these estuarine strata are represented by marine beds, and, with slight exceptions, similar conditions obtained in the area north of the Thames.

The Woolwich beds indicate sub-tropical and estuarine conditions, containing Cyrena, Melania, Melanopsis, Ostrea, Neritina, and other mollusca.

During some recent excavations at Park Hill Rise, in the calcareous conglomerate, were found *Cyrena cuneiformis, Ostrea pulchra, Melania inquinata, Pectunculus Plumsteadiensis, Calyptræa trochiformis, Cardium, Serpula, &c.*

Other physical changes succeeded, by which the Woolwich series became covered with a newer deposit of † sand and pebbles, referred by Mr. Whitaker to the Oldhaven beds, from their occurrence in Kent, and forming with the overlying mass, the basement series of the London clay. These pebbles are well known to you, for they are largely exposed near Croydon in the railway-cutting, Park Hill, Duppas Hill, and Croham Hurst; also in the picturesque districts of Shirley Common and the Addington Hills; and further east, at Blackheath, Bexley Heath, and other points. These beds vary in thickness from a few feet to about seventy, and consist of perfectly rounded flints, more or less altered in colour by exposure, but

* Quart. Journ. Geol. Soc., vol. x., p. 75.

* Along the southern boundary of the London Basin the most westerly place where the Oldhaven Beds are seen is Croydon, beyond which they seem to thin out.

The boundary line through the town is hidden of course, and not only by reason of the buildings, but also by the gravel; but it seems to run across the London and Brighton Railway to Park Hill.

The line of outcrop is also hidden, but an inward spur seems to run northwards under the gravel to Selhurst, where the beds rise up slightly, and being free from gravel are to be seen in sections. This outcrop—so far within the general line of the boundary of the London Clay, and not at a very low level—is owing to some local uprise of the beds.—Whitaker, ibid., p. 241.

evidently due to some old coast of line of chalk, from the flints of which they were derived, and on the shore of which they were rounded; evidence of some long period, and during which, or after, the area was depressed, for these beds overlap, and are spread out over the lower strata, while in some parts of the old sea, shelly deposits were accumulating as pointed out by Mr. Whitaker; and in their nature and age are different from the gravel of Croydon in which they are mixed, and also from that of the present Wandle.*

"Towards the eastern part of Surrey these lowermost Tertiary beds begin to have a well-marked escarpment, rising from above the chalk, as on the east of Ewell. At Beddington and Croydon, where the Thanet sand has thickened, this is also the case.

"Along the outcrop of these beds in Surrey, especially towards the east, there are many villages, the line of which indeed is in itself enough to mark (roughly) the junction with the chalk. Their position is doubtless owing to the springs that occur along this line.

"Beyond Croydon, eastwards to the valley of the Cray and northwards to that of the Thames, is the broadest tract of the Lower London Tertiaries, and there occur their most marked features, owing chiefly perhaps to the development of the pebble-beds of the Oldhaven Series, the Woolwich and Reading Beds being often thin, but the Thanet sand greatly helping to form the gentle hills.

"On the south of this tract the escarpment forms the well-known range of the Addington Hills, Hayes Common and Holwood, the high grounds of which consist of the pebbly and sandy Oldhaven Beds, with a more or less even top, furrowed by little valleys, covered with wide spreads of heath, of gorse and broom, or of firs, and giving rise to some of the most beautiful scenery near London."†

After the deposition of these sands, pebbles, and estuarine beds *(see Map)*, known as the Lower London Tertiaries, a considerable change must have taken place in the area of which Croydon now forms a part; however the chalk may have contributed

* With regard to the organic remains contained in these pebble beds, one of the problems which the late Mr. J. W. Flower set himself to work out, on his settling at Croydon some 25 years ago, was to ascertain whether the immense pebble beds of Addington, belonging to the Lower Tertiary series, were not formed of flints derived from the destruction of higher beds of chalk than any which now remain in the neighbourhood of London. Stratigraphical Geology has shown that the chalk formation, as it trends towards the weald, had been largely planed down before the deposition of the Tertiary Strata, and Mr. Flower's palæontological researches seemed quite in accordance with this view, and to point to the former existence of beds older even than any now remaining in the London Basin. In pursuance of this object, he carried on for years an examination of the flint pebbles forming the Addington Hills, and broke up many thousands of them in search of the small fossils they occasionally contain. Unfortunately the results of this long investigation have never been published. It was, however, evident that they were of a nature to confirm the views he had been originally led to form.—Geol. Mag., vol. x., p. 430.

† Whitaker, ibid., p. 368.

to the previous pebble bed, the next succeeding stratum, that of the London clay, a thick deposit of stiff tenacious clay, from 200-ft. to 500-ft. thick, must have been derived from the wear and tear of some old Southern and Western land, during a long period of time. It is of great thickness and extent, for it reaches from Hungerford to Canterbury on the south, and to Harwich on the north, varying in breadth from a few to 50 miles, and forming the marked deposit of the London basin. It may have extended all over the area) now occupied by the intervening chalk ridge, for it is found in outliers on the Downs; in the Hampshire basin, and also in the Isle of Wight. Eastward, it passes under the German Ocean, for it occurs in Belgium, and hence afforded one of the suggestions for the submarine tunnel, but only reaches France, near Dieppe, and is not found in the Paris basin, where it is doubtfully represented by other strata.

Not only does the London clay indicate great physical, but also considerable climatal changes. There was evidently a much warmer climate than in the preceding part of the tertiary period, possibly resembling that of the chalk time, as is clearly shown by its well-marked Fauna, which is chiefly of marine origin. It had, however, its land conditions—and here the studies of the naturalist assist the geologist, reasoning from data of the present known to us, we may fairly infer the conditions under which its accumulations took place. A muddy deposit is usually unfavourable to certain forms of life; hence the reason, perhaps, of the comparative rarity of Sponges, Coral, and Echinoderms, although, in some localities, the Pentacrinus flourished. The molluscan life (300 species) was rich in genera, many now restricted to tropical seas, as Volutes, Cones, Cowries, Pleurotoma, Fusus, Cassidaria, Venus, Pholadomya, &c., while no less than nine species of the tropical genus, Nautilus (only two now existing) were associated with other curious forms. Of fishes, they were many forms, about 100, some belonging to the Elasmobranchs, such as sharks, rays, and largely to the Teleosteans, which here increase in number, although foreshadowed at the close of the chalk period by two or three forms, as Beryx and Osmeroides; the Reptiles are represented by Crocodiles, Chelonians, and Snakes, the latter appearing, for the first time, in the geological series, and the study of these forms and their habits, as shown by Professor Owen, are of much interest. The crocodiles and turtles refer to land conditions. We find marine, soft or river turtles, and also tortoises. No less than 10 species of marine turtles have been found in the London clay of Sheppy; while, at the present time, there are only about five known species, and these widely distributed. Those of us who may believe in the ancient Pythagorean philosophy, might infer that the love of the civic Alderman for turtle may be due to the spirit of the old Sheppy chelonian not having been lost in the London area, the Aldermanic sentiment having originated from the former luxuriance of the animal, or that the present delicacy may be an ideal survival of its former residence here. The crocodiles and turtles indicate some shore upon which they deposited their eggs, while the soft turtle as at present, on the banks of the Nile, probably performed the office of keeping in check the greater increase of crocodiles by occasionally feasting on their eggs.

Nor were these the only indications of land conditions; wading birds and birds of prey were present; also forms of ungulate mammals, related to the hog and tapir—the Hyracotherium and Coryphodon; while Palæophis, if a land snake, as large as an ordinary boa threaded its way through the dense groves of evergreens and succulent plants, the stems and fruits of which, and other plants, are found so abundantly at Sheppy, as described by Dr. Bowerbank.* Besides the coniferæ and other trees, we find the gourd, custard apple, mallow, and numbers of the fruit of a peculiar palm (nipadites), related to the Nipa, which grows in such abundance in the Moluccas, Philippines, and India, that its fruits, in floating down, almost obstruct the navigation of the Ganges through the Delta, associated with which are cones of Petrophiloides, a genus of Proteaceæ, now so characteristic of the Australian continent.†

Besides these are many species of Leguminosæ, allied to Mimosa and Acacia, and also some Euphorbiæ, groups now nearly confined to tropical forests, and hence is inferred the character of the climate in this area at the period in question.

With the London clay, the Eocene formations, seen in the vicinity of Croydon, terminate, and a great hiatus, representing a long lapse of time, intervenes between it and the superficial gravel here—an imperfection in the geological record, from the want of continuity. Suffice to say that vast physical changes took place

---

* Fossil Fruits and Seeds of the London Clay, 1840.

† There are two brickyards on the north of Sutton, about half a mile from the boundary-line, and at Carshalton Gas Works stiff blue clay was found. Eastward of this the junction with the Reading Beds is hidden by the gravel of the Wandle.

In a field on the northern side of the by-road nearly three-quarters of a mile to the west of West Croydon Railway Station, I saw (in 1859) a small shallow pit in brown sandy clay, probably the lowest part of the London Clay. In the cutting at the station the clay is shown beneath the gravel.

At Croydon the London Clay seems to have been cut back northwards in a bay-like form, but the boundary-line is in great part hidden by the thick mass of gravel here. The sections at Selhurst however show that there must be a slight upheaval, as else the beds below would not have been laid bare.

At the Selhurst brickyard the bottom part of the formation is shown. The higher pits at this place show the London Clay only; the upper part brown (discoloured by oxidation), and with septaria; the lower part a little sandy, bluish-grey brown and yellow (ochreous), roughly laminated, and with many crystals of selenite. Lower pits show the junction with the underlying Oldhaven Beds.

As the broad extent of country taken up by the London Clay is free from Drift, with the exception of the gravel along the valley of the Wandle, &c., and on Kingston and Wimbledon Hills, its clayey nature is most marked.—Whitaker, Mem. Geol. Surv., vol. iv., p. 282.

during the interval; for over the London clay, in some parts of the London basin, are a series of marine sands, 600 feet thick, the Bagshot and Bracklesham beds, which, composing the heaths and plateaux of Esher, Bagshot, Purbright, Frimley, Aldershot, and patches showing their former extension, occur as outliers at Harrow, Hampstead, Highgate, and beyond Epping, in Essex. Beds of this age probably extended over what is now Salisbury plain, for it is the harder portions, remaining as isolated masses, which have been used in the construction of the outer circle of Stonehenge. At any rate, the Sarsen stones are of some tertiary age. *(See Table at the end.)*

Prof. Ramsay alludes to the great tracts of chalk strewn with huge blocks of tabular sandstone, and the angular and half-rounded blocks which lie on the plains to the north and west of the chalk escarpment, marking the immense waste to which the whole territory has been subjected long after the close of the Eocene times:—"They plainly tell, in fact, that the chalk and overlying Eocene beds (the Woolwich and Reading and the Bagshot series) once spread far across the plains which the chalk escarpments overtook. These have been and are still being wasted back, for they are comparatively easily destroyed, but the strong 'grey wethers' remain, and as the rocks in which they once lay were slowly wasted away and disappeared, they gradually subsided to their present places. Besides the name of 'grey wethers,' they are known by the name of Sarsen stones and Druid stones, and all the standing masses of Avebury and Stonehenge, popularly supposed to be Druidical temples, have been left by denudation not far from the spot where they have since been erected into such grand old monuments by an ancient race." *

These sandy deposits indicate a further depression of the sea-bed and its extension, and the existence of a southern land. Their fossils show conditions of considerable warmth in a sea still open to the south, as stated by Mr. Prestwich; this sea must have extended over a considerable area, for these sandy beds are not only seen in the Hampshire basin, but their equivalents are found in the fine limestones worked for buildings in Paris, and in the limestones so largely used in the ecclesiastical edifices of southern Europe. The materials of which the Pharaohs constructed the pyramids were limestones deposited in the seas of this period, and are almost entirely composed of a peculiar foraminiferal shell, the Nummulite, and considered, by Strabo, as the fossilized lentils such as those on which the workmen, who built the pyramids, subsisted. Still further east is this formation found, even to the Isles in the China seas, and on

* The Physical Geology and Geography of Great Britian. London, 1874, p. 123.

the Himalaya mountains, to the height of 16,000 feet, showing its former extent and subsequent elevation.*

Over these Middle Eocene deposits, again we find, in our own and the Paris areas, a return to land and freshwater conditions in the Upper Eocene beds of the Isle of Wight, from the Headon to Hempstead series, inclusive, and which are estimated to be about 500 feet thick. Their equivalents include the gypsum beds, so rich in peculiar mammalia of this period, near Paris.

Nor were these the only intervening strata between the Croydon gravel and the London Clay, for the whole Miocene period, rich in a varied Fauna and Flora, occupied with its marine beds large areas in Europe and the United States. Its land and freshwater beds are seen in Greenland and Iceland. The luxuriant forests of this period, differing from the previous vegetation of the London clay, and more nearly approaching our own times, have given the thick deposits of brown coal so largely worked over the continent of Europe. During this period great volcanic outbursts took place in Greenland and in Britain, as seen in the Giant's Causeway, Staffa, &c.† Again, after this period, occurred the elevation of, or an increase in the height of, the Pyrenees, Alps, Carpathians, and Himalayas, for, upon their upraised flanks we find, at considerable heights, from 10,000 to 16,000 feet, traces of the Miocene and Eocene strata, the latter in the Alps, sometimes so altered, that they can be used as slates for roofing.

---

* When we have once arrived at the conviction that the nummulitic formation occupies a middle and upper place in the Eocene series, we are struck with the comparatively modern date to which some of the greatest revolutions in the physical geography of Europe, Asia, and Northern Africa must be referred. All the mountain chains, such as the Alps, Pyrenees, Carpathians, and Himalayas, into the composition of whose central and loftiest parts the nummulitic strata enter bodily, could have had no existence till after the Eocene period. During that period the sea prevailed where these chains now rise, for nummulites and their accompanying testacea, were unquestionably inhabitants of salt water. Before these events, comprising the conversion of a wide area from a sea to a continent, England had been peopled by various quadrupeds, by herbivorous pachyderms, by insectivorous bats, and by opossums. Almost all the volcanoes, which preserve any remains of their original form, or from the craters of which lava streams can be traced, are more modern than the Eocene fauna now under consideration; and besides these superficial movements of the action of heat, Plutonic influences have worked vast changes in the texture of rocks within the same period. Some members of the nummulitic and overlying tertiary strata, called *flysch*, have actually been converted in the Central Alps into crystalline rocks, and transformed into marble, quartz-rock, mica-schist, and gneiss.—*Lyell, Elements of Geology*, 1874, p. 261.

† The present Europe, partly then a continent, was, in miocene times, the theatre of widespread volcanic eruptions in central France, Germany, and that part of the British Islands now known as the Inner Hebrides. In that region they play a much more important part in connection with the physical geography of our country than they do at Bovey Tracey. In the adjacent land of Antrim, through the Isles of Mull, Rum, Rigg, Cana, Muck, and Skye, a vast broken belt of miocene volcanic rocks forms great part of the Inner Hebrides; and far beyond Britain, in the Faroe Islands, and in Iceland, the same volcanic series is found now, fragments, perhaps, of one large continuous territory; or, if not, at all events of a series of large islands of which the Faroes make one of the fragments.—*Prof. Ramsay, Physical Geology and Geography of Great Britain*, 1874, p. 129.

Mr. J. W. Judd, in his valuable and elaborate paper "On the Secondary Rocks of Scotland," when speaking of the basalts of the Antrim and the Inner Hebrides, says, 'Thus we are led to the conclusion that along a line stretching at least 400 miles from north to south, in the north-western part of the British archipelago, there rose, during a great portion of the Tertiary period, a chain of volcanoes in a state of violent but intermittent eruption.'—Quart. Journ. Geol. Soc., vol. xxx., p. 275.

In fact, more than one-third of the land of Europe and the Maltese Islands have been formed beneath the sea, and raised above it since the Eocene period; for London, Paris, Brussels, Bordeaux, Berlin, Vienna, and other towns stand upon strata either of Eocene or Miocene age.

These elevations and other physical changes probably ushered in the great and long-continued glacial period, before, during, and after which an almost entire change took place in the Fauna and Flora, from that of the previous period. To different portions of this period belong the numerous remains of the large Mammalia; the Elephant, Rhinoceros, Hippopotamus, and other animals found in bone caves, freshwater deposits, and superficial gravels of this country and of Europe.

Probably, the re-arrangement of this gravel, its later distribution filling up the valleys and low grounds, may be partly due, as suggested by Mr. A. Tylor, to a great pluvial period, when large quantities of rain fell, exceeding that of Seathwaite, in Cumberland, or even of the Khasia Hills, in India (300 inches in a year), which not only strongly eroded the strata, but by the force and strength of the accumulated streams, excavated the valleys, carried away the gravels; these were distributed over wide areas, of which evidences are well seen around Croydon. Situated at the junction of two valleys, it partly stands on beds of gravel (containing elephant remains), composed of rounded and unrounded flints, belonging to different periods. It extends widely over the valley of the Thames, and has been itself scooped out. The portions of Bagshot sands previously noticed now remaining attest the amount of denudation to which the area has been subjected.*

Such is briefly the evidence derived from the study of the strata found around Croydon; they are not isolated portions simply deposited at one time and in this locality; but fragments of strata which have been formed over very large areas, and under very different conditions. First, the warm Cretaceous period and the subsequent break; the erosion of the chalk and deposition of the marine Thanet sands, with a milder climate. The estuarine Woolwich beds, the erosion of a chalk cliff, and the formation and dispersion of the Oldhaven and basement beds, with their marine Fauna, the depression and change which brought in the

---

* Dr. Forbes Watson in noticing Indian rainfall, says "A striking example of the influence of the latter being found in the Khasia Hills in which, during five days, a down-pour of 30 inches in each successive periods of 24 hours was measured by Dr. Hooker, and in which the yearly rainfall frequently exceeds 600 inches. In such a country all the phenomena of the denudation and erosion of mountains, hills, and table lands, of the formation of alluvial plains, and the growth of deltas, take place with a rapidity and on a scale of magnitude elsewhere unexampled. The study of all these processes is important alike to geography and geology, as showing in actual operation those very forces, to the long-continued action of which must be ascribed most of the geological changes."—*On the Establishment of an Indian Institute, &c. London*, 1875.

See also Mr. Whitaker "On River Drifts," in the Guide to the Geology of London, 1875, p. 60.—A. Tylor, Geol. Mag., Sept., 1875, p. 459.

formation and deposition of the London clay, indicative of a sub-tropical, or very warm climate, with marine, freshwater, and land conditions.

The great lapse of unrepresented time, between that and the overlying gravel (with its Mammalian remains, *Mammoth*, &c.), has been indicated; the gravel belonging in part to the close of, or subsequent to, the glacial period.

In reviewing the conditions under which the strata I have attempted briefly to notice this evening, were deposited, we perceive, that as in the present time, so in the long *past* periods of the history of the earth, the same adaptation of animal and vegetable life to the varying inorganic conditions existed at each great geological period, the same balance of power, the same order, harmony, and design; affording cumulative evidence of Creative intelligence and foresight, which he only can fully appreciate and admire, who seeks and follows out, with no blind or captious spirit, the true interpretation of the laws of Nature, by which the hills around you have received their form, and through which the ground beneath you has become the mausoleum of successive races of animated beings.

A TABLE

Shewing the Geological Formations which are present or absent in the vicinity of Croydon, and their equivalent elsewhere.

		Croydon.	London.	Hants	Belgium.	Paris.
Pleistocene	Recent Alluvium and Gravel of the Wandle					Loess or Limon jaune
	Older Valley Gravels, with Mammoth	*	*	*		Valley Gravel, Amiens, &c.
	Brick-earth Deposits, extinct Mammals		*		Bone Caves, Liege, &c.	
	Cavern Deposits				Limon de Hesbaye	
	Glacial Drift and Boulder Clay		*		Sables de Campine	
Pliocene	Norfolk Forest Bed—*E. meridionalis*		*			
	Chillesford and Aldeby Beds		*			
	Norwich Crag (*Mastodon*)		*			
	Red Crag				Système Scaldesien: Sable jaune	
	Suffolk Crag		*		Système Scaldesien: Sable gris	
Miocene	Upper Miocene (wanting)				Système Diestien	(Touraine, Bordeaux Faluns)
	Hempstead Beds (Isle of Wight)			*	Système Rupelien	Calc. de la Beauce; Grès de Fontainebleau
	Volcanic Rocks and Leaf Beds of Mull, Staffa, Antrim, &c.					
U. Eocene	Bembridge, Sconce, Binstead Limestones, Bembridge Marls			*	Système Tongrien, Sup.	Gypsum Beds, Montmartre
	Osborne, St. Helen's Beds					
	Headon Hill, Colwell, White Cliff (Isle of Wight)			*	Système Tongrien, Inf.	Calcaire Silicieux
	Beaulieu, Lyndhurst, Brokenhurst (Hants)			*		
M. Eocene	Upper Bagshot, Barton, Alum Bay, High Cliff, Hunting Bridge		*?	*	Système Lackenien	Grés de Beauchamp, or Sables Moyens
	Bramshaw, Brook, Stubington, Bracklesham, Chobham, &c., Alum Bay and Bournmouth Beds		*	*	,, Bruxellien	Calcaire grossier & Glauconie grossière
	Lower Bagshot Beds		*	*	,, Panisilien	Sables de Soissonnais; Lits Coquilliers
L. Eocene	London Clay, Highgate, Sheppy, &c.	*	*	*	,, Yprèsien	(Dieppe, Dunkerque)
	Oldhaven Beds; Woolwich and Reading Beds	*	*	*	,, Landenien, Sup.	Argile Plastique
	Thanet Sands	*	*		,, Landenien, Inf. (Systeme Heersien)	Sables de Bracheux
Cretaceous	Norfolk Chalk (part)				Maestricht, Faxoe Beds	Calcaire pisolithique (Danien)
	Chalk with Flints	*	*	*	Craie blanche	Senoniën
	Chalk without Flints	*	*	*	Craie de Hesbaye	Turonian
	Chalk Marl	*		*	Système Hervien	
	Upper Green Sand	*		*	Tourtia	Cenomanian
	Gault	*		*	Aachenian Sands	Albien
	Lower Green Sand	*		*		

APPENDIX.

THE CROYDON BOURNE.*

The "Nailbournes" or intermittent springs of the Chalk-tracts are of some interest, and their origin has been ascribed to various causes, siphons in the chalk and what not; but they are easily explained in a very simple way, and without calling in the aid of any wonderful agency, as being the simple overflow of the chalk after seasons of heavy rain. The question has been well worked out by Mr. C. W. Johnson in a short essay on the Bourne of Croydon,† from which I quote :—

All the rainfall upon the chalk either evaporates or sinks into the earth,—there is little or no *surface* drainage. In the *summer* months the rain which it receives is almost entirely *evaporated;* there is little or no overplus to feed its springs. But in the autumn and winter months the case is reversed; the *smaller* portion of the rainfall then evaporates; the larger portion descends beneath it.

Whenever the rainfall considerably exceeds the average annual amount, the old streams or bournes are unable to discharge the unusual amount of water with which the chalk hills are saturated; and this surface water, in obedience to the law of gravitation, makes for itself a new channel. A large portion of the water which flows from the Godstone and Merstham hills usually percolates through the thick beds of porous gravel and sand upon which the town of Croydon is built, and thus finds its way by slow degrees and through various springs into the Wandle . . . . . When, however, these beds of sand and gravel, after a very rainy season, are so saturated with this water that they can take no mode, that which they cannot receive overflows the usual subterranean channel, and appears on the surface : . . . . . : the subterranean watercourse is *choked* and filled up with *water*, and that as effectually as if it were filled in with pitch or metal, or any impermeable material.

My colleague Mr. Topley has favoured me with the following extract from an old book which shows that this view was held long ago, but like many others was hardly grand enough for those more modern philosophers who could not see the efficacy of existing causes :—

The rising of a bourn or stream near Croydon (as the common people hold) presageth death or the plague and it hath been observed to fall out so. The rising of bourns in places where they run not always, we have before proved to be caused by great wet years, which (according to Hippocrates' observation) are generally the most sickly; and if they prove hot as well as

* Extracted from Mr. Whitaker's "Geology of the London Basin."—*Mem. Geol. Surv.*, vol. iv. p. 391.

† Dr. Westall's, "Advantages to be derived from the Adoption of the Local Government Acts, as exemplified in Croydon," pp. 39, 40.

wet (because heat and moisture are the greater disposers to putrefaction) they prove also malignant, and for the most part pestilential. And the reason why the using [? rising] of this bourn doth not always presage the plague, is because all wet years do not presage hot.*

The greater part of the valleys of the Chalk country are now quite dry, and water is got by sinking wells through the gravels at the bottoms of their valleys. In the extreme west of Sussex there are some valleys in which, after wet seasons, water now runs; such are in that neighbourhood called "Levants." Similar intermittent streams are frequently found in other chalk districts. One of the best known is that which occasionally runs in the valley between Merstham and Croydon; this is called the "Bourn.'. In Kent such streams are called "Bourns" or "Nailbourns;" in Wiltshire and Dorsetshire they are generally called "Winterbourns;" in Yorkshire they are known as "Gypsies" or "Gipsies." These streams now only run after very wet weather.†

The Croydon Bourne only flows as a surface stream after the rain of the preceding twelve months has exceeded thirty inches.

CROYDON WELLS.

Well for the Local Board of Health.

Sunk and communicated by Messrs. T. Docwra (some particulars added from a MS. section in the Engineer's Office, Metropolitan Board of Works).

Yields 1,500,000 gallons a day.

		Feet.
Made ground	...	4
[Valley Drift, 11 ft.]	Rough loamy gravel ...	4
	Sand ...	½
	Finer loamy gravel ...	3½
	Coarse gravel ...	3
Chalk, 62 feet.	Hard chalk witn large flints ...	15
	Chalk ...	24
	Hard crust (the greatest supply of water comes from this ...	1½
	Chalk ...	21½
	Total ...	77

New Well for the Local Board of Health, 1864.

56 feet from the older well.

Sunk and communicated by Messrs. T. Docwra and Son.

Water rose to a height of 11½ feet below the surface.

		Feet.
Made ground	...	5¼
Gravel, 9¾ feet.	Black gravel ...	1½
	Grey gravel ...	1
	Red gravel ...	¼
	Yellow ...	7

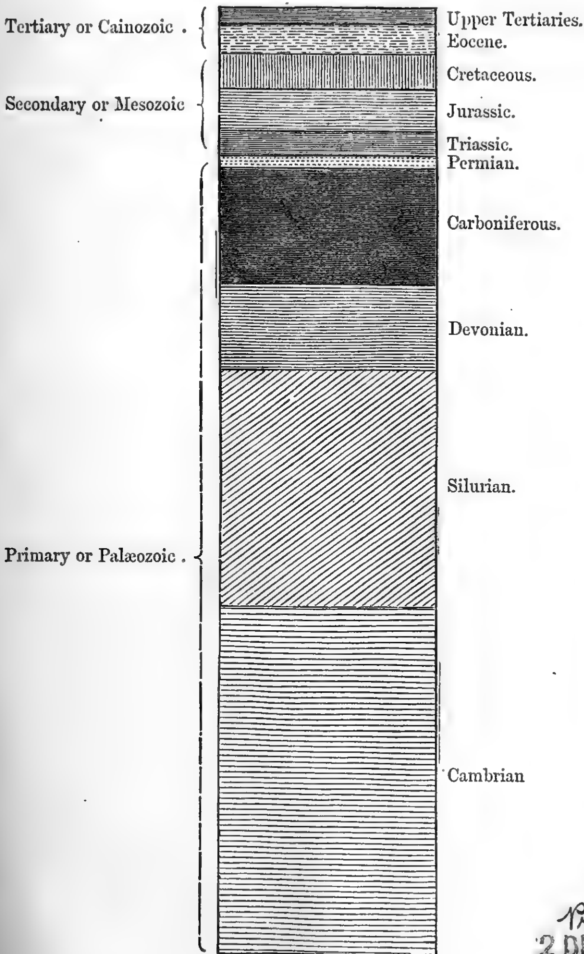
* J. Childrey, "Britannia Baconica, or the Natural Rarities of England, Scotland, and Ireland, p. 55. 1660.

† W. Topley, "On the Relation of Parish Boundaries, &c., &c." Journ. Anthropological Institute, vol. iii., p. 45.

	FEET.
Chalk, 137 feet. — Chalk (with rough gravel 7 feet down on one side of the well)	23
Chalk, layers of flints every 6 inches ...	10
Flints and chalk	16
Flints and rock chalk	29
Hard chalk...	$11\frac{1}{2}$
Yellow chalk	2
Rock chalk...	4
Chalk and flints	13
Blue clay	$\frac{1}{2}$
Chalk and flints	12
Grey chalk	1
Chalk and scattered flints	8
Soft chalk	7
Total	152

NOTE.—I am indebted to Mr. W. Topley, F.G.S., of the Geological Survey, for the Coloured Map and Section ; to Mr. J. L. Lobley, F.G.S., for the Wood-cuts (figs. 1 and 4) used in his Lecture on the Cretaceous Rocks, printed in the Proceedings of the Watford Natural History Society; to Mr. A. Smee, F.R.S., for the Figures 2 and 3, used in his work, "My Garden;" and to Mr. W. Whitaker, F.G.S., for permission to insert the paragraphs from the memoirs of the Geological Survey, vol. iv., and to Prof. T. R. Jones, F.R.S., for the netes on the Foraminifera.

Fig. 4.—*Section showing the approximate relative thickness of the British Sedimentary Rocks.*



SIXTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 19, 1876.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1877.

SIXTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 19, 1876.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1877.

OFFICERS AND COMMITTEE

FOR THE YEAR 1875.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

ALFRED CARPENTER, M.D., J.P.

Committee:

JOHN BERNEY, F.R.M.S.

WILLIAM REEVE COOPER.

PHILIP CROWLEY.

JOHN FLOWER, M.A., F.Z.S.

J. S. JOHNSON, M.R.C.S.

GEORGE F. LINNEY.

GEO. MANNERS, F.L.S., F.S.A.

GEORGE PERRY.

HENRY J. STRONG, M.D.

Honorary Secretary:

KENNETH Mc KEAN,

Summerfield, Warham Road, Croydon.

REPORT OF THE COMMITTEE.

The Sixth Annual Meeting of the Club was held on Wednesday, 19th January, 1876, Henry Lee, Esq., President, in the chair. The minutes of the last meeting having been read and confirmed,

The President said—It is impossible that I can open the proceedings this evening, without making allusion to the loss which we have recently sustained by the death of our friend Mr. Alfred Crowley. We, in this narrow circle, will remember him as a good naturalist, a kind and genial friend, and an associate who was always ready to assist us in every possible way at our ordinary meetings, and especially at our soirées. He derived, as he has frequently told me, the greatest pleasure and gratification from his association with the club. The town of Croydon has lost a most able administrator—a man distinguished by unswerving probity, sound good sense and practical knowledge, and one who, as a resident of the town, was always willing to contribute by his means and personal assistance to every good cause and undertaking in the parish and neighbourhood. Those whom he has left behind, his wife and a numerous young family, will especially feel his loss. I think, as this is our general meeting, that you will be glad to join with me in expressing the regret which we all feel, and our sympathy with his bereaved relatives and friends. I will therefore ask our Honorary Secretary to send, on behalf of the Club, a letter of condolence to Mrs. Crowley.

The following gentlemen were ballotted for and duly elected members, viz., Mr. James Buck, Mr. Edmund Gill, and Mr. F. W. Nash.

Six botanical slides were presented to the cabinet by Mr. John Gregory, who received the thanks of the Club.

The SECRETARY then read the

ANNUAL REPORT OF THE COMMITTEE.

In presenting their Sixth Annual Report, your Committee have again the satisfaction of recording the steady progress of the Club.

During the year just closed thirty-four new members have been elected. In the same time the Club has lost two of its members by death, and fifteen by removal from the neighbourhood and other causes. On the 31st December the number of members was one hundred and eighty-eight.

On the 21st of April, Dr. R. Beverley Cole, of San Francisco, was elected the first honorary and corresponding member.

Your Committee refer with pleasure to the special lecture by Professor Morris, on the "Geology of Croydon," the interest in which was evidenced by the large audience on that occasion, composed of members and their friends to the number of seven hundred and ten. The lecture has been printed, and is in the hands of each member.

The following papers have been read during the year:—

March 17*th*.—"On the Aquarium as a field for Microscopical Research," T. CHARTERS WHITE, Esq.

May 19*th*.—"On Carnivorous Plants," ALFRED CARPENTER, Esq., M.D.

October 20th.—"On the Anatomy of the Marine Mussel," J. S. JOHNSON, Esq.

November 17*th*.—"On the Scales of Male Butterflies," T. W. WONFOR, Esq.

December 15*th*.—"Introductory Lecture on Geology," GEORGE PERRY, Esq.

December 15*th*.—"On Staining Leaves," N. BOGLE-FRENCH, Esq.

Excursions to Merstham, Addington Park, Reigate Heath, Orpington, and Caterham were arranged for the summer months, but were greatly marred by the bad weather. The last-named excursion, however, was well attended.

The Sixth Annual Soirée was held on Wednesday, 10th of November, and was attended even more numerously than the previous one. The usual kind assistance of kindred societies was given, and the Club itself was fairly represented. One hundred and fifty-three microscopes were exhibited altogether; the number of visitors and members present was six hundred and thirty-four.

In the past twelve months, various donations have been made to the cabinet, which now contains sixty-eight slides. The Committee are glad to observe that the Club's books have been more in request than hitherto.

The average attendance has been rather higher than in the previous year.

Rumex Rupestris, a plant of the dock tribe, and new to the British Flora, has been discovered by Mr. W. H. Beeby.

BALANCE SHEET FOR THE YEAR ENDING DECEMBER 31st, 1875.

Receipts.

	£	s.	d.
Balance in hand	81	0	10
Members' Subscriptions	91	0	0
Sale of Soirée Tickets	24	7	6
	£196	8	4
Balance in hand	£61	18	6

Payments.

	£	s.	d.	£	s.	d.
Hire of Rooms { Lecture on Geology, Committee Meetings, Ordinary Meetings }				6	17	0
Printing and Advertising				9	10	6
Postages				4	19	6
Professor Morris				10	10	0
Printing Lecture on Geology				24	10	0
Printing Fourth Report				19	5	0
Box for Club Documents, &c.				1	5	0
Stationery				1	9	6
Gratuity to Mr. Pusey (January, 1875)				1	1	0
Mr. J. Jones' Commission Collecting subscriptions, &c.				3	7	7
,, attending to Lamps, &c.				1	7	4
Sundries				1	11	0
SOIREE EXPENSES.	£	s.	d.			
Printing and Advertising	4	1	0			
Messrs. Standidge (Admission Cards)	2	10	0			
Hire of Rooms	7	14	6			
Refreshments	13	7	11			
Pianistes Hire of Pianos, and Stage Decorations	5	15	6			
Mr. Hodder for Tables	8	2	6			
Hire of ten dozen Lamps	2	14	0			
Attendants	0	12	6			
Postages	2	5	0			
Carriage and Sundries	1	13	6			
				48	16	6
Balance				61	18	5
				£196	8	4

ALFRED CARPENTER, TREASURER.

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct.

EDWARD B. STURGE, } AUDITORS.
GEORGE ROPER. }

4th January, 1876.

Mr. J. FLOWER moved, and Mr. A. D. TAYLOR seconded, the adoption of the report, which was agreed to unanimously.

The balance sheet was taken as read.

The PRESIDENT then stated that the Committee had complied with a great deal of readiness with the request of some of the members, that the Club should have a bi-monthly meeting, which would be devoted to conversation and the exhibition of microscopical objects and natural history specimens.

It was resolved that the new arrangement be incorporated with the rules of the Club. A slight addition was also made to the rules with regard to membership, viz., that the annual subscription of 10s. be payable in advance on 1st January, *or on election if previous to November.*

ELECTION OF OFFICERS.

Dr. CARPENTER said—I rise with very great pleasure for the purpose of proposing the re-election of our President for the seventh time. (Cheers.) I take that response as a sufficient answer to the statement made to myself by the worthy President, when he said he thought he had occupied the chair long enough. I do not think he has. So long as he is willing to occupy the chair so long shall I be pleased to nominate him. There are several requisites which are necessary for the presidentship of the Club. The first is that the name of the President shall be a name outside the Club as well as within it. That certainly we have in our President. He is a man of science, acquainted with scientific men, and recognised by them as a man of science. In filling the chair of this Club he does honour to the Club. We feel, that in his acceptance of that office, we have secured that which certainly ought to exist in our President. Second, it is requisite that the President should be able to command the attention of the members, and hold his own. Thirdly, it is requisite that he should have the esteem, regard, and friendship of every member of the Club. That I know he has; and, therefore, in proposing the re-election of our President for the seventh time, I know I propose that which is acceptable to every member of the Club in this room, and to every member not present. (Applause.)

Mr. Linney, in seconding the motion, said there were some formal matters to be transacted at that meeting, but it was no formal matter to propose the re-election of their President. He could re-echo all that Dr. Carpenter had said with regard to the President, and he was sure they all felt that not only was Mr. Lee a good President, but a warm personal friend. (Cheers.)

The motion was carried *nem con.*

The President said—I really assure you I hardly know how to express my feelings. The Committee will tell you that I sincerely and earnestly placed my resignation in their hands, and I had the full intention of resigning this chair. It struck me that the time had come when it would not be injurious, and might be beneficial that new blood should be infused into the Club. I thought so, and I have not altered my opinion. You know I am not a vacillating man, but since I sent in my resignation remonstrances and requisitions have been made to me, some at personal interviews and some by letter, in which it was pointed out that circumstances rendered it advisable in the interests of the Club I should hold the presidency another year. I consented, and it is a great gratification to me to do all I can for the Club, and to know that I have your affections. I have to thank Dr. Carpenter for his kindly remarks. I look forward to see him among my successors, and I can only say that whenever the time does come for me to vacate this chair—and I think I ought to be allowed to do so when I have served a seven years' apprenticeship—you will find me ready to act in a subordinate capacity, and cheerfully render to my successor all the assistance in my power as long as I have good health and strength. I thank you for this renewal of your confidence, and I hope you will join with me in endeavouring to make this, the last year of my presidency, a very brilliant one for the Club. (Cheers.)

Mr. J. Berney proposed the re-election of Dr. Carpenter as Treasurer for the ensuing year.

Mr. Flower seconded the motion.

The President remarked that Dr. Carpenter had been justly praised for the performance of his duty as Treasurer. When he (Mr. Lee) once became treasurer of a certain society he had no funds to hold, and he was told that it was his duty to advance them.

(Laughter.) Thank goodness Dr. Carpenter had never had that duty to perform; but whether as Treasurer or in any other capacity he had acted most ably, and he was a gentleman whom they would always like to see at the head of affairs. He was glad if they could retain his kind assistance and support, for which they were all grateful.

The motion having been carried unanimously,

Dr. Carpenter said he was much obliged to the members for the expression of their confidence. His duties were light, he had very little trouble except to hold the money and dole it out as it was required. He could assure them that he would take care of it.

M. W. H. Rowland proposed the re-election of Mr. K. McKean as Honorary Secretary, extolling that gentleman for the manner in which he performed the duties of that position, and for the careful manner in which the accounts were kept.

Dr. Strong seconded the motion, which was carried unanimously.

Mr. McKean said he was very glad to find that his work had given satisfaction, for there was no one who had the interests of the Club more at heart than himself.

On the motion of the President, seconded by Mr. A. D. Taylor, Mr. Beeby and Mr. Sturge were elected members of the Committee, in the room of Mr. W. R. Cooper (resigned), and Mr. John Flower, who retired by rotation. The remainder of the Committee were re-elected.

A vote of thanks to the members of the local Press for reporting the proceedings of the Club, and to the committee for their services during the past year, terminated the proceedings.

The President and the following members exhibited microscopes: W. H. Beeby, J. Berney, John Corry, Frederick E. Fletcher, J. S. Johnson, G. Perry, and A. D. Taylor.

ABSTRACT OF PROCEEDINGS.

1875.

February 17*th*, 1875.—This meeting was held in the Large Hall, Henry Lee, Esq., in the chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members:—Captain Colin Mackenzie, Mr. J. Lacy Morley, M.R.C.S., and Mr. John G. Turney; and the following were proposed for membership, viz. :—Mr. F. S. Morgan, F.R.C.S., Mr. Geo. Anson Whealler, Mr. Edward R. Moules, Mr. William Smith, and the Rev. W. Wilks.

Professor Morris then delivered a lecture on "The Geology of Croydon and the Neighbourhood," and illustrated it with numerous diagrams and maps. At the conclusion of the lecture a hearty vote of thanks was passed to him. The admission to the meeting was by ticket only, each member being provided with tickets for himself and six friends. Number present—members 89, visitors 621; total 710.

The Club is much indebted to Professor Morris for his kindness in allowing the lecture to be printed, and for the trouble he has taken in revising and annotating it. A geological map of the neighbourhood of Croydon was added to the pamphlet, a copy of which is in the possession of each member.

March 17*th*, 1875.—Henry Lee, Esq., President, in the chair. The minutes of the previous meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members: Mr. F. S. Moyer, Mr. G. Anson Whealler, Mr. Edward R. Moules, Mr. William Smith, and the Rev. W. Wilks; and the following were proposed for membership:—Messrs. H. H. Dean, C. H. Downes, Mark Fothergilt, Litchfield C. Moseley, Herbert Shattock, and Thomas Yuille Wardrop.

The President said he had much pleasure in proposing for election, as an honorary member, R. Beverley Cole, Esq., M.D., &c., of San Francisco.

The nomination was seconded by Dr. Carpenter.

T. Charters White, Esq., read the following paper on "The Aquarium as a Field for Microscopical Research":—It is now 25 years since the Aquarium, as it exists in its present form, elaborated by the observations of Dalyell, Warrington, Gosse, &c., became *un fait accompli*; and although it has been largely employed and productive of much good work by many observers, it is to be regretted that it has not been more freely used as an aid to microscopical research. While the last quarter of a century has seen much progress in other departments of natural science, comparatively little has been added to our knowledge of the *development* of the many forms of animal and vegetable life with which the aquatic kingdom abounds, and two causes exist which may account for this. First, microscopists as a rule are too much satisfied with a collection of pretty objects for their cabinets, and not sufficiently alive to the interest and importance of observing and recording the various stages through which those much admired objects attain their ultimate condition; and secondly, an idea seems prevalent that the maintenance of an aquarium in such a state as would conduce to the growth and devolopment of microscopic life is a matter of immense difficulty, and only to be undertaken by a few especially gifted individuals. No greater mistake can interpose itself in the way of your intellectual enjoyment than this, for the maintenance of an aquarium is a much more easily managed affair than the keeping of a birdcage, and should offer no obstacle even to a child. As I feel, from the questions put to me by members of the Quekett Microscopical Club and other friends, that many would willingly adopt this means of adding additional observations to those already made in this department of natural history if they could be put in the way of aquarium research, I propose this evening to lay before you such directions as an experience of ten or twelve years' successful management of a small marine aquarium may enable me to offer towards the attainment of a similar success by any member who may feel inclined to take up this particular study. If in carrying out my proposal I may seem to dwell too much upon details, I must crave your indulgence, asking you to believe that they are not trivial, and that while their faithful observance will ensure success, their neglect will result in failure. The treatment of this subject will naturally resolve itself into three divisions—first, the vessel employed to hold the water; secondly, the water employed; and thirdly, the most suitable occupants of the aquarium. The vessel employed may be anything that will hold water, and at the same time keep its natural character unaltered. Successful observations have been made in vessels of every size and shape, from earthen pans and pie dishes through the entire range of glass jars and propagating bell glasses up to the regularly constructed tank, and therefore the vessel employed should present no difficulty to those who wish to commence this method of microscopical research. In these days of amateur ingenuity a tank could be constructed with much facility by anyone wishing to possess one, or, if money be no object, tanks can be bought ready for the reception of the inhabitants intended to be observed. These tanks are formed of slate and glass—materials which are not affected by sea water. *No metal* *entering into its construction should be allowed to come in contact with the sea water.* The form of tank I have found so successful is of an oblong shape, three feet long, eighteen inches wide, and nine inches deep, and capable of containing sixteen gallons; its bottom, back, and two ends are of slate, and the front of stout plate glass; these are all firmly bolted and cemented together, and all the joints are perfectly water-tight. Inclining from before, upwards and backwards, at an angle of about fifteen, with the glass in front, is a slate false bottom placed. This should not fit too accurately round its edges, so that if necessity requires its removal, no difficulty may be experienced in doing so. The object of this inclining false bottom is worthy of being borne in mind, as it is of some importance. It affords, in the first place, a varying depth of water, enabling your animals to select the depth most suited to them, and secondly, it divides the tank into two compartments, that under it being filled with water which is always cool and in a state of rest, while that above it is exposed to the light, and actively engaged in ministering to the animal and vegetable life growing in it, and a compensating action always takes place within these two compartments which very materially aids in keeping the water in a wholesome and healthy condition. The great object to be kept in mind in working an aquarium is to assimilate its conditions as much as possible to those of natural rock pools. All attempts to construct grottoes, arches, or temples, or, in short, any such like ornamentation, are to be strongly deprecated; but sandstone rock-work, roughly disposed, is of much use, affording shelter for your stock, and, by extending the superficial area of the bottom, increasing the aërating capacity of the vegetation which will ultimately clothe it. This rock may be cemented on the sloping bottom with Portland cement, but none must be placed on the sides of the tank, as that would interfere with the removal of the false bottom, should that be required. Care must then be taken to thoroughly soak the rock-work and cement for a fortnight, or even longer, frequently changing the water, that all soluble matters may be removed from them. When you feel sure that these are sufficiently soaked, and that no more lime will be eliminated from the cement, you may move on a step further. While some forms of animal life cling to the rocks, others will burrow in the sand, therefore a supply of this must be added. If you are not in a position to get sea sand, an excellent substitute may be found in the silver sand sold at any of the oil shops, and for an aquarium the size of mine, two gallons will not be too great a quantity. This must be repeatedly washed till the water is quite clear when the sand is stirred up in it, and then it may be placed in the tank. Everything being now ready for the sea water, this brings me to the second division of my subject. The water employed may be artificial or natural sea water. Of course, where attainable, the preference is given to real sea water, because however closely its composition may be imitated in these days of accurate analysis, there are principles in it which no chemist can supply. There are, however, many difficulties in obtaining real sea water in London, and in some inland localities these would constitute an almost insuperable barrier to the establishment of an aquarium had we not the artificial substitute to fall back upon. But since science has furnished us with the constituents of sea water, this may be concocted in any place where the necessary chemical salts can be obtained, and we may feel great confidence in employing it, since most of Mr. W. Alfred Lloyd's first observations were made while using it, and in his hands it was productive of very satisfactory results. As the cost of its production is about 3½d. a gallon, I shall introduce to your notice the formula for making it, as given by Mr. Gosse in his "Handbook to the Marine Aquarium:"—

Common Salt, 3½ ounces		Avoirdupois.
Epsom Salts, ¼ ,, ...		
Chloride of Magnesium, 200 grains ...		Troy.
Chloride of Potassium, 40 ,, ...		

These salts are dissolved in little less than four quarts of fresh water, so that a specific gravity bubble of 1.026 would just sink in it. Having made sufficient of this solution to fill your tank, wash several handfuls of freshly-gathered sea-weeds in it, especially "*Ulva latissima*," but do not leave them permanently in; also add any pieces of rock that may have Marine Algæ growing on them, and let the water be exposed to the sunlight for about a fortnight. At the end of that period it will be fit for the reception and healthful preservation of your animal life, the rockwork will have become fairly covered with the growing Diatoms, and the germs of marine vegetation will be giving off a plentiful supply of bubbles of oxygen. Now, all these preliminaries may seem very tedious to those who are anxious to see their tank blossoming with all its animal beauty, but the great error into which so many fall who start an aquarium, is that of being in a hurry to see the occupants placed in it before its vegetation has sufficiently advanced to supply the atmosphere necessary to their existence, and thus too many begin in haste and leave off in disgust; but follow minutely these details, and I promise you success and satisfaction. There are one or two pieces of accessory apparatus which, while not of absolute importance, yet will be of great service—a specific gravity bubble, that will just sink in sea water of the right density, may be kept in your tank; if it floats to the top of the water you may know that the water has evaporated and become too salt, when it will require diluting with fresh water till the bubble slowly sinks again. Many mark the side of the tank by gumming a piece of paper at the level of the water, but this method is not sufficiently delicate. I have recently added a means of injecting atmospheric air into my aquarium, which serves the double purpose of aërating the water and creating a current in it, which seems to be appreciated by my anemones, and it may be of service to describe it. At one end of my aquarium, and just above high water mark, a hole has been drilled through the slate and a tin gas pipe cemented in; it is left projecting about one inch on the outside, and on the inside just sufficient to carry a length of glass tubing about the diameter of an ordinary quill; this is bent at several angles to enable it to lie safely along the sides and bottom of the tank, and at its extremity is bent, so that its end, drawn in a gas flame to a capillary point, projects into the middle of the water. To the metal tube on the outside of the aquarium a piece of elastic tube, attached to an india-rubber bellows is fixed, and by this means I am enabled to drive a stream of air into the water till it appears effervescing; the fine bubbles from the spray remain in suspension for hours, and become ultimately absorbed. This apparatus, although not absolutely necessary, is attended by such good results, that I recommend its adoption; but a great deal of benefit arises from syringing the water with a glass syringe. And now for a few words on the third division of my subject—the occupants of the tank. If you add nothing more to your aquarium than what will be found growing and multiplying as it were spontaneously, you will have abundant material for microscopical observation. I have been enabled in mine to watch the conjugation and multiplication of some of the Diatomaceæ, the development of the Foraminifera, the growth of the germs of the Marine Algæ, the development of the Polyzoa, and the various transitional stages through which all these forms of marine life pass; these, and many other subjects of study, a successfully-established aquarium would afford, and if, after the example of Drs. Drysdale and Dallinger, these researches were recorded, and every change faithfully drawn and preserved for future reference, abundant light would be thrown upon many obscure points in the developmental history of these objects. Every fact impartially observed and faithfully recorded, although *per se* but of small value, in the aggregate will prove that no more enticing path for the student of microscopic life can be offered than that which leads him through the comparatively untrodden and, therefore unreaped fields of aquarium research. But I know that an apparently empty aquarium looks a joyless wilderness, and you will be anxious to see it tenanted by more visible objects of interest; and here let me give you a word of caution—*Be content with still life.* The student must be guided by his subject of study in stocking his tank. No harm will arise from putting in a few of the hardier varieties of the Actinidæ, some serpulæ or sabellæ, and such like objects, but my experience is decidedly against *over-crowding* with anything; the atmospheric condition of your aquarium, if I may use the term, must not be abused any more than that of our own. We may now consider your aquarium in healthy working condition, and the probable objects of interest that may soon present themselves. One of the first may probably be the multiplication of the Actinidæ. This process takes place in three ways, by *gemmation* most commonly, especially in *Actinia mesembryanthemum*, sometimes as many as thirty tiny well-formed anemones being ejected from the oral opening of the parent at a time. Again, buds may be given off from the sides, as in *Sargartia bellis*. Multiplication takes place by *fission*, as may be observed in the plumose anemone (*Actinolobus dianthui*), which often slides, like a snail, along the glass front of your aquarium, leaving in its trail little pieces of its basal disc, which ultimately become young anemones; or *fission* may take place bodily, as in *Anthea cereus*, which often divides into two or more parts by a gradually depending sulcus, which, forming from crown to base, results in the establishment of two or more of these anemones where only one existed. But the third and rarest form of multiplication consists in the ejection of ova, and this I was fortunate enough to witness in my aquarium. It occurred in a specimen of *Bunodes gemmacea*, which had taken up a favourable position close to the glass. I was attracted to it by observing a drab-coloured stream of ova pouring from its mouth and falling in a heap at its feet; upon more closely examining the creature with a pocket lens I found it distended with water, and the tentacles especially so, while globular bodies were circulating up and down the interior of them, but did not pass out of their extremities. I examined some of these bodies under the microscope and found them opaque and non-ciliated spheres filled with granular contents. I had hoped to have seen the development of these ova into the adult form, but, as in Mr. Gosse's experience of similar ova, decomposition set in. Dr. Spencer Cobbold was more fortunate, and in *Annals of Natural History* for February, 1853, he describes the various changes through which these ova at last arrive at their final shape. A depression takes place in the surface of the globose embryo, which becomes the general cavity, the edges become incurved and descend into the cavity, forming the stomach; septa spring from the inner wall beginning from the summit and extending downwards, and tentacles bud from around the mouth. He made these observations at a continuous sitting, occupying the whole of one night, before decomposition had commenced its attack upon them. I once saw the ejection of ova by a serpula; noticing occasional bursts of cloudy matter from the centre of its plumose branchiæ, I collected some of it by the dipping tube, and found it consisted of an immense number of minute orange-coloured globules, each enveloped in a clear sac of a probably albuminous nature. I was not fortunate enough to trace out the development of these ova, but I shall hope to do so at some future time by means of a method I have the last few months adopted. I place ordinary microscopical slips of glass in various parts of my aquarium, and especially near such objects as are likely to eject ova or to develop a stem like the Polyzoa, and then they can be taken out and examined under the microscope, a drawing made of any developing form, and replaced to undergo further examination as change advances. In this manner I have been much interested in watching the growth of foraminifera, which have attached themselves to these slips, and which, apparently, have not suffered from the trip they took out of the aquarium. In a short practical paper like this, I cannot do more than suggest various objects of interest to be taken up and followed by yourselves; therefore I can only briefly describe such as have presented themselves to me at various times, and afforded me the pleasure I hope you may derive from similar observations. I have been much pleased by the hatching of the zoe of the crab and prawn, and can recommend this to your notice. Crabs and prawns bearing ova can be safely transferred from the coast packed in sea-weed. I once brought a pint of live prawns, most of them bearing ova, from Dawlish, merely packing them together in a basket in their wet state. They endured a twelve hours' journey without apparently suffering, and I placed a dozen of them in the aquarium; in about six weeks the young ones hatched out, and could be distinguished in the sunlight as clouds of tiny specks swimming together in shoals. They, like the crabs, are entirely unlike the adult form at first, and it would have been interesting to have observed the number of moults they underwent before arriving at that condition; but, unfortunately for my observations, the anemones and the parent prawns admired the young fledglings as much as I did, but after a different manner, and they gradually disappeared. It would be better in this case to establish a separate tank for the study of these crustacea, removing the parents when the hatching was complete, for I can promise you a rich store of interest in observing the changes which are effected in these creatures in passing from the strangely-shaped zoe to the final stage of development. I would also suggest the study of foraminifera as likely to interest you. The stock may be procured from many sources, but the most abundant is the ooze of the oyster beds, where living specimens of many varieties may be found. They may also be found attached to sea-weeds and to old shells dredged up from the sea bottom, and in your tank they will soon multiply, and present themselves in every stage of development. In my aquarium various stages of the *miliolidæ* may be seen in the summer time, anchored up by their pseudopodia to the front glass. I have had also an abundant supply of textularia and rotalina. I do not point to these as rarities, but only to show that once get your aquarium fairly started, and it will form an inexhaustible store of interesting study. The chitonidæ live well in confinement, and a study of their developmental changes will repay you. The eggs are exceedingly interesting objects. The chitons deposit their eggs closely united in clusters, each egg presenting a curious appearance from the folds of transparent membrane, which, gathered up in branches at different points on its exterior, give it the appearance of a statoblast. The young have no shell when first hatched, but their backs are marked with seven furrows, between which close granuies indicate the future shelly structure. I have placed upon the table, among other microscopical slides illustrating the minute life of my aquarium, some of these eggs mounted in sea water. The shells that are sometimes dredged up from a good depth at sea will be found most prolific in developing forms of animal life, and some kindly sent me from Weymouth bore several specimens of *Grantia compressa* in a living state, but unfortunately sponges do not live long in a tank, nor are they desirable tenants, they exhaust the water very quickly, and then dying, poison it. This is to be regretted, for much is yet to be learned in reference to them, especially about their reproduction. Various forms of tunicata are found attached to these shells, and to sea-weed. *Perophora* I have exhibited in our gossip nights, which were brought from my aquarium where it grew and blossomed for months. The growth of Bowerbankia, Syncoryna, and other Polyzoa, may be readily observed and noted by this additional aid to microscopical research, and I should, I, fear sadly try your patience if I detained you while I enumerated the many forms of marine life I have had thus brought before me, but which, alas, I have been too busy or too unsystematic to profitably use as I ought; but if I can by these few suggestions stimulate any amongst you to adopt this line of observation, I can promise you that your pleasure shall not be satiated, but that fresh stores of interest will be continually opening to your gaze.

At the termination of the paper, a cordial vote of thanks was passed to Mr. White.

The following members exhibited their microscopes:—J. Berney, P. Crowley, J. Gregory, J. S. Johnson, E. Lovett, K. McKean, G. N. Price, and the President.

April 21*st*, 1875.—Henry Lee, Esq., President, in the chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members:—Messrs. H. H. Dean, C. H. Downes, Mark Fothergill, L. C. Moselely, H. Shattock, and T. Yuille Wardrop; Mr. George Roper was nominated for election. R. Beverly Cole, Esq., M.D., M.R.C.S.E., was ballotted for and duly eleected an honorary and corresponding member.

The President alluded, in feeling terms, to the loss the Club had sustained in the death of Mr. Edward Berry and Mr. John G. Price.

A proposed alteration in Rule III. (for the circulation of books), notice of which had been duly given at the previous meeting, was then put to the meeting and carried unanimously. The rule to stand thus:—

3.—Members may obtain books by making personal or written application for them, and by signing a receipt for the same, which shall be held by the Librarian until the book is returned. No Member shall have more than one work at a time, nor shall he keep any work for a longer period than one month; but it may be returned for exchange any time within that period when the Library may be open.

Dr. R. Beverley Cole then gave a short account of the "Progress of Microscopical Science in Western America," and at its termination a vote of thanks was unanimously passed to him.

Dr. Adams exhibited a valve of *Myra Margaritifera,* containing artificial pearls.

The following members exhibited microscopes:—J. Berney, E. Lovett, J. Gregory, K. McKean, and A. D. Taylor.

May 19*th*, 1875.—Henry Lee, Esq., President, in the chair. The minutes of the last meeting were read and confimed. Mr. George Roper was ballotted for and duly elected a member. Mr. J. S. Wright and Mr. W. Dickinson, M.A., were nominated for election.

The President then called upon Dr. Alfred Carpenter to give his lecture on "Carnivorous plants."

After some prefatory remarks, Dr. Carpenter said—I had been taught—as had all the members of my profession—that plant growth could only be nourished by the decomposition of manure and its resolution into its ultimate elements—that manure must putrify before it could be absorbed by plant life. That was laid down as a canon law by Liebig, the great German chemist, also by the author of "Agricultural Chemistry;" it was adopted as an axiom by physiologists; it was accepted by Dr. W. B. Carpenter, the most noted physiologist of the day; and Dr. Anderson endorsed it as a fact, holding that all plants, before they could be nourished, must have the material which was offered to them reduced to such a state as to be soluble in water, otherwise it could not be absorbed. Dr. Anderson stated that was so, because the rootlets of plants had been carefully looked into; and that examination showed no opening by which anything in a solid state could possibly find admission into the plant itself. The matter absorbed must, therefore, be in solution, and to become dissolved the matter, whether animal or vegetable, must first be resolved into its original elements, and form chemical salts, as ammonia, nitrites, and nitrates or phosphates.

But there were certain circumstances which took place on the Beddington farm which satisfied me that this theory was wrong in its premises, and a close examination of the subject convinced me that animal matter need not be so resolved before it became assimilated into plant life; that as far as rye grass was concerned it might be considered carnivorous in its tastes, and that it digested animal matter in a manner not unlike to the amœba and other animals in the lowest grade of the animal kingdom. I published this idea in 1868, but it was thought to be Utopian, and I could not put my opinion against those of the distinguished physiologists I have mentioned with any chance of a hearing. But at the meeting of the British Asssociation, held in Belfast last year, some statements were made by eminent men which have emboldened me to bring forward my idea again as to the carnivorous nature of rye grass, and to submit some of the points raised to your notice. At that meeting Dr. Burdon Sanderson stated that if the leaf of the *Drosera Dionæa* (Venus's fly trap, of which there are several specimens on the table) was examined at the moment when it contracted on an unfortunate fly, a galvanic action was developed similar to that which was exhibited when a muscle contracted, showing a state of vitality somewhat different from that of contractility alone. Then Dr. Hooker, of the Royal Gardens at Kew, followed with observations upon the digestion of animal matter, which sometimes was observed to take place in some of the *Nepenthes* or Pitcher plants, as well as in the *Saraceniaceæ* or Side-saddle plants. (Specimens were here shown.) That eminent naturalist, Mr. Darwin, then stated that the digestion which took place when the *Drosera* digested the fly which happened to be caught between the leaflets of the plant, was precisely similar to that which takes place in the human stomach when food is dissolved by gastric juice. The agreement of these great *savans* to the principle that it was not requisite for animal matter to putrify before it was absorbed into plant tissue, seemed so fully to support my original idea regarding rye grass, that I submitted my view to the Medical Officers of Health in London about a month since, and I now wish to interest you in the same direction. There are several plants of rye grass in the room, and some rootlets in some of the microscopes, and an examination of these objects will enable you to see how it may be as easy for the minute fibres there visible to digest animal matter as it is for the leaflet of the *Drosera*. If anyone will examine a field of rye grass, he will find it in several distinct states, according to the time the individual plant has been growing. If it has been cut for two or three years, there will be a tangled mass of rootlets around the plants which are above, the ground, which are comparatively absent in a younger set. If these rootlets are examined as the sewage passes on to the field, it will be seen that they take up an active movement immediately the sewage comes near them, and if at that moment the fibrillæ of the rootlet be taken up and examined under a quarter-inch power, the minute hair-like processes which surround the fibrillæ will be seen to be coated with the organic matters contained in the sewage which have been arrested in their course and abstracted from the sewage, leaving the water to pass off minus the organic matter contained in it. These organic matters are not to be found on the unsewaged grass. If the plant is examined still further, and a root is abstracted from the soil by most gentle washing with a jet of water, it may be seen that these minute fibrillæ extend for a very long distance into the soil, and that they evidently perform other duties than simply fixing the plant in its place. They are seen to be bundles of parenchymateous tissue surrounding prosenchyma, and from the parenchyma, processes are given out which are elongated cells something like the mycelium of fungi. This mycelium-like matter forms apparently a tangled mass which surrounds every bit of organic matter in the soil or in the sewage, and rapidly extracts all the nitrogenous matter which is contained in it. Carbonic acid is set free, whilst the ammonia, or other nitrogenous compounds are absorbed. Freed carbonic acid is dissolved by the water, and may be seen as bubbles on the root. It is shewn to be in excess in the effluent water by treating the latter with lime water; carbonate of lime is deposited in a manner which shows excess of carbonic acid in the effluent, or if retained for some time crystals of bicarbonate of lime become deposited as in the specimen on the table. That specimen is effluent taken at Beddington Farm some years since, and crystals have been slowly deposited in it. The action of the minute fibrillæ seem to be something similar to the action of certain fibres in extracting dyes when colourings are discharged by the effect of certain salts. There is either a chemical attraction for the nitrogenous matter, or else a vital affinity for it, by which all the granules containing nitrogen are seized upon by the roots, and a change instantly commences in them, by which they are deprived of their dangerous qualities and made harmless. It is a disputed point as to whether fungi are the causes or the consequences of decay in organic bodies, but there can be no doubt in this case that the fibrillæ which are developed on the rootlets of rye grass are the cause of the change which takes place in the organic matters submitted to the action. I have submitted these points to the test of experiment by growing rye grass in silver sand and feeding it with various substances. I have found that if the grass is fed with some things, such as phosphate of ammonia, and more especially with non-nitrogenous matters, it has dwindled and after a time died away. It has not grown for some time, even if fed with artificial manure, but if fed with milk and beef tea it grew rapidly immediately, those ingredients being assimilated at once. Plants which existed under similar conditions and which were not so fed, dwindled away, whilst pans in which milk and beef tea were added to the sand without vegetable growth soon gave evidence of putrefaction. On the other hand, no signs of putrefaction showed themselves in the pans in which the rye grass was growing. It thus appears that the fibrillæ of rye grass assimilate nitrogenous matter, without that matter first undergoing decomposition into its ultimate elements, unless it be contended that decomposition is set up by contact with the fibrillæ of the rootlet itself. If this argument is used, then I contend that even in that case the nitrogenous compounds are seized upon in a nascent state, and do not lose their vitality by the process. This vitality would be entirely lost if actual decomposition did take place, and chemical matter was formed. It is this action which makes the difference between carnivorous plants and graminivorous or chemical salt feeders. The ordinary run of plants require the decomposition of vegetable matter into certain elements, such as ulmic, humic, geic, aprocenic, and crenic acids, before they can assimilate it in a proper manner. It is in this very decomposition that we have one of the most wonderful provisions of nature. It is the presence of these acids which enables garden mould to deodorize decomposing excretia so effectually, in a way that nothing else in nature will do. It is this class of acids which result from vegetable decay which enables soils to retain animal débris, and present it ready for the formation of plant life; and nothing has ever been discovered which will remove the ammonia from sewage except earth acids and carnivorous plants. The latter will remove matters which manufacture ammonia without the intervention of earth acids; for rye grass will grow in silver sand if fed with beef tea or ordinary dish washings; but vegetable feeders will not do so. For them time is requisite for the decomposition of animal matter into its original elements, and the stage which has been called previous sewage decomposition must be reached before plant growth will take place. It has been supposed by eminent physiologists that carbonic acid is mainly absorbed by the leaves of plants from the atmosphere, and decomposed by the agency of light, oxygen being given out in the process. This is true in regard to a large part of the vegetable kingdom, but it is not so at all times. It does not follow that it is absolutely necessary for carbon to be absorbed as carbonic acid; take the instance of a seedling potato grown under glass in a way by means of which the access of carbonic acid shall be denied. It will grow and produce green haulms, assimilating and forming woody fibre out of the potato, without the material in the potato undergoing previous decomposition, and being resolved into its elements. Carnivorous plants are able to assimilate food in a similar manner; they seize upon the living matter which exists in sewage, and build up their structures from it, sending out oxygen into the atmosphere, but, like fungi, producing carbonic acid at their extremities in the soil or water. Dr. W. B. Carpenter says the only class of plants dependent upon matters already organised are fungi; that they require a large, ready, and constant supply of carbonic acid and ammonia. To these I would add rye grass and other of the carnivorous tribe of plants, such as nettles, and others which follow in the wake of civilisation and haunt the steps of man. The absorption of carbonic acid takes place through the prosenchyma of the root, not by the hair-like processes which I have previously described; it, finding its way into the tissues of the plant, is then decomposed by the action of light, the carbon being assimilated into wood fibre, and the oxygen given out. This is in antagonism to the generally received idea regarding plant respiration, which is that the carbonic acid is absorbed by the stomata which exist in the plant. In support of this view, I may mention fungi and cascuta do not obtain carbonic acid from the atmosphere, but from the nidus upon which they feed. Again, we have another analogy between fungi and carnivorous plants. Fungi grow in the dark, and, curiously enough, the effect of the light is not so important in the growth of Italian rye-grass and other carnivorous plants; they grow faster in the night. Carbonic acid is supplied at their roots when fed by sewage, and it is found that the sewage which passes on to the fields at midnight, and is collected before sunrise at the outfall, is as effectually purified as that which passes on at mid-day and is collected at sunset.

A short discussion followed, and the proceedings terminated in a hearty vote of thanks to Dr. Carpenter.

Mr. J. H. Ley exhibited plants of *Dionæ Muscipula*, and Mr. W. H. Rowland a pair of Hybrid Pheasants, male and female. The following members put their microscopes at the service of the lecturer:—J. Gregory, J. S. Johnson, E. Lovett, K. McKean, A. D. Taylor and the President.

September 15*th*, 1875.—Alfred Carpenter, Esq., M.D., in the chair. The minutes of the last meeting were read and confirmed. Mr. J. S. Wright, and Mr. William Dickinson, M.A., were ballotted for and duly elected members.

The business having been concluded, the meeting resolved itself into a conversazione, at which the following articles were exhibited under microscopes:—

Petal of Geranium (stained)	N. Bogle-French, jun.
Section of Mole's Jaw; ,, Fox's ,, ; ,, Foraminifera	Philip Crowley.
,, Whalebone	Edward Lovett.
Rose Aphides	George Manners.
Fibres of Muscle (*Anodon Cygneus*) ...	K. McKean.
Pond Life	E. B. Sturge.

There were also exhibited Fossil Oysters from Croydon by Dr. Carpenter, Plants of Drosera Rotundifolia from Keston, by H. M. Klassen, and Nest of Tree Wasp by E. Lovett.

October 20*th* 1875.—Alfred Carpenter, Esq., M.D., in the chair. The minutes of the last meeting having been read and confirmed, and the Chairman having alluded to the unavoidable absence of the President, who was in Paris, the following gentlemen were nominated for election at the next meeting, viz.:—Messrs. Arthur Birkitt, J. B. Fawcett, John Jaques, and Michael Pope.

At the request of the Chairman, Mr. J. S. Johnson, M.R.C.S., then read the following paper "On the Anatomy of the Marine Mussel."—The common mussel (*Mytilus Edulis*) belongs to the class *Lamellibranchiata*, and division *Anodontophora*, indicating that it is devoid of any tongue. It frequents mud banks which are uncovered at low water. The fry abound in water a few fathoms deep; they attain their full size in a year. The mussel is much used as food, but at times, from some unknown cause, it is extremely deleterious; they are largely used as bait in fishing for cod. The shell is wedge-shaped, equi-valve, but slightly inequilateral, pointed anteriorly, rounded behind, it is secreted by the thick edge of the mantle, the thin edge of which secretes the nacre, lining the interior. Either between the mantle and the shell, or in the substance of the mantle itself, small pearls are frequently formed of an inferior quality (specimens were exhibited). Any foreign body of moderate size which is insoluble, and cannot be got rid of by the animal, is coated with nacre so as to isolate it. The outer surface of the shell is coated by a horny or chitinous membrane, called the periostracum, which is secreted by the thick margin of the mantle and organically connected with it. If rubbed off with emery powder, the shell is semi-transparent, and of a rich violet colour, *Mya Arenaria*, *Truncata*, and some others called *Gapore*, being the exceptions. The shell is a close one. As in most bivalves, it is coated on the inside with nacre, the iridescence of which is caused by light impinging on an undulating surface, called diffraction. On the outer surface are the lines of growth, that nearest the umbo being the youngest. Mr. Johnson having, by means of diagrams, shown the positions of the various organs, the courses of the nerves, and the attachment of the mussels, continued,—The foot is of a muscular mass, hollowed out for the lodgment of the digestive and reproductive organs. It is retracted by two pairs of muscles, which give firm points of support, resisting the strain frequently put on the byssus; the anterior pair diverge on either side from the edge and anterior part of the foot to the dorsal position of the side of the anterior adductor, and pass between the tentacles and by the side of the mouth, supporting the æsophagus; the posterior are fan-shaped, and pass upwards and outwards in a slanting direction, to be inserted in the valve at the anterior and more dorsal portion of the impression of the posterior adductors. The divergence of these two large muscles forms a furrow in which a great part of the body, the heart, and large vessels, are lodged. A difference of opinion seems to exist as to whether a mussel can move. It may have the power to do so the fraction of an inch by the help of its byssus; but from the firm manner in which they are matted together by hundreds, and attached to sea-weed, gravel, and broken shell, it is more probable that they are firmly fixed, or rather permanently fixed, but not to the same extent as the oyster. Mr. Buckland says that if a mussel be packed close to the glass of an aquarium, a large, finger-like organ, the foot, will soon be observed protruding from the gaping shell, and applied to the surface of the glass. A small slit near the tip of the foot is then opened, and the end of the thread attached. The foot being withdrawn, the byssus will be seen leading from it to the glass. At first this is apparently soft, but it hardens by contact with the water. The byssus is secreted by a gland at the base of the foot, and moulded in a groove which runs along the posterior side of the foot. At the tip is a fossa, capable of holding a certain quantity of the plastic material which forms the thread; behind the gland of the byssus the muscular structure of the foot passes backwards in a falciform shape, the point of which is attached to the under surface of the adductor, between the ganglions of the branchial nerves. Behind the byssus, from this portion of the foot, the generative orifice opens and discharges the ova into the branchial chamber. The mantle or cloak covers all the organs, except the adductor muscles which run through it from one shell to the other; it is open the whole length of the ventral and posterior inferior border of the shell, as far as the back part of the posterior adductor. With reference to the digestive system, the mouth terminates in a short æsophagus, soon leading into a stomach. This is simply a dilation, irregular in shape and surrounded by a liver of a pale green colour and spongy texture. The liver discharges its secretions into the stomach by several ducts. The intestine describes several turns throughout the substance of the liver. The first turn is to the left. It then curves downwards, the concavity of the turn looking towards the foot, called the "neural flexure" by Huxley. After crossing and recrossing itself, it terminates in the straight portion or rectum, which emerges from the liver, and passing through the heart, covered by the pericardium and ventricle, terminates in the upper of the two pallial chambers at the back of the posterior adductor. The stomach and alimentary canal contain the skeletons of animalcules and diatomaceæ, also the larvæ of a species of entozoa. The relation of these larvæ to the mussel and cockle has lately been discussed by the Quekett Microscopical Club, (see papers by D. Moore, M.D., and W. Fells Wood, in the Journal of that club of August last.) These gentlemen are of opinion that the larvæ spoken of are the larvæ of the mussel and cockle respectively, and not parasitic. They form their opinion from finding fertilized ova and Bucephalus Haimeanus in all stages of growth within the same tubular structure, of which the generative gland consists. A difference of opinion exists as to whether the sexes are distinct. Professor Huxley is of opinion mussels are usually diœcious; and the fact that sometimes spermatozoa and ova are found in the same individual is no proof of their self-fertilizing power. The same gentleman, in his account of the embryo, says that it is a ciliated neligerous larva. I have examined the ova of fresh-water snails, and have seen the embryo rotating within the ovum by means of cilia. The surface of the body of these snails, when full grown, is covered with these organs, and as the adult mussel is richly ciliated, the inference is that the embryo would be so too. The circulation of the mussel is exceedingly difficult to illustrate. The blood is colourless, and mixed with water from the aquiferous and water vascular system. A communicating vessel can be seen coming from the heart to the organ of bojanus on either side; the blood vessels from the aorta can also be seen distributed over the mantle. The course of the blood is therefore through the aorta into the capillaries, to be returned by the veins through the organ of bojanus; from thence to the gills, there to be áerated, whence it returns to the heart by way of the branchial veins, and auricle of either side. Respiration is effected by two pairs of light brown branchiæ, floating freely in the lower of the two pallial chambers. They are modified inner folds of the mantle, connected with each other posteriorly behind the foot, and form a sort of partition between the anal and branchial chambers: that is to say, the communication between the two is not quite shut off. They consist of parallel tubes opening into longitudinal canals at the base of the gills, which unite behind the posterior adductor at the siphonal opening. Anteriorly they are connected with each other at the base of the tentacles; their dorsal edges or bases are free. Each gill consists of two membranous plates, cemented together by transverse septa running across each tube in a slanting direction; these form the transverse canals which run horizontally from before backwards. The interlaminar canal between the laminæ of the parallel tubes, and run from above downwards. The interlaminar and transverse canals communicate with each other; the canals and the outside of each bar are richly fringed with more than one row of cilia. The branchial currents carry minute particles towards the mouth, and the water is filtered through the interlaminar canals before it escapes. The cilia compel the requisite movements of the water in the branchial chambers when the mussel is above water, and enable the animal to live a considerable time without a fresh supply. Respiration is carried on by the ceaseless action of these cilia, and the nutrient particles are hurried along the marginal grooves of the branchial plates. These are formed by the extremities of each bar in close apposition, which terminate in two finger-like processes. The nervous system is more easy to make out. The labial ganglions may be distinguished in the fresh mussel by their yellow colour, at the base of the labial processes lying on the tendons of the anterior pedal muscles. They are connected by a transverse chord passing above or in front of the mouth. From each ganglion two principal nerves are given off; one passes downwards and forwards to the anterior adductor, sending branches to the mouth and tentacles; the other backwards along the base of the foot to the posterior adductor, where it joins its fellow by means of a bilobed ganglion, which distributes nerves to the retractors, the base of the foot and the acoustic sac. The branchial ganglions send off branches, which diverge and supply the base of their respective gills; then each gives off a large nerve which passes over the adductor muscle to the hinder part of the pallial lobe, along which it curves, and is continued forwards near the border of the mouth until it meets the nerve which passes forward to the anterior adductor from the labial ganglion. These circum-pallial nerves give off branches to the tentacles and the border of the mantle, forming a plexus. The nerves and ganglions are soft and pellucid, as common to the aquatic invertebrata. In the Lamellibranchiate Mollusca, which are acephalous, the nervous system only gives to the animal general sensibility to impressions. Whether the labial ganglia which supply the mouth and tentacles enable it to select food is questionable. I rather think they do: still, during my search for diatoms, by boiling about a dozen mussels in nitric acid and carefully washing the deposit, I was only so far successful as to find about half-a-dozen, one of which (Triceratium favus) I have mounted. The remaining portion of the deposit, with the exception of two or three Coscinodisci, consisted entirely of sand. Perhaps it will be safest to say that they take whatever comes in their way, and make the best use they can of it.

Mr. Johnson illustrated his paper by means of numerous diagrams, mounted specimens, and beautiful dissections.

In the course of the discussion which followed the paper, Mr. Perry asked whether in the study of Mollusca there was any plan by which the parts to be dissected might be hardened? His experience had taught him, that unless the object was hardened it was next to impossible to separate the tissues.

Mr. Johnson said he had tried chromic acid, but possibly he applied it too strong, for it dried up the parts and rendered them brittle. The specimens before him were prepared in methylated spirits of wine, and they were tolerably firm. Perhaps the chromic acid might do if it was more diluted, and it was probable that spirits of wine alone would be effectual.

Dr. Strong expressed an opinion that Mr. Perry would get al the hardness he required from spirits of wine. He had seen sections which had been soaked in chromic acid, and they appeared to answer the purpose, therefore it was probable that Mr. Johnson's preparation was too strong.

An unanimous vote of thanks was accorded to Mr. Johnson for his interesting paper.

The following microscopic objects were exhibited:—

Organ of Generation	(Mytilus)	W. H. Beeby.
Tentacle, stained	,, ...	P. Crowley.
Brandial Bars	,, ...	E. Lovett.
Section of Pearl	,, ...	G. Manners.
Action of Cilia in Gills	,, ...	K. McKean.
Triceratium, from stomach of	,, ...	J. S. Johnson.
Unfertilized Human Ovum*	,, ...	Dr. Strong.

November 10*th*, 1875.—The Sixth Annual *Soirée* was held at the Public Hall, and proved very successful. Forty-five microscopes were exhibited by members of the Club, and valuable assistance was, as hitherto, rendered by kindred societies, as follows:—

Royal Microscopical	Society	exhibited	... ...	12	Microscopes
Quekett	,,	,,	,, ...	22	,,
Tower Hill	,,	,,	,, ...	9	,,
South London	,,	,,	,, ...	20	,,
Margate	,,	,,	,, ...	1	,,
New Cross	.,	,,	,, ...	2	,,
West Kent	,,	,,	,, ...	1	,,
Forest Hill	,,	,,	,, ...	11	,,
Private Exhibitors			,, ...	3	,,
Six Opticians			,, ...	27	,,

Altogether 153 microscopes.

The Large Hall was retained exclusively for microscopes, while in the smaller Hall a variety of objects of interest was exhibited, among which may be named, a fine collection of swords, Capt. Mackenzie; Icthyosaurus, from Lyme Regis, Mr. Lee; Japanese castings in bronze, Mr. C. M. Major; collection of skulls, Mr. A. Crowley; machine for exploding torpedoes, Mr. Thomas Cushing; collection of fungi, from Addington Hills, Mr. E. B. Sturge; pen-and-ink sketches, Mr. John Chumley; and a specimen of *Rumex Rupestris*, a plant new to the British Flora, Mr. W. H. Beeby.

November 17*th*, 1875.—Henry Lee, Esq., President, in the chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted for and duly elected members:—Mr. Arthur Birkitt, Mr. J. B. Fawcett, Mr. John Jaques, and Mr. Michael Pope; and the following were proposed for membership:—Mr. P. T. Duncan, M.D., Mr. Maitland Gardner, Mr. Henry Kemp-Welch, Mr. C. H. Maltby, and Mr. Edwin Williams.

* Showing resemblance between vertebrate and invertebrate ova.

One dozen slides were presented to the Club's cabinet by Mr. E. Lovett, and one dozen by Mr. K. McKean. Thanks were voted to the donors.

T. W. Wonfer, Esq., Curator of the Brighton Museum, and Honorary Secretary of the Brighton Natural History Society, then read the following paper "On Scales characteristic of the Male Sex in Butterflies."—Among insects, scales are not confined to any one group, though they are found on every member of the division *Lepidoptera*, the scale-winged as their name implies, but, in connection with microscopical work, the scales obtained from certain insects have been, and still are, favourites with microscopists very deservedly, because, through differences of opinion as to the markings on sundry scales, together with an attempt to resolve their markings, we owe the great improvements made in objectives since the achromatic microscope has been an instrument of research and not a mere optical toy. As all know, certain scales, such as those from the gnat, (*Lepirma*, *Podura*, or *Lepidocyrtes*), and three or four butterflies, viz., a blue and a white of English origin, and a gorgeously coloured foreigner, have been employed along with sundry silecious valves of plants, named Diatoms, as test objects, and the objectives have been considered up to or below the mark, accordingly as they are able or not to resolve certain feigned markings seen by objectives of particular aperture and magnifying power. Again, to enable these objectives or others of different aperture and power, to resolve the same or other markings, various adjuncts to the microscope have been devised, such as condensers, prisms, &c. And though many, alas, too many microscopists in this country have spent nearly all their time in trying to see exactly the same things that other men have, or say they have seen, yet within the last few years a very considerable addition has been made to our knowledge of many physiological facts, as well as the resolutions of diatoms and scale makings, and though we may not accept Dr. Royston Piggott's conclusions, yet had he not ventilated the subject through his "Rouleaux of Beads," we might have gone on plodding in the same steps as those before us, and accepted our view of an object as a sufficient test of the power of an objective. Whatever view we may take of the markings of scales, there seems to us no manner of doubt that the scales of insects are nothing more nor less than modified hairs of greater or less thickness, more or less flattened or cylindrical according to circumstances and the position on the body, legs, or wings of the animal on which they are found. If, then, we regard all scales as modified hairs, and consider that hairs are composed of cells, we may see our way out of some of the difficulties into which the learned among microscopists have led us, and we may also understand how an under and an upper surface, two laminæ, striated surfaces, ribs, and sundry other puzzling terms, have come into existence when speaking of scales. Those who have written or spoken about scales and their markings within the last few years, are Royston Piggott, and those who incline to his "beaded" theories on the one hand, among whom must be included Mr. Slack, one of the Secretaries of the Royal Microsopical Society, and on the other, Col. Woodward, Dr. Maddox, Dr. Anthony, and Mr. McIntyre; it is with the latter group I feel I must ally myself, because much if not all of the so-called structure described by Dr. Piggott, I believe is purely optical and not structure. Primarily, the scales of insects, and especially the *Lepidoptera*, are more or less flattened hairs of a cylindrical or tube-like shape, inserted by a pedicle, differing in character according to circumstances, into the wing membrane, on both sides of which they are arranged in symmetrical rows like the tiles on the roof of a house. The majority of those on the wing, or rather the flat part of the wing, are flat or nearly so; interspersed among these are others quite hair-like in their character, and in some cases, to be alluded to presently, are some which are balloon-like in shape, and, we believe, are capable of being inflated like a balloon. We shall mention that from six to eight different kinds, or rather shapes, of scales, are found on each butterfly or moth, and when it is borne in mind how many thousand kinds of moths and butterflies are known to science, it may be imagined that though the varieties are not commensurate in numbers with the varieties of the insects themselves, yet the varieties in shape and markings are very numerous. Anyone devoting a little time and attention to scales will be well rewarded for his pains, and will learn far more by comparison than he can possibly glean by studying one or two special scales. Among other points, he will find that the colour of insects is not always due to what to the eye appears as colour on the wings. A striking illustration of this is seen in the case of the common "Orange-tip," the green colour on the back of the wings proves, on examination, to be produced by an intermingling of the black and yellow scales. Some certainly owe this colour to pigment, but in a great many it is due to the incidence of light, for if while under examination under the microscope the stage be rotated, as great a change will be seen in colour as with some objects under polarized light. Seen as transparent objects, brown seems the prevailing hue. Again, if scales are taken from living insects, or from those recently killed, and gently squeezed by pressure with a thin covering glass, greenish oily particles will be seen to ooze from the pedicle, leading to the idea, that in the living insect there is something like the circulation of a fluid from the wing mentioned. It is certain they cannot require any fluid to repair waste or to accelerate growth, because they are of full size the instant the insect escapes from the chrysalis. There is no growth in the scales, any more than in the wings. The instant the moth or butterfly emerges from the pupa-case, it comes forth full grown, the wing membranes expand laterally and longitudinally, and by so doing the scales of full-size and in situ are simply drawn wider and further apart, but of growth there is none. This can be seen by cutting open the pupa-case just before the emergence or taking the wing of a recently emerged insect; this must be done at once, because in some cases within ten minutes of emergence the wings are of full-size. There is, therefore, no replenishing of waste, nor reparation of parts in the scales of *Lepidoptera* as in the hairs of the *Mammalia*. Nor can we trace in all scales the cuticular layer, cortical and medullary substance of such hairs; we seem to obtain a cortical substance with or without a cuticular layer and sundry rib-like strengtheners, which have given rise to the diversities of opinion as regards structural markings. There is another curious fact sometimes noticed, viz., that there appears to be a power on the part of the insect to raise the rows of the scales, as well as to inflate some scales. We have often found the scales on the wing of a butterfly, caught or killed in flight, not lying flat on the wing membrane, but raised on it at a more or less acute angle, as though in flight the insect possessed the power of raising the rows of scales; this may, if we imagine the power of inflation of the scales, as well give greater buoyancy to a butterfly or moth in flight. We have every reason to believe this holds true of some scales, if so it would give to the wing membrane with its resources a power not accorded to it in the manuals of Entomology. It is time we passed on to what is after all the especial point your worthy President wished me to talk about, viz., those scales which are characteristic of sex, and by this we mean are found only on male insects. It is now twelve years ago, I started one afternoon with a medical friend to look for a certain fern, said to grow about twelve miles from Brighton. We got out of the train at Hassock's Gate Station, and diverged a little from our course to see whether *Neottia Spiralis*, the orchis which Darwin watched the bees fertilizing by carrying the pollen masses from one flower to another, was in flower. While searching for this plant several blue butterflies got up. My friend and I managed to catch several; this fact is strongly impressed on my mind, because after walking nearly a mile, we retraced our steps to search for a stethoscope which, in his eagerness of the chase, had dropped from my friend's hat when catching a "blue." On our way we both talked over the question of why we had not been able to find "battledore" scales on blue butterflies; was it because they were only on one kind? for though we had both searched for them on the part described in the Micrographic Dictionary, p. 564, under "*Polyomanatus*," and we had neither been able to find them. The words there run:—"The scales upon the under surface of the wings of *P. argiolus* and *P. argus* have been proposed as test objects. They are of two kinds—one resembling in structure the ordinary scales of insects, the other of a battledore form." What my friend did with his "blues" I do not know; I carefully removed the scales from the under surface of my "blues," and found not a single battledore. Having placed a wing upper side downwards on a glass side, to enable me to search over the wing, I found after a long-continued search, that a considerable number of scales detached from the upper surface of the wing, were upon my glass slide; focussing down to these I found battledores in plenty, but not exactly like those figured in the books. I then realized this fact, that battledores were to be found on the upper surface of the wings of *Polyomanatus*, or as it is now called *Lycœna alexis*, differing in form from those figured as obtained from *L. argiolus*. This led me to try whether I could find battledore scales on other blues than *L. alexis* the common blue, or *L. argiolus* the azure blue; for to those unacquainted with such differences among blues, I should mention that we have in England nine different species of blues, such as the common, azure, clifden mazarine, chalk-hill, silver-studded, large blue, little blue, and long-tailed blue. Through the kindness of an Entomological friend, I secured examples of nearly all, and found, strangely enough, battledore scales on the upper surface of both wings in some cases, and not in others. It turned out that the insects on which I had been unable to find battledores were females, while those on which I had found them were males. This caused me to make a critical examination of the blue family generally, and I then found the two facts, the battledores were found on the upper sides of the wings of the males only and in rows beneath the ordinary scales, and at their intervals of overlapping. I should mention that among the blues, the males only are of a deep blue colour, the females generally are of a brownish blue and a few blue scales, and this may have led to the assertion that battledore scales were found on the blues. It is true some females adorn themselves with so great a profusion that they simulate the garb of the males, much in the same way as the erstwhile "weaker sex" among humanity, since the cry of woman's rights has been raised, assume the get up and garments of the lords of creation; but on no female, however highly coloured, have I been able to find battledores. Since then I have had the opportunity of examining many foreign and tropical blues, and in each case, even where the female assimilated closely in colour to the male, only on the male, and invariably on the upper surface and in rows beneath the ordinary scales, have I found battledores. As might be expected, these battledores differ in size and shape, the blade is longer or broader in some than others relatively, the top is more or less rounded or squared, while the length of the pedicle also varies, so that when two species of blues resemble each other very closely in their markings, the shape and size of the battledores might be used as a ready means of settling species. There are species among the *Lycœnidœ* in which neither males nor females are blue or bluish in colour, and, curiously, among these, no single example of a male with battledores has been discovered. Mr. Watson who was working on *plumules*, at the same time I was carrying on my investigations, has had opportunities of examining some hundreds of specimens of blues and browns among the *Lycænidæ*, and has never met with battledores on any but the blues proper. We turn now to another characteristic scale, the "tasseled," described in the Micrographic Dictionary under the head *Pontia*, p. 571, thus :—"The form and structure of certain scales existing upon the under side of the male is curious." Here too, as we shall show, the writer has made a slight mistake; instead of under we should read upper, for it is there and there only we shall find scales similar to those figured in the Micrographic Dictionary. As may be supposed, having got an inkling from the blues respecting the situation of the battledores, I was not long before I searched the whites; the first to come under examination was the large and small cabbage white, both of which gave, on the upper side, the characteristic scales called tasselled, or as some prefer *plumules*. These scales differ essentially from the battledores in shape, ornamentation, markings, and pedicle; some are long and very slender throughout and gradually tapering to a point, others seem cut short, while others, comparatively broad at the basal end, suddenly narrow, and terminate either as though cut short or fine off to a slender point, all, whatever be their comparative breadth and length, have a cup-like ball and socket termination to the pedicle. At the apex of each scale is a tasseled fringe of great beauty, from which circumstance they have been called tasselled scales. All our English whites, with the orange tip, possess these peculiar scales, and if we turn to the great family of *Pinidæ*, which includes a vast number of continental and tropical forms, we shall find the males invariably possess a tasseled scale, either of the form of the English white and orange-tip, or a modification of these both as regards the terminal fringe and the pedicle. We have had opportunities of examining a good many, but Mr. Watson enumerated upwards of 200 English and foreign *Pinidæ* examined by him, in which in every case the males and the males alone possessed the characteristic scale. As might be supposed, there are great diversities of size and form from what has been said respecting our English *Pinidæ*, which doubtless might be very useful in determining species. One curious confirmation of the value of these characteristic scales Mr. Watson drew my attention to in 1868, viz., that two hitherto believed different species of Pines turned out to be male and female of the same, the one having and the other being without the characteristic scales. They are arranged in rows behind the other scales as in the blues, but many being long and hair-like they appear only *in situ*. The next English family to be noticed is that named Hipparchia, the common meadow brown, *H. janira*, has a scale brush-like and tapering like the large white, but differing from it in the markings in the ribbon-like portion, as well as having a pedicle similar to that possessed by the blues. Investigating this family, I found the same story told throughout—a distinctive scale, ribbon-like and tasseled, on every male of the family, but never a scale of such a character on the females. In each of the families described, there is generally a difference of wing markings between the males and females, occasionally they resemble each other, and some few insects have been found with the wings on one side with the male markings and on the other with the female markings. It would be very curious to find out if, with this assumption of marking, they also on the male-marked wings had this undoubted sex distinction. There is only one other family of English butterflies possessing, as far as I have been able to make out, a characteristic scale, and that is the *Argynnidæ* or Fritillaries, or at least these among them the underside of whose wing is marked by mettallic spots. The male scales are of a very decided character, differing essentially from those of the Pieridœ on the one hand, and from the Hipparchiœ, which they somewhat resemble, on the other. Some are of a very long, narrow, and ribbon-like form, with the tassel at the apex, while others are shorter and broader. Some too, like the Hipparchiœ, are nearly opaque, except at the apex, while others have the ribbon-like portion opaque for one-half its length. The position of these scales on the wings differs from that of any others we have described, for instead of being placed in rows beneath the ordinary scales, they are situated on the black veins of the upper surface, and have mingled with them in some species very peculiar Indian-club-shaped scales or hairs. Mr. Watson, whose opportunities of examination have been far greater and more extensive than my own, has found *plumules*, as he calls them. on 30 genera of butterflies, or nearly 600 species. In every case they were found on the male species alone. We consequently draw the inference, a very reasonable one, that battledores, tasseled scales, or *plumules*, wherever found, are characteristic of sex. What purpose they serve in the animal economy is not yet clear, their paucity or abundance on individuals cannot be, as some have suggested, marks of greater or less virility, because as we have seen scales do not grow with the age of the individual, nor do you find more scales on one freshly emerged butterfly than another of the same species: they may render the males more buoyant on the wing, but here we are met by this difficulty well known to field entomologists, the females are more rapid in most cases than the males. They seem rather to be the type of the beard in man, the mane in the lion, the comb in the cock, or the more brilliant plumage of some birds, and possibly to insect eyes, render their possessors more attractive than the duller coloured and non-plumuled sisters of their species. There are many debated points of structure we scarcely feel justified in touching on, because we have rather dealt with the scales as a means of differentiating species or determining sex, and not as a test for objectives. In obtaining the scales for examination, I have found the best way to examine a wing is to lay it on a clean slide, then place a covering glass upon it and gently press. Upon removing the upper slide, plenty of scales will be obtained in their relative positions. The covering glass can be mounted, a ring of cement run round the slide, a cover added, and when dry, a finishing coat be put on and the slide is ready for the cabinet. We fear we have been too prolix in our remarks, and not added any new fact to the store of the members of this Society, but if we have been able to enlist one to pursue the study of scales of insects, we shall have done our quota towards the use of the microscope as a means of research, for there are many paths open besides the beaten tracks, by which not only (if that be needed as a spur) fame may be won by the discovery of new facts in physiology, but much pleasure and interest may be derived from prying into the secrets of nature hidden from the unaided eye.

A short discussion followed the above paper, and a cordial vote of thanks was passed to Mr. Wonfer.

Dr. CARPENTER exhibited and described the American Poke Weed (*Phytolacca decandria*), with spikes of ripe fruit; and Mr. W. H. Beeby described the new plant (*Rumex rupestris*), discovered by him in Scilly.

The following exhibited their microscopes:—Mr. J. S. Johnson, Mr. E. Lovett, Dr. Strong, and Mr. A. D. Taylor.

December 15*th*, 1875.—Henry Lee, Esq., President in the chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted for and duly elected:—Dr. Duncan, Mr. Maitland Gardner, Mr. H. Kemp-Welch, Mr. C. H. Maltby, and Mr. Edwin Williams; and the following were nominated for election:—Mr. James Buck, Mr. Edmund Gill, and Mr. F. A. Nash.

The PRESIDENT announced that two members of the Committee, Mr. W. R. Cooper and Mr. John Flower, would retire at the close of the year.

It was proposed by Mr. J. S. JOHNSON and seconded by Mr. H. M. KLAASSEN, that Mr. W. H. Beeby and Mr. E. B. Sturge be nominated for election at the General Meeting as members of the Committee. It was further agreed that Mr. Beeby and Mr. Sturge, be appointed auditors for the present year's accounts.

Mr. GEORGE PERRY gave an "INTRODUCTORY LECTURE ON GEOLOGY," which he illustrated with numerous diagrams and specimens.—The study of Geology, he said, is that which leads us to investigate and distinguish the separate layers and rocks which form the rind or crust of our globe. I say rind or crust, because, if all the separate layers, from the newest or most recently formed, down to that which appears to be the oldest, were placed one over the other in complete order, their total thickness would not exceed twenty miles, and as our globe is roughly calculated as being eight thousand miles in diameter, we are left in complete ignorance of the nature of the intervening space of seven thousand nine hundred and sixty miles. But it may be naturally asked, how is it that we get this knowledge of nearly twenty miles, when our means of penetration by boring or mining, has in no instance been so much as one mile. Fortunately for the student, internal disturbances have caused the separate layers to be tilted up, so as to bring the oldest beds within reach of study, and to form, in many instances, our highest mountains; and though the separate layers may not be found lying in regular order, one over the other, the newer often being found resting on beds of much older date, the intervening beds being absent, the missing beds are found in other places resting conformably on those immediately below them, and thus supply the missing links and enable the geologist to obtain a considerable insight of the disposition of land and water in former times. It is therefore the duty of the student in geology, to learn to distinguish the several layers by their lithological and mineralogical characters, and especially by the fossil remains found therein. Apart from the interesting nature of the study, little need be said of its great importance and value, as enabling the geologist to state with some degree of precision, the probabilities of obtaining coal and other minerals, and thus preventing the waste of money in futile search. The various characters exhibited by the different rocks and layers of earth which formed the hills and valleys, the cliffs and rocks of the river margin and the sea shore, could not fail to attract the ancient philosopher, and the occurrence of shells and other marine remains in places far removed and elevated above existing rivers and seas, must have still further formed subjects for speculation and thought, and hence from the earliest time various theories have been propounded to account for such peculiarities and anomalies. Tradition, from a very early period, has handed down a reference to some great cataclysm in form of a great irruption of water over a large inhabited district, which from the limited knowledge of the people, who in all probability emigrated, and the natural distortion of tradition or oral communication became exaggerated into a universal deluge. We find the Hindoos, Chaldeans, Assyrians, and Egyptians, make reference to a deluge; and it was but natural that Moses, who passed the early part of his life among the Egyptians, should in writing his account of the creation and the early history of the Jews, introduce the account of the deluge. This Mosaic account of the creation and the after deluge, has been a sad stumbling block in the path of the geological student, and, even at the present time, there are many who still believe in the universality of the deluge. The natural consequence of the great difficulty of reconciling the Mosaic account with what was clearly visible in opposition, led to the proposal of various theories, some of which were more singular than philosophical, for we find one suggesting "that the globe is a hollow shell with a large loadstone inside, which being pulled alternately from one pole to the other, caused one or other half of the globe to be covered with water." Another, after examining a collection contained in the Museum at Verona, declared his belief that "the shells, &c., were nothing more than mere earthy secretions and sports of nature to puzzle us poor mortals." Buffon was obliged to publish a recantation of his theory, because it was supposed by the priesthood to militate against the Scriptures. But in the latter half of the last century, men sprang up who determined to collect facts, and we have Werner, while Professor of the School of Mines at Freyborg, after carefully studying the district in his immediate neighbourhood, bringing forth a theory which gained many staunch supporters. It was called the Neptunian, because he stated his belief that all or almost all the strata were formed from water containing material chemically dissolved or mechanically suspended therein, and that igneous action had only come into existence in very recent times. Hutton, a Scotchman, while travelling in pursuit of his favourite study, viz., mineralogy, collected many facts connected with geology, and published a work, "The Theory of the Earth," in which he says:—"The ruins of an older world are visible in the present structure of our globe, and the strata which now form our dry land have been once beneath the sea, and were formed from the materials washed down from other dry land, and these several strata have been more or less, and at various times, altered by internal heat and volcanic action." He satisfied himself that trap basalt, porphyry, and many other rocks, were of igneous origin, and had, while in a melted state, been forced up through cracks in the strata, and in many cases had flowed over their surface, even while covered by the sea. He raised a storm by observing, "In the economy of the world I can find no traces of a beginning, no prospect of an end." Hutton's theory was called the Vulcanian, and as between fire and water, so between the Vulcanists and Neptunists, fierce controversy raged. But there is another name I must not omit, viz., William Smith, who while carrying on his profession as surveyor, was quietly collecting facts and studying the various strata in England; and in 1790 published "A Tabular View of the British Strata," and afterwards produced a geological map of England, which remains a lasting monument of talent, extraordinary patience, and perseverance. In the early part of the present century the Geological Society of London was founded for the collection and recording of facts, and comparing and discussing the results of observation ; and now we have many earnest students in geology, with its kindred branches, mineralogy, palæontology, and natural history in general. Though there may be some who do not see the connection between geology and microscopy, the connection in reality is very close, inasmuch as by the aid of the microscope we have been enabled to discover the Foraminifera, whose remains form so large a portion of the chalk ; and also to discover by their fructification the nature of many of the plants living during the period when coal was formed. To be a student in geology it is not necessary to travel far and wide, for we find many most valuable contributions are from those who, from business or other causes, are prevented from getting far away from their places of residence, and yet have the inclination and sufficient leisure to carefully study the strata of their immediate neighbourhood. The neighbourhood of Croydon is interesting and well worthy of detailed examination from the circumstance of its being the outcrop of the London clay, and some beds lying between that stratum and the chalk formation."

Reference was made in course of the evening to some sections, among others, to one showing the strata passed through by the London and Brighton Railway, also to a map of Kent, Sussex, and part of Surrey, showing the weald formation and strata adjacent.

The Secretary read the following paper, contributed by Mr. N. Bogle-French, "On Staining Leaves":—The leaf is first to be put into a chlorinated solution of soda, as purchased at the chemists, till it becomes perfectly transparent and white, the time varying according to the thickness of the leaf. It is now placed for 18 or 20 hours in water to eliminate the soda. The water should be changed three or four times. After taking it from the water it is placed in absolute alcohol for about an hour previous to being put in the dye, which is the next step. In this it remains till the colour is sufficiently deep. The dye is prepared by mixing in a mortar one-eighth or one-fourth of a grain of aniline with one ounce of absolute alcohol, and acidulated with one drop of nitric acid. The leaf, when dyed of the right colour, is next placed in oil of cloves for one or two hours in order to set the dye. This only applies to those stained *blue*. The red stainings must be placed in turpentine or benzole for the purpose of setting the colour, as oil of cloves bleaches it out ; but they must not remain in the turpentine or benzole too long, as these contract the cells. Experience will be the best guide as to the time. For my own part I have hitherto confined myself to blue stainings. The leaf is then mounted in Canada balsam in the usual way. I believe gum damar is equally good, though I have never tried it. In the January and April numbers of "Science Gossip," 1875, full particulars will be found on this subject in two papers by Dr. Beatty, of Baltimore, U.S. It was from these articles I originally obtained my information, though I have not followed them to the letter.

Unanimous votes of thanks were passed to Mr. Perry and to Mr. N. Bogle-French.

The following members exhibited their microscopes:—Mr. Phillip Crowley, Mr. Maitland Gard'ner, Mr. J. S.Johnson, and Mr. K. McKean.

CROYDON MICROSCOPICAL CLUB.

RULES.

OBJECTS OF THE CLUB.

The Club is constituted for the mutual help of its Members; for the discussion of subjects connected with, or dependent upon, Microscopical research; for the exhibition and exchange of Microscopic Objects and Preparations; and for the promotion of the study of Microscopy and Natural History generally.

MANAGEMENT OF THE CLUB.

The business of the Club shall be conducted by the President, Treasurer, and Hon. Secretary (*ex-officio*), and nine other Members, who shall be elected by ballot at the Annual General Meeting. Three to form a quorum.

MEMBERSHIP.

1.—Every candidate for Membership shall be proposed by two or more Members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the Form appended. The certificate shall be read from the chair, and the candidate therein recommended ballotted for at the following meeting. Three black balls to exclude.

2.—The Annual Subscription shall be 10s., payable in advance on the 1st of January (or on election, if previous to November), and no person shall be entitled to the privileges of the Club until his Subscription shall have been paid.

3.—Distinguished men may be elected Honorary Members of the Club, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subject to any of the expenses of the Club, and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall by their merit satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No Member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any Member from the Club, the same shall be done by a resolution of the Committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the Members present shall vote for such Member's expulsion, he shall no longer be considered a Member.

7.—Any Member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the Member by whom he is introduced, in a book to be kept for that purpose.

ORDINARY MEETINGS.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at seven o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other time as the Committee may appoint.

2.—The ordinary course of proceedings shall be as follows :—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.

II.—The names of candidates for Membership shall be read, and the ballot for the election of Members shall take place.

III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the Members present at any ordinary meeting shall elect a chairman for that evening.

4.—No paper shall be read which has not received the sanction of the Committee; and, whenever it is possible, early notice of the subject of the papers to be read shall be given, by the Secretary, to the Members. No paper shall exceed fifteen minutes in the actual reading, unless by the especial permission of the Chairman.

5.—In addition to the above ordinary meetings, others, for conversation and the exhibition of Microscopical objects and Natural History specimens, shall be held on the first Monday in each month, at eight o'clock in the evening.

BUSINESS MEETINGS AND ELECTION OF OFFICERS.

1.—The accounts of the Club shall be audited by two Members appointed at the ordinary meeting in December. No Member of the Committee shall be eligible as an auditor.

2.—At the same meeting notice of the Annual Meeting in January shall be given from the chair.

3.—An Annual Meeting of the Club shall be held, in the place of the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the committee on the affairs of the Club, and the balance-sheet, duly signed by the auditors, shall be read.

4.—No permanent alteration in the rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or addition must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

CROYDON MICROSCOPICAL CLUB.

Mr.

of

being desirous of becoming a Member of this Club, we beg to recommend him for Election.

(on my personal knowledge).

This Certificate was read 187

The Ballot will take place 187

NOTE.—Original Rules, drawn and adopted at a meeting held on the 16th March, 1870.

Rules, as to Election of Officers, and number of Committeemen, revised January, 1872.

Rules, as to payment of Subscriptions and establishment of Conversational Meetings, revised and adopted January, 1876.

THE LIBRARY.

RULES FOR THE CIRCULATION OF BOOKS.

1.—Books to be lent out to Members at any time when the Library of the Literary Institution, at the Public Hall, is open, on application to Mr. Pusey, the Librarian.

2.—All books and periodicals to be marked with the stamp of the Club and numbered before being circulated, and kept in such a place as shall from time to time be determined by the Committee.

3.—Members may obtain books by making personal or written application for them, and by signing a receipt for the same, which shall be held by the Librarian until the book is returned. No Member shall have more than one work at a time, nor shall he keep any work for a longer period than one month; but it may be returned for exchange any time within that period when the Library may be open.

4.—When a book is returned by a Member it may be borrowed by him again, provided it has not been bespoken by any other Member. Books which have not been bespoken shall circulate in rotation, according to priority of application.

5.—Standard works, as shall be named by the Committee, to be kept for reference, and not to be lent out.

6.—Members retaining books longer than the specified time shall be subject to a fine of one penny per day. If any book be retained by a Member for two months, and be not returned after written application has been made for it, the Committee may order it to be replaced and charge the Member in default with the amount thus incurred, in addition to the fine. If any book, when returned by a Member, is found to have been damaged during the period such Member has had it, a fine equivalent to the injury shall be paid by the Member.

LIST OF BOOKS BELONGING TO THE CROYDON MICROSCOPICAL CLUB.

Achromatic Microscope	*Beck.*
Address before the Royal Microscopical Society ...	*Rev. J. B. Reade.*
British Diatomacœ (vol. 1.)	*Smith.*
British Diatomacœ (vol. 2)	*Smith.*
British Shells	*Turton.*
Collection and Preparation of Algœ	*John Nave.*
Cryptogamic Botany	*Berkley.*
Foraminifera	*Dr. W. B. Carpenter.*
Flora (vol. 1)	*Bentham.*
Flora (vol. 2)	*Bentham.*
How to Work with the Microscope	*Dr. L. Beale.*
Human Microscopic Anatomy	*Kölliker.*
Lectures on Histology	*Quekett.*
Marvels of Pond Life	*H. J. Slack.*
Microscopical Manipulation	*Suffolk.*
Polarized Light	*Woodward.*
Preparation and Mounting of Microscopical Objects	*Davies.*
Spectrum Analysis	*Suffolk.*
The Microscope	*Dr. W. B. Carpenter.*
The Microscope	*Quekett.*
Opticians' Catalogues	*Beck and others,*
Journals of Quekett Club.	

THE CABINET.

Slides of various objects, presented to the Club by Members and others.

LIST OF MEMBERS.

(*Revised to 6th February,* 1877.)

Adams, T. Rutherford, M.D., St. James's-road.
Anthony, Saml. H., 4, Sydenham-villas, St. James's-road.
Bailey, Edward, 4, Ripley-place, Dingwall-road.
Baker, Samuel, Lansdowne-road.
Barrett, Dr., Carshalton House, Carshalton.
Baldock, J. H., F.C.S., 3, High-street, South Norwood, S.E.
Baldiston, Frederick, Glastonbury-lodge, Sydenham-road.
Barnes, Thomas H., M.D., Lynton-villa, St. James's-road.
Baynes, W. W., D.L., J.P., Whitehorse-road.
Beeby, William H., F.R.M.S., 2, Outram-road.
Berney, John, F.R.M.S., 61, North-end.
Berney, Edward, M.R.C.S, 58, North-end.
Bennoch, Rev. A. J., Woodside, S.E.
Bennett, Arthur, 107, High-street.
Berridge, G. W., 2, Outram-villas, Outram-road.
Bindley, Theo., St. Peter's-road.
Bishop, Howard W., Ringstead-lodge, Whitehorse-road.
Blake, A. G., Dingwall-road.
Blake, W. J., Jun., Duppas-hill-terrace.
Bonus, Charles W., Oakwood-house, Sydenham-road.
Brodie, Robert, M.A. ; George-street.
Buck, James, 63, High-street.
Carpenter, Alfred, M.D., J.P., 113, High-street.
Chambers, W. E., Eversfield, Sutton.
Chumley, John, 3, Park-villas, Alexandra-road.
Clarke, A. H., Crown-hill.
Cleaver, H.A., M.R.C.S., 40, North-end.
Coates, W. N., Fairfield-road.
Cooper, George, M.R.C.S., 4, George-street.
Cooper, W. Reeve, Oakfield-road.
Corry, John, Rosenheim, Park-hill-road.
Corden, George, 53, High-street.
Crisp, Frank, 5, Lansdowne-road, Notting-hill.
Crowley, E. A, 62, High-street.
Crowley, Philip, Waddon House, Waddon.
Crowley, Jonathan S., 3, Park-hill-rise.
Curling, George, Elgin House, Addiscombe-road.
Curling, Jesse, Elgin House, Addiscomberoad.

Cushing, Thomas, Woodstock-villa, Alexandra-road.
Dickens, Richard Joseph, Addiscombe-road.
Dickinson, William, M.A., F.G.S., Warham-road.
Dix, T. H., 36, High-street.
Downes, C. H., 88, Church-street.
Drummond, A. W. B., Lynton-house, Oakfield-road.
Drummond, John, 76, North-end.
Drummond, William, 2, Sydenham-road.
Duncan, P. T., M.D., 53, High-street.
Eastty, Alfred, Wellesley House, Wellesley-road.
Eastty, Joseph M., J.P., Wellesley House, Wellesley-road.
Edridge, T. R., J.P., The Elms, High-street.
Evans, Henry, Bramley-hill.
Fagg, Edward, Clarence-lodge, Canning-road.
Fawcett, J. B., North-park.
Fletcher, Fred. E., Howard-road, South Norwood, S.E.
Flower, John, M.A., F.Z.S., Fairfield-road.
Gard'ner, Maitland, Fairfield-lodge, Park-lane.
Gibson, John, Canning-lodge, Addiscombe-road.
Gill, Edmund, Linn-villa, Sutton-hill, Sutton.
Goddard, D. E., Harcourt-road, Wallington, Surrey.
Grundy, Charles, Outram-road, Addiscombe.
Haddock, Roland, 64, High-street.
Hales, Edward, The Waldrons.
Hall, Robert, Garth-villas, Addiscombe.
Harrison, William, 2, St. John's-villas, Thornton-heath.
Hebb, W. H., Heathfield-road.
Hodges, O. T., Laurel-cottage, Sydenham-road.
Hopgood, James, Clapham-common, S.W.
Horsley, Henry, M.R.C.S., London-road.
Hovenden, C. W., 93, City-road, London, E.C.
Hovenden, T., Arbor-end, Selhurst-road, South Norwood, S.E.
Hudson, Robert, F.R.S., J.P., Clapham-common, S.W.
Ingrams, William, Whitgift Schools, Church-road.
James, Robert A., Ravenswood, Oakfield-road.
Jaques, John, Hillside, Duppas-hill.
Jarrett C., St. John's-grove.
Jecks, Charles, 26, Langham-place, Northampton.
Johnson, Cuthbert W., F.R.S., The Waldrons.
Johnson, J. S., M.R.C.S., 105, High-street.
Jolland, C. J., London-road, Thornton-heath.
Jones, E. F., St. Germain-villa, Forest-hill, S.E.
Kemp-Welch, Henry, 18, Billiter-street, E.C.
Klaassen, H. M., F.G.S., 2, Chepstow-road.
Lambert, A., Jun., High-street.
Lanchester, Henry, M.D., Park-lane.

Lashmar, Charles, M.D., Wellesley-road.
Latham, Baldwin, C.E., Park-hill-rise.
Lee, Henry, F.L.S., F.G.S., F.R.M.S., The Waldrons.
Lee, Henry, Jun., The Waldrons.
Leeds, C. E., Selhurst-road, South Norwood, S.E.
Ley, J. H., Exotic Nursery, Lansdowne-road.
Linney, George F., Park-lane.
Lister, Charles H., Swindon-lodge, Wellesley-road.
Loftus, T., Lower Addiscombe-road.
Long, Henry, 90, High-street.
Lovett, Edward, Holly Mount, Upper Addiscombe-road.
Mackenzie, Captain Colin, Hareston, Bedford-park.
Mackenzie, David, Beulah-road Schools, Thornton-heath.
Major, Charles M., Duppas-hill-terrace.
Maltby, C. H., Stewart-villas, St. James's-road West.
Mallett, Edward M., 2, Cromwell-terrace, Clyde-road.
Manners, George, F.L.S., F.S.A., Lansdowne-gardens.
Manners, Charles, Lansdowne-gardens.
Marks, S. G., 78, Church-street.
Marshall, Edward, M.R.C.S., Church-house, Mitcham.
Martin, Howard, Havelock-road.
Miller, William Frederick, Havelock-villas, Havelock-road.
Mitchell, E., Laurel-cottage, St. James's-road.
Moore, Edward, 2, Stanley-villas, St. James's-road West.
Moore, John, Oakwood, Park-hill.
Morland, Charles C., Rastrick-lodge, Morland-road.
Moseley, Litchfield C., Chandos House, West-hill, Sydenham, S.E.
Moseley, T. B., Brighton-road.
Moules, Edward Robert, Whitgift-lodge, Wellesley-road.
Muggeridge, T. Benjamin, Upper Addiscombe-road.
Nash, F. A., Rochfort, South Norwood.
Nation, W. J., 1, Clifton-villas, Thornton-heath.
Newton, Charles, Crossland-villa, Broad-green.
Noakes, Henry, Poplar-cottage, St. James's-road.
Oldfield, John, 16, Tamworth-road.
Oswald, Edward C., Old Palace.
Owens, Henry, M.D., F.R.M.S., Selhurst-road, S.E.
Overton, S., Selsdon-road.
Packham, James, Katherine-street.
Page, Joseph, 4, Derby-houses, Derby-road.
Paget, Peter, Coombe-lane.
Peake, Francis, The Waldrons.
Peek, Sir Henry W., Bart., M.P., Wimbledon.
Pelton, John, Park-lane.
Perry, George, 2, Park-lane.
Petherick, H. W., Maple, Lodge, Havelock-road.

Philpot, Charles W., M.D., Sydenham-road.
Pitt, Sidney, Grove-road, Sutton.
Podmore, H. R. B., Bramley-hill.
Pope, Michael, 1, Park-lane.
Price, George N., St. Peter's-road.
Purser, George, 3, Wellesley-villas, Sutton.
Puxon, E. W., Wintons, Park-hill-road.
Reid, George, Havelock-road.
Ridge, Byron, 60, North-end.
Rigby, G., Wellesley-road.
Roberts, Rev. Dr., The Limes, High-street.
Roberts, H., Norfolk House, Cheam-road, Sutton.
Robinson, W. M., Kenley, Surrey.
Roby, R. F., Shirley House, Selhurst, S.E.
Roper, Alfred G., F.R.C.S., 57, North-end.
Roper, Edwin, 57, North-end.
Roper, George, 57, North-end.
Rosser, Walter, M.D., George-street.
Rowland, W. H., Tavistock-road, Bedford-park.
Russell, James, M.D., Cambridge-villa, Sydenham-road.
Salmon, H., 8, Warwick-villas, Clyde-road.
Shattock, Herbert, Dingwall-road.
Simons, George, Beddington-lane.
Smith, William F., Belfort, Park-hill-rise.
Snelling, W. H., Selhurst-road, South Norwood, S.E.
Spencer, John, The Grange, Sutton-common, Sutton.
Spencer, J. G., The Grange, Sutton-common, Sutton.
Stanley, W. F., Albert-road, South Norwood, S.E.
Steele, Joseph, L.D.S., M.R.C.S., London-road.
Stevenson, Albert, Brighton-road, Sutton.
Stoneman, W. G., 8, Lee's-villas, Canning-road.
Strong, Henry J., M.D., North-end.
Sturge, Edward B., The Waldrons.
Suffield, Rev. R. Rodolph, Alfred-villa, Parson's-mead.
Swaine, Captain J. C., Fairfield-road.
Taylor, A. D., 3, Ripley-place, Dingwall-road.
Thrale, Peter, George-street.
Thrale, Ralph, George-street.
Toms, Alfred, Lychett-villa, Tavistock-road.
Toms, Joseph, Lychett-villa, Tavistock-road.
Toms, J. A., Lychett-villa, Tavistock-road.
Townly, E. W., 116, High-street.
Turner, Henry, Birchanger-road, South Norwood, S.E.
Twentyman, Alfred, Park-hill-road.
Turney, John G., Canning-road.
Wake, Captain John D., Beachley, Chepstow-road.

Wallis, J. W., Lansdowne-road.
Walton, A., Tavistock-road.
Walters, Walter, Park-hill-road.
Warren, Francis, Fairfield-road.
Waters, Charles, Kenley, Surrey.
West, Frederick, The Waldrons.
Whealler, G. Anson, Elgin-road.
Whitling, Henry T., F.R.C.S., F.R.M.S., High-street.
Williams, Edward A., Friends' School, Park-lane.
Williams, Edwin, 3, Wellesley-villas, Wellesley-road.
Williams, Dr., Duppas-hill.
Wilks, Rev. W., Old Palace.
Windsor, H. W., 8, Old Jewry, London, E.C.
Wood, J. D., Selhurst-cottage, Selhurst-road, S.E.
Woodward, John, 1, Lee's-villas, Canning-road.
Wright, James, S., Duppas-hill-terrace.

HONORARY MEMBERS.

R. Beverley Cole, M.D., San Francisco, California, U. S. A.
Kenneth McKean, The Beach, Madras.

NOTICE.—Members are requested to give the hon. secretary early notice of any change of Residence, so as to prevent miscarriage of correspondence.

SEVENTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 17, 1877.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1878.

SEVENTH REPORT

AND

ABSTRACT OF PROCEEDINGS

OF THE

CROYDON MICROSCOPICAL CLUB,

ADOPTED AT A MEETING HELD

JANUARY 17, 1877.

CROYDON:

PRINTED BY F. BALDISTON, "CHRONICLE" OFFICE, HIGH STREET.

1878.

OFFICERS AND COMMITTEE

FOR THE YEAR 1876.

President:

HENRY LEE, F.L.S., F.G.S., F.R.M.S., &c.

Treasurer:

ALFRED CARPENTER, M.D., J.P.

Committee:

JOHN BERNEY, F.R.M.S.
WILLIAM H. BEEBY, F.R.M.S.
PHILIP CROWLEY.
JOHN FLOWER, M.A., F.Z.S.
J. S. JOHNSON, M.R.C.S.
GEORGE F. LINNEY.
GEO. MANNERS, F.L.S., F.S.A.
GEORGE PERRY.
HENRY J. STRONG, M.D.

Honorary Secretary:

EDWARD B. STURGE,

The Waldrons, Croydon.

REPORT OF THE COMMITTEE.

The Seventh Annual Meeting of this Club was held at the Public Hall, on Wednesday evening, January 17th, 1877, Henry Lee, Esq., President, in the chair. The minutes of the previous meeting having been read and confirmed, the following gentlemen were nominated for election :—Mr. H. Sykes, of Upper Addiscombe; Mr. H. Moules, Wellesley-road; Mr. T. A. Richardson, Croydon General Hospital; Mr. E. W. Puxon, Mr. W. H. Hebb, and Mr. John Pelton were ballotted for and duly elected members, Mr. A. Freeland, junr., who had been nominated at the previous meeting being rejected.

ANNUAL REPORT OF THE COMMITTEE.

The Committee of the Croydon Microscopical Club have much pleasure in submitting to the Members of the Club the Seventh Annual Report of its proceedings. During the year 23 new members have been elected, 11 have resigned, chiefly from removal from the neighbourhood, and 4, whose loss the Committee sincerely regret, have died, viz. : Mr. Alfred Crowley, Mr. Fredk. West, Mr. John Shepherd, and Dr. Cresswell; the number on the list at the close of the year being 195 ordinary members, and two honorary members, making a total of 197.

The Members attended the Soirée of the New Cross Microscopical Club, and also the Soirée of the South London Microscopical Club, held at the Crystal Palace.

Eight Papers have been read, viz. :

February 16*th.*—Mr. C. Jecks "On Darwinism."

March 15*th.*—Mr. A. Halley, "On some habits of the White Ant."

April 19*th.*—Dr. Philpot, "On Recent Microscopical Researches in respect to Infectious Disease," and Mr. Jno. Flower exhibited and described a hybrid grouse between the black grouse and hazel grouse.

May 17*th.*—Mr. Chas. Stewart, F.R.M.S., "On Sea Stars and Sea Urchins."

September 20*th.*—Mr. H. Turner, "On Trilobites and their Modern Representatives."

October 18*th.*—Mr. W. H. Beeby, F.R.M.S., "On Crystals of Lime Salts found in Plants."

November 15*th.*—Mr. Jno. Flower, M.A., "On Pallas' Land Grouse."

December 20*th.*—Dr. Carpenter, "On Circulation of Sap in Plants."

Also a Lecture by Professor Rupert Jones, F.R.S., &c., "On the Antiquity of Man," illustrated by a large collection of flint implements kindly lent by Mrs. J. W. Flower and Mr. John Flower. This was given under the same arrangements as that by Professor Morris, F.G.S., in the previous year, when members were allowed six tickets for friends, ladies or gentlemen. The large hall was engaged for the occasion, and was well filled, and the committee have reason to believe that the lecture was much appreciated.

Excursions were arranged during the recess in connection with the Quekett and South London Microscopical Clubs.

Conversational Meetings have also been held on the first Monday in every month (or on appointed days).

The Seventh Annual Soireé took place at the Public Hall, on Wednesday evening, 29th November, and was attended by Fellows of the Royal Microscopical Society, and Members of the Quekett, the South London, the Tower Hill, New Cross, Greenwich, Forest Hill, and Old Change Microscopical Clubs, by whom and members of the club 168 microscopes were exhibited, besides other objects of interest. The number of persons present was 129 members, 654 visitors and exhibitors, total 783, the largest attendance at any Soirée of the Club since its establishment.

The additions to the Library comprise the new edition "Carpenter on the Microscope," and "Bennett and Dyer's Translation of Sach's Work on Botany," by purchase; the Reports and Journals of the Quekett, South London, and Brighton Clubs; and Messrs. Sorby and Butler's paper on Amber, were kindly presented and have been duly acknowledged.

The cabinet has received additions kindly presented by members, as follows:—Mr. McKean, 58 slides; Mr. E. Lovett, six ditto; Mr. Gregory, six ditto.

Mr. McKean, who had for two years efficiently performed the duties of honorary secretary, received an appointment in India in April, and was in consequence compelled to resign the office, when Mr. E. B. Sturge was appointed his successor.

Mr. McKean was elected an honorary member, and received the thanks of the Club inscribed on vellum.

In conclusion, the committee consider they have reason to congratulate the members on the hitherto very successful career of the Club, and to hope that its usefulness may be still further advanced by an increased interest in its proceedings and an enlarged sphere of operations.

The thanks of the Club are due to the Local Press for the very copious reports of the various meetings which have appeared in the columns of the *Croydon Chronicle* and *Croydon Advertiser*.

Signed in and on behalf of the Committee,

HENRY LEE, *President.*

Croydon, 15th January, 1877.

BALANCE SHEET FOR THE YEAR ENDING 31st DECEMBER, 1876.

Receipts.

	£	s.	d.
Balance in hand 1st January	61	18	6
Subscriptions	95	0	0
Sale of *Soirée* Tickets	28	17	6
	£185	16	0
Balance brought down	£70	6	7

Expenditure.

		£	s.	d.
Hire of Rooms		9	19	6
Lecture on Antiquity of Man; Professor Jones		10	10	0
Engrossing Testimonial to Mr. McKean		6	3	0
Printing and Advertising		11	6	9
Stationery		3	17	4
Postage		4	1	1
Lamps, Oil, &c.	Jones	1	8	9
Commission on Subscriptions	Jones	5	3	6
Books, "Botany;" "Microscope"		1	15	3
Refreshments at Annual Meeting		2	5	0
Gratuity, Librarian, and Assistant ditto		1	6	0
Sundries		1	4	8

Soirée Expenses.

		£	s.	d.
Hire of Rooms		7	14	6
Printing and Advertising		11	10	9
Refreshments		16	0	10
Music		1	11	6
Decorating Platform	Ridge	2	0	0
Lamps on hire	Gibbs	2	14	0
Tables	Hodder	10	8	0
Postage		3	5	0
Police and Attendants		0	14	0
Carriage of plants	Batchelar	0	10	0

	£	s.	d.
	56	8	7
Balance forward	70	6	7
	£185	16	0

ALFRED CARPENTER, *Treasurer.*

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct, according to the Vouchers and the Banker's Pass-book.

4th January, 1877.

THEOPHILUS BINDLEY,
HOWARD MARTIN, } *Auditors.*

The Rev. Dr. Roberts, in moving "That the report and accounts be received and adopted, and that they be printed and circulated among the members," said that although the report was of a gratifying character as recording the increased prosperity of the Club, yet there was a sad side to it, and he was sure that every member deeply regretted that whilst they had lost some of their members by reason of their leaving the neighbourhood, they had lost four by death, and they regarded the loss they had sustained not only a loss to themselves, but also to the parish, and more especially with regard to those with whom they were more intimately acquainted, namely, Mr. Crowley and Mr. F. West.

Mr. C. C. Morland, in seconding the motion, said the report shewed that a large quantity of useful and excellent work had been done by the committee, and the thanks of the members were due to them for the very many pleasant evenings the members had been able to spend in that room and elsewhere.

The motion was then put and carried.

ELECTION OF OFFICERS.

Before the election of President was gone into, the Rev. R. R. Suffield gave notice that at the next meeting of the Club he should move that in future the duration of the office of President should be restricted to two years. It was desirable that the rules of this Club should conform to the rules of similar scientific bodies, and as they had, with extreme reluctance, yielded to the solicitation of their President to retire, he thought it was advisable before that gentleman's successor took office, to submit a resolution that the duration of the term of office should not exceed two years, thus affording an opportunity to the other members who were eligible for the appointment to have the honour of filling the presidential chair. There was no doubt that the new President would receive the cordial support and co-operation of his predecessor. The name to be submitted to them this evening was that of a gentleman of position and of well-known scientific attainments, not only in this town, but also in London and other large places. This resolution would take the following form:—"That in future the election of President, after the second year, shall be subject to this condition—that the retiring President shall be ineligible for one year."

The President rose and said—Gentlemen,—You are all, no doubt, aware that for the past two years at least, I have felt that I ought to resign the Presidency of this Club; not because I found the duties of the office too onerous, but because there are gentlemen amongst our members whose election to the chair would be an honour to the Club and a compliment to themselves; and it would be a gratification to me to give place to them, and to assist them in their endeavours to carry the Club to a higher standard of excellence and a greater success even than that to which it has already attained. You will remember that, last year, I laid before the committee my views on this subject; but finding it was the wish of my fellow members that I should hold my position for another year, I readily consented to do so. (Hear, hear.) Now that period has elapsed, and the time has come for me to divest myself of authority, and ask you to elect my successor. Time flies so quickly that I can hardly realise the fact that seven years, almost, have passed since I was made President of this Club: but so it is: and although I have the happy consciousness that I have not held that office longer than you have wished, and that if I desired to retain it I should have the unanimous vote of all the members of the Club—(loud applause)—you must, I am sure, feel that I am acting rightly and justly in retiring, that I may enable other members to come forward into a prominent position, and share with me the honour of having occupied the Presidential chair of the Croydon Microscopical Club. Believe me, I have not taken this step lightly, nor without full appreciation of the honour I am resigning. But the honour and the gratification will always remain to me, that I have had the happiness and high privilege of enjoying, throughout the long term of my presidency, your full and unbroken confidence, your cordial, loyal, and unanimous support; that I have made many friendships which I trust will never cease; and that whilst from you I have received unsullied kindness, I am able to say that, in my official career as President of this Club, I have neither done nor spoken anything which I would wish to alter or recall. (Loud applause). I thank you gratefully for all your goodness to me, and ask you kindly to accept my resignation.

VOTES OF THANKS TO OFFICE-BEARERS.

The Rev. R. R. Suffield, in proposing a vote of thanks to the late President, said he had a painful duty to perform. Mr. Lee might be designated as the real founder of the Society, for it sprang into existence at his own house. Those who prognosticated failure, and they were many, had proved to be false prophets, for instead of failure the Club had turned out to be a great success, and that success was in a less degree due to themselves as members than to their late President. It was difficult to speak of Mr. Lee in his presence, but there was one special feature which had made his presidency conspicuous—he had had no selfish object in view, but had simply worked for the benefit of science and in the interests of the Club, ever since the first advertisement appeared in the Croydon papers enlisting the little incipient movement which was afterwards naugurated, and had ever since been carried out so successfully. Through their career they had always felt that Mr. Lee was anxious that the Club should not be exclusively confined to microscopy, but should embrace different departments of science, including the interesting subject of natural history, and this was partly due to the fact that their President was well acquainted with different branches of scientific knowledge, and therefore he had induced gentlemen capable of taking up one or other of these pursuits, to enrol themselves as members of this Society. Although they hailed with pleasure the appointment of Mr. Lee's successor, they could not forget the pleasure which their President's genial character, noble sympathy, even-handed courtesy, and intense love of natural history and science had afforded them. Mr. Lee had kindled amongst the members a similar spirit, and had succeeded in maintaining it; and he (Mr. Suffield) had not the smallest doubt that, with his cordial co-operation and valuable assistance, the Club would go on and prosper. With feelings of real affection and gratitude for the invaluable services that their retiring President had rendered to them as a Club, he begged to propose, with all the cordiality possible, a vote of thanks to that gentleman. (Applause.)

Dr. Strong said he could not let this occasion pass without seconding this resolution, as he had been a member of this Club ever since its establishment, and although, from the effluxion of time and other circumstances he had been compelled to sever his active connection with the Club, he would yield to none in the respect and friendship he entertained for their retiring President. Ever since Mr. Lee had been connected with the Club he had always been at his post, and had proved himself to be so good a commander of the ship, that it was not surprising it had come safely into port; and now, with a new commander, but under the guidance of its late captain, the vessel was about to be launched for another voyage. On every occasion Mr. Lee had shown his readiness to afford information on any subject of which the members were ignorant, and it was afforded in such a way as to encourage the recipient to seek further knowledge. (Hear, hear.) Although Mr. Lee had severed himself from the Club officially as President, it was gratifying to know that he would give them the benefit of his advice and assistance as a member of the Committee; and therefore he cordially seconded the vote of thanks for the valuable services afforded by Mr. Lee in the past.

Mr. Warren said that although the Club would have an excellent President in Dr. Carpenter, he felt they had sustained a great and heavy loss by the absence of Mr. Lee from the presidential chair, for they could not expect to have a Lee occupying the chair more than once in a generation. He observed that their friend had been appointed President of the Quekett Microscopical Club;

therefore our loss was their gain, and he was sure that Mr. Lee would shed lustre on that Society. He hoped that their retiring President would be spared for many years to benefit science as he had done in the past, and he was pleased to find that the Croydon Microscopical Club would still retain his invaluable services. He had much pleasure in supporting the vote of thanks which had been proposed.

Mr. Suffield having put the resolution, it was carried amidst prolonged applause.

Dr. Lanchester, before proposing a gentleman to succeed Mr. Lee, as President, expressed his concurrence with the resolution of which Mr. Suffield had given notice, as it would give all members who were eligible, an opportunity of filling the chair which had for many years been so ably filled by Mr. Lee. He begged to propose Dr. Carpenter as Mr. Lee's successor, whose scientific attainments were well known, not only in this country, but also in many others, for the genuine scientific work he had accomplished; and in appointing him he (Dr. Lanchester) believed they would fill the chair with a gentleman whose name would command respect, and be received with respect. Dr. Carpenter was a gentleman occupying a good social position, and with his high character and great ability he (Dr. Lanchester) believed that in electing him for this post they would add honour to the Club and pay a compliment to him.

The Rev. Dr. Roberts, in the absence of the member who had been deputed to second the nomination, discharged that duty, knowing that it was the wish of a large number of members that Dr. Carpenter should be elected to the presidentship.

Dr. Carpenter was then ballotted for and duly elected President of the Club.

Mr. Lee mentioned that the newly-elected President was prevented by indisposition from attending that evening. He called upon the members to extend to Dr. Carpenter the same cordial and loyal support that he had experienced, and he promised to be at that gentleman's right hand to assist him in the performance of his duties.

APPOINTMENT OF TREASURER.

It was moved by Mr. Lee, seconded by Mr. John Drummond, and resolved that Mr. Philip Crowley be appointed Treasurer in the place of Dr. Carpenter.

APPOINTMENT OF SECRETARY.

The Chairman said the Club could not do better than re-elect their Hon. Secretary. They had been peculiarly fortunate in the gentlemen who had filled that post. Their first Hon. Secretary started the Club; their next Secretary zealously served them until he was called away to a distant country, and he took with him the strongest feelings of respect from the members; and inferior to neither of them was Mr. Sturge, their present Secretary. The labour he threw into his work was very great; no man knew it so well as himself (the Chairman). He was in constant communication with their Hon. Secretary, and he could honestly say that Mr. Sturge did more for the Club than many members were aware of. He therefore cordially proposed that gentleman's re-election.

Mr. Turner seconded the motion, which was carried with acclamation.

APPOINTMENT OF COMMITTEE.

The Chairman said that as Dr. Strong had declined to offer himself for re-election on the Committee, he should be happy to fill the vacancy caused by that gentleman's retirement. (Hear, hear.)

Dr. Lanchester moved, Dr. Adams seconded, and it was resolved, that the following gentlemen be appointed as the committee for the ensuing year: Mr. John Berney, Mr. W. H. Beeby, Mr. John Flower, Mr. J. S. Johnson, Mr. H. Lee, Mr. G. F. Linney, Mr. Geo. Manners, Mr. Howard Martin, and Mr. Geo. Perry.

Mr. Lee, in acknowledgement, said his presidency of the Quekett Club had nothing whatever to do with the resignation he had tendered that evening. He had long felt the desirability of making room for other men who were eligible to occupy the post of President, rather than monopolise the position himself year after year; and although he had yielded to their pressing solicitations on former occasions not to relinquish that position, he felt that the time had at length arrived when he should give place to some other gentleman. It was his intention to stand by their new President and their future Presidents, and assist them to the best of his ability by his presence at their committee meetings. He should endeavour to be constant and regular in his attendance, but of course they would not expect him to come from places at long distances from Croydon, as he had sometimes done when filling the position of President. He was happy to say that he was not taking leave of them, but should still remain an active member of the Club, and such, he trusted, he should always continue. (Applause.)

Mr. Warren then proposed votes of thanks to the Treasurer, Committee, and Secretary.

The Rev. W. Wilks seconded the motion, which was duly carried, and Mr. Sturge, hon. secretary, offered a few remarks in acknowledgment.

Mr. Lee said it had always been his endeavour to make this Club a Natural History Society as well as a Microscopical Society. Seeing the strides they had taken, it really became a question whether they should not add to their title that of a Croydon Natural History Society. If they would like to have it inserted, he had no doubt it could be done at the next meeting when they were discussing other alterations in the rules of which notice had been given.

Mr. John Flower gave notice that at the next meeting he would move "That the title of the Club be changed to that of the Croydon Microscopical and Natural History Club."

Mr. H. Turner gave notice that at the next meeting he would move "that the rules as to the election of members be revised."

The Chairman then said that the popularity of the Club had been greatly dependant upon the assistance which had been afforded by the local press, and no one could appreciate more highly than he did the efforts of those gentlemen who prepared such copious and faithful reports of their proceedings. He begged to propose a vote of thanks to those gentlemen, and also to the editors of their respective papers, the former for kindly reporting the proceedings of the Club, and the latter for publishing them.

Mr. G. F. Linney, in seconding the motion, boré testimony to the care which was exercised by the reporters in preparing for publication the transactions of the Club, a labour sometimes involving no little difficulty, on account of the scientific nature of the subjects with which they had to deal.

The motion having been put and carried, the company adjourned to an ante-room, where a light refection of tea, coffee, &c., had been prepared, and the remainder of the evening was spent in social intercourse.

The following members exhibited microscopes: Mr. Beeby, Mr. F. E. Fletcher, Mr. Klaassen, Mr. H. Long, Mr. Lovett, Mr. S. Overton, Dr. Strong, Mr. A. D. Taylor, and Mr. E. B. Sturge. Mr. Lovett also exhibited some shells from the Victoria Nyanza, found by Colonel Gordon.

ABSTRACT OF PROCEEDINGS.

1876.

February 7th, 1876. — Conversational Meeting. Four members present.

February 16th, 1876.—Paper read by Mr. Charles Jecks, "On Darwinism."

The President, Mr. Henry Lee, in the chair. The minutes of the last meeting were read and confirmed.

Mr. George William Berridge, 3, Outram Villas, Outram Road, was nominated for membership.

The President announced that Mr. Philip Crowley had conveyed to the Committee, and requested him to convey to the Club, the kind appreciation of Mrs. Crowley of the vote that was proposed on the last occasion. They knew how very sincere that vote was, and Mrs. Crowley had kindly recognised it. He had also to mention that Mr. Taylor, who had often read papers before them, had brought for distribution amongst the Club some sea grass from Algeria, used commercially here for stuffing beds, in which, unfortunately for the sleepers, an acaris something like the itch insect was found. It was peculiar that an acaris should be found in marine grass, unless engendered by its heating. If the members would like to take a portion of the grass home to examine it they were welcome to do so. He then stated that their friend Mr. Jecks, who had given them a lecture on a previous occasion, had come up from Northampton to give them another, and that this time it would be upon "Darwinism." He thought it was right that the Club should launch out from the narrow groove of microscopy, as they had always intended, into the wide domain of Natural History. He was quite sure that the committee and the members were too liberal not to permit one of the great questions of the day to be freely discussed after it had been introduced to them with the acumen and learning which distinguished their friend Mr. Jecks.

"DARWINISM."

Mr. C. Jecks then delivered a lecture on the above subject. He said he believed that Mr. Darwin was a man of retiring, unassuming habits, with a great aversion to what was called publicity. He was gifted, however, with a great amount of perseverance, an amazing power of observation, and an unwearied patience—the result of which, after many years of labour, had been the production of his celebrated theory of "The origin of species by natural selection." His theory was contrary to the generally received opinions of mankind upon the subject, and Mr. Darwin had met with a great amount of misrepresentation, vituperation, and abuse. Inquiring into the true meaning of the theory, he remarked that in the first place it implied no unnecessary development, but merely asserted, or rather suggested, that under certain favourable conditions if one variety of life, whether vegetable or animal, possessed any advantage over another, it would, as a general rule, tend to be propagated more extensively, and that the more favoured variety would increase and flourish by reason of the law of natural selection, which, as it were, picked out any species more favoured than another, and tended to perpetuate its existence, till in course of time and under long-continued favourable conditions, and the peculiar adaptability to surrounding circumstances, as climate, food, &c., which occasionally happens with both plants and animals, these advantages became more or less fixed and permanent, and species was the result. Thus, supposing all the above-named conditions to exist to a sufficient degree at any one time and place, that variety which was best able to avail itself of them would probably succeed in establishing itself, while others, not so fortunate, would in course of time become extinct. Each stage of progress, however, in the favoured variety would be marked by a certain degree of advancement, owing to what was called the law of heredity, or the law by virtue of which the progeny of a plant or animal tended to inherit those advantages possessed by its parents. This tendency existed in an ever-increasing ratio—*i.e.*, supposing the parents to possess certain advantages, the progeny would possess not only the same advantages, but, to a certain extent, a tendency to greater ones. It was supposed that if one form of life gave rise to a number of descendants, the progeny of each of these might, in course of time, be so much modified by natural selection, while still preserving more or less likeness to its original progenitor, and so many transitional links would be missing, that any form of life now existing could scarcely be said to have descended from any one progenitor. And as these transitional forms, constituting the missing links, were themselves liable to a constant variation, or even extinction, by reason, probably, of the battle of life which they had to wage with other allied forms, it could not be wondered at that there were so many seeming breaks in the chain of development. It should be remembered that the remaining links in this chain represented in themselves not any line of direct descent from any one form, but, as it were, a very broken and indistinct reflection. The objections to Mr. Darwin's theory were numerous, and were generally based upon misconception and prejudice. As an instance of the former, it might be noted that it had often been confounded with that of Lamarck, a French naturalist, who lived towards the close of the last century, and whose theory, though it might perhaps in some measure resemble that of Mr. Darwin, still presented important points of difference, as, for instance, with regard to what are called rudimentary organs, which Lamarck considered as organs coming into use, while Darwin applied the term to cases of the survival of organs the use of which was no longer needed. As examples, the ostrich of Africa and the emu of Australia might be mentioned, allied as they were to each other, and taking each other's place in different regions in which they were found. These birds having gradually lost the use of their wings by the action of natural selection, were now all reduced to the condition of running birds. The bustard family, found in the eastern part of England, and chased by greyhounds, was another example; while, as a striking instance of organs which seemed to have only lately become useless, and which would, doubtless, in the course of time, become rudimentary, the ground parrot of New Zealand might be mentioned, which, while having fully-developed wings, seemed to have lost the use of them—doubtless from the same causes as those noted above. Again, with regard to the origin of certain alterations in structure, as length of neck, &c.; Lamarck believed that as in proportion as any organ was used it increased in size, so it was with length of neck and other peculiarities—and that in proportion as an animal stretched its neck it would naturally become longer by an extension of the vertebræ; while Darwin held that supposing by reason of these slight varieties in structure which were continually arising both in the vegetable and the animal world, any animal having a slightly longer neck than others, if this were an advantage in the struggle of life it would be laid hold of by the principle of natural selection, and the animal would be more likely, by reason of this variation, to flourish under circumstances which to others would be prejudicial. This advantage would be continued by the law of heredity, which signified the perpetuation, under favourable conditions, of any advantage in an ever-increasing ratio to its descendants, until, in course of time, the difference in structure became confirmed, thus giving rise to what was called a difference in species. For holding these views the anathemas of the Church had been launched at the devoted head of Mr. Darwin; he had also been subjected to a kind of Protestant excommunication, and his theory had been condemned by men, who, were it not that their eyes were blinded by dogmatic bigotry, would certainly have known better. Reverting to the theory of natural selection, he remarked that it had been objected that if it were true some signs of its action would be found in domesticated animals. He thought, however, that it was unreasonable to expect this, as in the artificial state of existence implied by domestication, animals were probably subjected to different modes of action of this law, as compared with those in a state of nature. Another objection was that no one had ever witnessed the process of development which it was alleged took place. When, however, the shortness of human life was considered, compared with that of many species; the extremely small development of most; and still more, how rarely the faculty of observation was found directed to such subjects as the appearance, variation, and extinction of any form of life, it was not surprising that such things had not been noticed. He asked if it was not probable that natural selection by variation of species and consequent development was continually going on around us, though unrecognised by reason of the extreme slowness of the process, and the close observation needed to perceive it. As no one had ever witnessed the development, certainly no one had ever witnessed the creation of a new species, and therefore the objection was not worth much, and seemed very much like a begging of the question. Mr. Huxley had said of Darwin that it was his misfortune to know more of his subject than any other man, and this was possibly the cause, in part at least, of the number of ignorant critiques upon his works. With regard to the ultimate truth of his theory, three things were necessary to prove it—firstly, to show that the phenomena referred to really existed in Nature; secondly, that the assumed causes of the phenomena were sufficient to produce them; and, lastly, that no other causes were sufficient. He thought that Mr. Darwin had shown good reason to believe that the phenomena really existed in Nature, and that the assumed causes were sufficient to produce them; but in the third requirement he had not, perhaps, as yet, quite succeeded, though he had accounted satisfactorily for most of the phenomena which were seen around them. It must be remembered, however, that Mr. Darwin's theory was, in the very nature of things, incapable of logical proof, as the alleged facts were of so wide and comprehensive a nature, and embraced such enormous periods for their accomplishment, that all that could be done was to reason by induction in the matter. There was, however, another difficulty. In order to prove the truth of his theory, Mr. Darwin ought to be able to show that it was possible to produce from a particular stock, by selective breeding, two forms which should either be unable to cross with one another, or whose cross-bred offspring should be infertile with one another. This had not as yet been done. It would, however, be rash to say that it could not be done, as so little was known of the laws which rendered animals sterile or the reverse. Mules would not breed together in England, but he believed that in Spain they did so, and it was possible that the difference in climate might have some effect in producing this result. If Mr. Darwin's only published book had been "The Origin of Species," he would still have done good work in pointing out the way to a true theory of the development of species by material selection. He believed it was Professor Agassiz who said that a new theory must pass through three different stages. At first people said "It is not true;" then "It is against religion;" and lastly, "Every one knew it before." (Laughter.) He (the lecturer) thought it might fairly be said of Mr. Darwin's theory that it was at least in great measure a true guide to a broader and higher knowledge of the subject; that it was not opposed to religion properly so called; and that every one did not know it before; but that it had brought forward facts hitherto unknown, and that further there was a growing acknowledgment of the truth of his theory by some of the most eminent naturalists of Europe. One of the principal advantages attending the theory was that it explained better than any other a phenomenon in the geographical distribution of species, which it was very difficult, if not impossible, to explain in any other way—namely, the fact that in certain parts of the world species were found existing which were certainly not those best suited to the surrounding conditions; for other species, introduced from other surrounding far-off districts, speedily took their place. This was found to be the case in but little known parts of the earth's surface, where, according to all appearance, there has been very little if any change in climatal conditions for a very long period. If all these species had been created by the direct act of God, they would naturally expect to find them in those positions only which were best suited to their welfare; but to some extent at least the reverse was the case, and the only rational explanation of this phenomenon seemed to be Mr. Darwin's theory, by which they had only to imagine that certain forms of life migrated to certain localities, where, finding no allied species to interfere with their welfare, they established themselves *pro tempore;* but when the time arrived for the introduction of species better suited to the natural surroundings, the latter superseded the former, which would in course of time perhaps become extinct. Lastly, in forming an estimate of the scientific attainments of Mr. Darwin, as giving him a fair claim to the reverential remembrance of future generations, it should be borne in mind that the most characteristic feature of his works was perhaps not so much the fresh facts he had accumulated (though these were numerous and valuable) as the altogether new light he had thrown upon the subject of which he treated, and which seemed transfigured by his wonderful genius. A great deal had been said about the necessity of reconciling science with religion. It was quite true that, considering religion as apart from mere dogmatic theology, such a reconciliation was much to be desired; for it would be merely a re-union of what was naturally one—being, indeed, but different forms of the same truth. Mr. Darwin's theory had, doubtless, exercised many minds in this effort, and it was sad to think how many noble minds had been overthrown, and how many had been driven into unbelief, by the vain attempt to reconcile God's laws, as revealed in Nature, with their own narrow, dogmatic notions of what they called religion. But surely it might be said with truth that so long as religion was believed to depend in any way on mere external authority, so long would those efforts, however well meant, be fruitless. What, then, was the true method of reconciling the two? He must leave this for wiser men than himself to decide. For his own part, he could only say that he was more and more convinced that true religion was not opposed to true science, but that both came under the same law—the former being merely the development of the moral and emotional part of their nature, as the latter was that of the intellectual. He would conclude by expressing a hope that in his treatment of the subject he had not hurt the feelings of any one present, as he should be exceedingly sorry if such were the case.

The PRESIDENT said he was sure Mr. Jecks had put the subject before them in so delicate a manner that it was out of the question that he should have hurt the feelings of any one present. A frank statement of any truth ought to hurt the feelings of no one. They were there for the discussion of facts, and did not bring in political, social, or denominational distinctions. Every man who studied nature had a right to state his view of things, and Mr. Jecks had stated his opinions in a manner which no one could take offence at, but which all would rather be inclined to coincide in. The President then invited discussion upon the subject, and hoped that no young man present would fear to express his views. As there was no immediate response to the invitation, he went on to state that the lines of demarcation between species were so indistinct that the question was one that could not be settled there for or against. The men capable of entering the lists against Darwin might be counted upon the fingers of both hands, if not upon one. He was a profound philosopher, a most industrious accumulator of facts and statistics, a most acute observer, and a thoroughly honest disputant. Those who had occasion to differ from him in his arguments would never have been able to do so but for the objections he had honestly stated himself in his books. For twenty years he could have mastered any one of them with the most perfect ease. As for the poor critics who had assailed him, they were not to be thought of, and Mr. Darwin must look upon them with scorn and contempt if he were capable of such a feeling. He was a great man, who was not to be sneered down. He (the President) did not exactly coincide with him, but he did respect him as the great philosopher of the age. Never did he blink a fact, and he stated his opinions modestly. He thought, however, that Mr. Darwin was so impressed with great truths, as he believed them, that he sometimes drew deductions which he (Mr. Lee) with his insufficient knowledge, thought he was hardly warranted in drawing, and he stated things sometimes which militated against the deductions which he drew. But the heterodoxy of to-day in many cases proved the orthodoxy of to-morrow, and that which was now not sufficiently comprehended would hereafter be recognised and appreciated at its true value. He denied that Darwin's theories militated against the great truths of religion. Nothing had made itself, and he (Mr. Lee) believed there was one great Maker, and whether things were made by special creations, or natural laws made from the beginning, sufficient for all time, there was still one Great Architect and Designer who was an all-sufficient Creator. He did not think that anything Mr. Darwin had said militated against that belief, as he did not say that there was no Creator.

Mr. R. A. James was sorry for the sake of himself and some others not sufficiently acquainted with Mr. Darwin's theory, that the lecturer had not mentioned it to a greater extent. It was some years since he himself read Mr. Darwin's book, and he traced the subject from the small microscopical organisms in water up to the time of the amphibious animals. From thence he followed the author very clearly indeed, but he could not help laughing when he got to the part where the animals lost their tails. There he could not follow him. When he got to the passages referring to the gorilla, it appeared that that creature was not far removed from man, because Mr. Darwin conclusively proved that the cranial capacity of the savages in New Zealand and of the North American Indians was only just above the cranial capacity of the gorilla. They all knew that intellectual development came to those savages by a process of civilization, till they were gradually able to hold their own with the white man; and as the years went on he did not hesitate to say that they would become quite on a level with the ordinary white man. If they had heard a little more on these points he should have been very much delighted.

The Rev. R. R. Suffield said he was very reluctant to make any remarks upon the subject, as he felt how inferior his knowledge was to that of the President; but whilst he entirely concurred in the general line of argument pursued by Darwin, his own opinion very much coincided with that which Mr. Lee had expressed. He thought there was a great deal in Mr. Darwin's theory; but that he had not produced sufficient grounds for carrying it out to the full extent. For instance, it struck him that they ought to see the formation of different things going on in the manner in which Mr. Darwin supposed everything to have taken place, but it did not seem that they were presented with those facts. He felt really ashamed to mention his own theory, but according to his limited knowledge it seemed to him that it coincided with what they saw in Nature to suppose that there had been an epoch at which there had been something like a distinct commencement. For instance, he did not think that Darwin had made out in at all a satisfactory way the origin of one portion of Nature—the existence of man, which had been an anxious source of discussion since his work had been published. He must confess that looking at it by the simple collection of facts which Mr. Darwin had brought forward, he should expect to find something existing at the present time in Nature analagous to what Mr. Darwin supposed to have taken place in times past. He should have been glad if some one else more competent had elucidated that point, as it seemed to him to be exactly the one which Mr. Darwin had not sufficiently proved in his works.

The President said that if the discussion elicited had been but brief, Mr. Jecks must not take it as evidence of any want of appreciation. The fact was that the subject was a very difficult one to express an opinion upon, and he felt that he had himself almost gone beyond his limits in saying what he had. He did not hesitate to thank Mr. Suffield for taking part in the discussion, and he was sure they would show their appreciation of Mr. Jecks' lecture by giving him their hearty thanks for coming there.

Mr. Jecks, after briefly returning his acknowledgments for the compliment paid him, said, with regard to what Mr. James had mentioned about the brain of the Indians and the apes, it was so difficult a question to decide upon in any way, that he did not feel competent to speak decisively upon it. The different capacity of the brain itself was so variously estimated, even with regard to the primitive subject of man as man, that it was difficult, indeed, to estimate the capacity of the brain of the earliest inhabitants of the world as compared with the capacity of those at present existing. One of the earliest skulls ever exhibited showed a brain capacity such such as might have been possessed by a philosopher living at the present day, but it was a difficult matter to speak about, as Darwin himself would have confessed, as he was not a man to shirk difficulties, but confessed them fairly and openly. With regard to Mr. Suffield's kindly criticism, he thought that gentleman in a great measure agreed with himself. With respect to the possible discovery of the links which connected the anthropoid family with the early races of man, those links had not been sought for in the sources whence they are most likely to be found, namely, in the tropical climates in the interior of Africa, where it was possible that the earliest race of man first came into being. Nothing was known geologically of Africa, and comparatively nothing of the whole of the earth, as it was only a very small portion of the earth that had been geologically surveyed. He, therefore, thought they would come to no decision as to whether those links between man and the lower animals might or might not be found, and as it was desirable to suspend one's judgment until the areas he had spoken of had been geologically surveyed. They knew what vast strides geological science had made during the last twenty, and even within the last ten years—how forms of life which formerly were supposed not to have existed lower than the tertiary or secondary strata were now found to have existed in far earlier times. He was, therefore, sure that the point was one upon which they could come to no definite decision. He thanked the members of the Club very much for the way in which they had received his paper.

Messrs. W. H. Beeby, Philip Crowley, J. S. Johnson, K. McKean, E. Lovett, Geo. Perry, and A. D. Taylor exhibited microscopes and objects.

March 6th, 1876.—Conversational Meeting. Eight members present.

March 15th, 1876.—Paper read by Mr. Alex. Hay Halley, "On some Habits of the White Ant."

The President, Mr. Henry Lee, in the chair. The minutes of the last meeting were read and confirmed.

Mr. Geo. Wm. Berridge was ballotted for and duly elected a member of the Club.

The following gentlemen were nominated for membership: Mr. John Chumley, of 3, Park Villas, Alexandra-road; Mr. Sidney Pitt, Grove Road, Sutton; Mr. Wilfred Godden, and Mr. William Godden, Walgrave Road, Sutton.

The President said it was with some considerable regret on the part of the Committee (although in reality it should not be, as it was for the benefit of their friend), that he announced that Mr. Kenneth McKean was about to leave this country for Madras, and that this was the last time he would be able to act at the Club officially as Hon. Secretary. He was sure that the Club would gladly join the Committee in a proposition they had made to present their friend with some little memento of their personal regard and esteem, and in recognition of the valuable services he had given to the Club. The form which the little testimonial was proposed to take was an inscription on vellum, and there was no doubt the Club would readily delegate to the Committee the task of preparing the inscription. As Mr. McKean was on the eve of his departure it would be necessary to present him with the testimonial before the next meeting; and it had also been proposed to make their excellent friend an honorary member of the Club. It would be an indication—small as it was—of the hearty good-will they had towards him, and they hoped that whilst he was away Mr. McKean would be cheered by the remembrance of their friendship, and the pleasurable associations with the Club. It was hardly necessary to move the proposition he had submitted, in the shape of a formal resolution, for it was a suggestion that at once commended itself to their sympatheis, and therefore he would ask them to signify their approval by rising *en masse*, which would be preferable to a demonstration of cheers.

The members present having risen in compliance with the President's suggestion, that gentleman announced that the proposition was unanimously carried.

Mr. McKean said he had to thank the Club sincerely for the very kind way in which they had treated him. He confessed that his labours had been very light, and that his official connection with the Club had been very beneficial to himself, for he had learnt several things in connection with the duties of secretary which probably might be of advantage to him hereafter, and he had also made pleasing associations with friends whom he otherwise might not have had the opportunity of meeting.

The President then announced that Mr. Edward B. Sturge had kindly consented to officiate as Hon. Secretary, and there was no doubt that gentleman's services would be highly acceptable to the Club, as he had, on more than one occasion, proved himself a valuable and useful member. This would cause a vacancy on the Committee, and it was proposed that Mr. John Flower, whose services they had unfortunately lost in that capacity, should be appointed to the post vacated by Mr. Sturge. As it was more agreeable that these gentlemen should be formally appointed by the Club, he gave notice that at the next meeting there would be a special general meeting for the election of Mr. Sturge as secretary, and Mr. John Flower as a member of the committee,

The President also announced that arrangements were in progress for the summer excursions of the Club, and an endeavour would be made to so fix them that they would be of service to the monthly conversational meetings of the Club. Mr. Lee also mentioned that at the next monthly meeting Dr. Philpot would read a paper on some recent microscopical researches with respect to infectious diseases, which was a subject much discussed just now, and would no doubt attract a large attendance of members;

and in May, Mr. Charles Stewart, secretary to the Royal Microscopical Society, and Fellow of the Linnæan Society, would read a paper, the subject of which had not yet been decided on. The annual lecture of the Club would also shortly be given in the large Public Hall, when it was probable that Professor Morris (who last year delivered an able lecture on the Geology of Croydon), would be succeeded by Professor T. Rupert Jones, F.R.S., &c.

The President then called upon Mr. Alexander Hay Halley to read a paper illustrating the Habits of the White Ant, from notes taken in Java. Before proceeding with the subject matter of his paper, Mr. Halley gave a description of the species generally, which he said were numerous, and distributed over temperate and tropical regions. Their habits and instincts were extremely interesting, and had attracted attention from remote ages. They lived in societies, often very large, which consisted, as in bees, of males, females, and neuters, the latter being females with imperfect ovaries transformed at an early stage of their existence, and were distinguished into two classes, workers and soldiers, the former constituting the greater portion of each society, the latter somewhat differing from them in larger size and larger and more powerful heads. The ordinary work of the society was performed by the workers; the principal part in warfare, defensive and offensive, was taken by the soldiers. Mr. Halley described the nests of ants, the process of pairing (supposed to take place in the air), the disposition, by the workers, of the eggs deposited, and the care taken by them of the young larvæ and pupæ, which, on being disturbed, are carried on the backs of workers to places of safety. Their resemblance to a grain of rice or corn had led to a general belief that they amassed stores of that commodity for winter food, but it was extremely difficult to ascertain whether this was so, as ants were in an entirely torpid state during winter. The habitations of ants were very curiously constructed, displaying great ingenuity, although with great diversity in the different species, the greater number of which formed their nests in the ground, and these rose above the surface in the forms of a dome; hence the name "ant hills," commonly given to them. The White Ant was one of the most dreaded of insects in all tropical countries where they abounded; and they committed great havoc in house roofs, furniture, woodwork, and amongst crops, and all sorts of devices had to be resorted to in order to preserve property from these destructive insects. When in Java he was warned that the presence of these insects in a room might be detected by a noise like the dripping of water, which showed that they were eating their way upwards. After vainly listening on several occasions for the singular sound, he one night heard it at the uther end of his room, and on lifting up the matting he observed hundreds of these little insects, which were about the same size and colour as a grain of wheat. They had worked their way up a small crevice between the wall and the floor, and had already constructed tunnels along the canes of the mat, having eaten the underside quite away. These creatures never worked in the light—hence the formation of tunnels, which were beautifully constructed of small particles of clay or earth; they were evenly built, and of uniform thickness throughout. He had seen one of these tunnels raised about six feet in one night, which was evidence as to their rapidity in building. Their mode of working a tunnel greatly interested him. On opening one of them he observed a continuous double line of insects, one line going up and the other down, and so admirably was the tunnel constructed that there was just room for the ants to pass each other without touching. The white ants were subject to attacks from a deadly foe in the shape of long red-legged ants, who generally succeeded in carrying off an equal number of white ants. The queen of the white ants laid about 60 eggs in a minute, or 80,000 or upwards in the course of 24 hours; these eggs were instantly taken away by the workers to portions of the ant-hill where they were hatched, and the larvæ attended to and nursed until they were able to shift for themselves. In Java, a long piece of bamboo was used to fill the tubs used for bathing purposes in connection with wells from which the water was obtained. The piece of bamboo he was speaking of was 13 feet long. He happened to be taking his bath at 6 a.m., and on looking up to the ceiling he was surprised to find that these insects had been at work during the night, and had formed a tunnel from the floor up the interior of the bamboo tube to the ceiling and through the roof; and as a proof of the rate at which they had worked, the bamboo tube had been used at five o'clock in the evening before, which gave them only 13 hours at the most. He knocked the tube on the floor, which caused the insects to drop down by scores, and so far from being disconcerted or frightened by the suddenness of the movement, he was surprised to see them take their places in admirable order, ten or twelve deep, with here and there two or three single ants to separate the different companies. There were about ten of these bodies, and this orderly behaviour astonished him more than anything he had hitherto observed of their habits, for one would naturally have expected confusion at being thus roughly used. In conclusion, Mr. Halley said the white ants and others of the tribe were very useful in clearing away refuse animal and vegetable matter.

In a short discussion which followed, mention was made of colonies of small red ants, which had lately found their way into dwellings, and against the ravages of which it was very difficult to keep articles of food. If a bone was left on the table at night it would be covered with swarms of these little insects, and bread and other articles of human consumption were equally liable to their rapacious attacks. These creatures had appeared in swarms in a number of houses in Croydon, and so great was the annoyance to the tenants, that some of them had been compelled to leave their houses. Boiling water had been resorted to amongst other means for their extirpation, but apparently without effect; and it was only after shutting up a house for a time that these insects were effectually got rid of.

Mr. J. Berney said that a good way of getting rid of these pests was by applying a sponge containing sugar or molasses to their haunts, and submerging it in hot water, repeating the process until the ants were extirpated.

A vote of thanks was then awarded to Mr. Halley for his interesting paper.

The following gentlemen exhibited objects with their microscopes: Messrs. A. H. Halley, W. H. Beeby, J. Berney, Edward Lovett, A. D. Taylor, K. McKean, and H. M. Klaassen.

Mr. John Gregory presented for distribution among the members specimens of Sphœraphides of Echinocactus, and received the thanks of the Club.

April 3rd, 1876.—Conversational Meeting. Eight members present.

April 19th, 1876.—Special Meeting. Paper read by Charles W. Philpot, Esq., M.D., "On some recent Microscopical Researches with respect to Infectious Disease."

Description by Mr. John Flower, F.Z.S., of a "Male Hybrid between the Black Grouse and the Hazel Grouse."

The President, Mr. Henry Lee, in the chair. The minutes of the last meeting were read and confirmed.

The following gentlemen were ballotted for and duly elected members: Mr. John Chumley, Mr. Wilfred Godden, Mr. William Godden, and Mr. Sidney Pitt.

Mr. Kenneth McKean was ballotted for and duly elected an Honorary Member, Mr. E. B. Sturge was appointed Honorary Secretary in the place of Mr. McKean, and Mr. John Flower was elected to fill the vacancy on the Committee caused by Mr. Sturge's appointment.

The PRESIDENT announced that in accordance with the following resolution passed unanimously at the last meeting, viz.:—"Croydon Microscopical Club.—At a meeting of the members "holden on the 15th day of March, 1876, it was resolved unani-"mously that the Honorary Membership of the Club be conferred "on Kenneth McKean, Esq., on his departure for India, and that "this be accompanied by the expression of the best thanks of the "Members of the Club for the valuable services rendered by him as "its Honorary Secretary, and of their sincere wishes for his "happiness and success in life.—Signed Henry Lee, President,"—a testimonial on vellum had been prepared and engraved with the foregoing, and presented to Mr. McKean on the eve of his departure, and that Mr. McKean had requested him to convey his hearty thanks to the members for the honour they had done him.

The PRESIDENT further announced that the Lecture by Professor Rupert Jones on "The Antiquity of Man" would take place on Wednesday 26th inst. in the Large Hall, and also that Mr. Charles Stewart, F.L.S., F.L.M.S., &c. would read a paper on "Sea Stars and Sea Urchins" at the next meeting to be held 17th May.

It was also announced that Mr. McKean had very kindly presented the Club with 58 slides, chiefly of his own mounting.

Dr. PHILPOT then read a paper.

I thought that an account of some recent microscopical researches, which have greatly advanced our knowledge of the nature of infectious disease, would be interesting to the members of this Club. On further consideration, however, I saw that this presupposed for its due appreciation an acquaintance with minute anatomy and pathology such as only those of my audience who have received a technical education in these subjects would be likely to possess. I have therefore widened the scope of my paper, and instead of giving a detailed account of the brilliant discoveries by which the causes of certain specific infectious diseases have been identified with low vegetable organisms (such as would be only interesting to my professional hearers), I propose to take a wider view in this paper, and treat of microscopical vegetable fungi, not only in relation to infectious disease, but in connection with other processes occurring in nature, with the causation of which they also appear to be intimately related, and this I trust may prove of interest to all. In the process of fermentation and putrefaction, chemical changes appear to be occasioned by the rapid growth and multiplication of minute living organisms. These processes are not only extremely interesting in themselves, but derive additional interest from the light which a study of them has thrown upon the nature of infectious diseases. Indeed, the well-known term Zymotic, applied to the large class of infectious diseases, points out the analogy which is supposed to exist between them and the process of fermentation. And this analogy gave rise to the germ theory of disease, a theory the truth of which has been confirmed by recent research. In fermentation, putrefaction, and disease, the access of the germs of certain microscopic plants sets up a process of change, the process of which is accompanied, nay probably is caused, by enormous growth and multiplication of the plant. When fermentation takes place in a saccharine solution the greater part of the sugar is resolved into carbonic acid and alcohol, the elements of which, taken together, are equal in weight to those of the sugar. A small part breaks up into glycerine and succinic acid, and one or two per cent. is not yet accounted for, but is, perhaps, assimilated by the Torula plant. The carbonic acid escapes in the form of minute bubbles, the alcohol remains in the solution, from which it can be separated by distillation. The plant by which these chemical changes are connected is the Torula, or Saccharomyces Cerevisiæ, or yeast fungus. If a small piece of germinating yeast is examined under a microscope with a magnifying power of 3,000 diameters, it will be seen to consist of numerous transparent colourless oval bodies, varying in size from $\frac{1}{2500}$ to $\frac{1}{7000}$ of an inch (with an average size of $\frac{1}{3000}$ of an inch), some single, but many joined together in heaps or strings. Each of these minute bodies is a cell, consisting of a thin transparent sac, the "cell wall," and its semi-fluid contents, the "proto-plasm." Under favourable circumstances rapid growth and multiplication takes place, minute buds appear on the surface of each Torula, which become detached at various stages of their rapid growth, some when they are extremely minute, others not till they have reached the size of the parent Torula, and have themselves developed buds and these yet others. Torulæ thus produced by budding the one from the other frequently continue to adhere together in heaps or strings. The Torula multiplies in another way, by the process of endogenous division; no budding takes place, but the "proto-plasm divides into (usually) four masses; each of them surrounds itself with a cell-wall, and the whole are set free by the dissolution of the cell-wall of the parent." (Huxley.) Reproduction further takes place by aeriel spores.

The power of exciting fermentation is inherent in the Torula cells and not in the fluid part of yeast, for when they (and their minute germs) are separated from the fluid by a very fine filter, such as porous earthenware, the latter will not give rise to fermentation when added to a saccharine solution. Further, the production of fermentation is connected in some way with the vital processes of life and reproduction of the fungus. Probably the peculiar power which the plant has of seizing some of the elements of the sugar and appropriating them for its own growth, may in some way set up the chemical changes. The activity of the fermentation is directly proportionate to the rapidity of growth of the plant, and conditions which destroy its life deprive it of its power of fermentation. Independent of the Torula, fermentation does not occur; a saccharine solution will not ferment spontaneously. If it begins to ferment, yeast has undoubtedly got into it in some way or other. If it is boiled so as to destroy the efficiency of any yeast germs it may actually contain, and then allowed to come into contact only with such air as has been passed through cotton wool (which has the power of intercepting any germs floating in that medium) it will never ferment.

The chemical changes of putrefaction are intimately associated with the growth of minute living organisms, known as bacteria or microzymes. How far the microzymes are the cause of the chemical changes which are coincident with their evolution it is difficult to say. It has been demonstrated that many animal fluids show no little disposition to putrefy so long as the germs of microzymes are excluded, but that the putrefaction is at once excited by their access; therefore, under certain circumstances, it may be said that microzymes are the cause of putrefaction, and experience shows this to be the rule. Putrefaction does not occur spontaneously, but it is set up by the germinal matter of microzymes, and its progress is accompanied by their growth and reproduction. Having defined the terms bacteria, or microzymes, Dr. Philpot continued—From careful examination it seems probable that bacteria came into distinguishable existence as spheroids. What are the conditions of their origin? There being an immense preponderance of evidence that they do not spring into existence of themselves in the media in which they grow, most observers have looked for germs in the atmosphere, but with no success. Liquids which contain no particle distinguishable under the highest powers of the microscope can often be proved to possess the property of evolving microzymes without contact with external media, and must, therefore, contain the germinal substance from which these organisms spring. In interpreting this fact it may be supposed that the germinal substance is universally and equally distributed, *i.e.*, dissolved in such liquids, or that it is unequally distributed or particulated. That any living substance is soluble in water, is not at present admissable; we must therefore accept the other alternative, and believe that we have to do with particles so minute that they do not interfere with the homogeneity of the liquid.

If we take a small quantity of hay, for convenience, divided into small pieces, and pour sufficient boiling water on it to cover it, infuse for half an hour, and then filter, we shall obtain a perfectly clear fluid, which, in the course of a day or two will become turbid, and on the surface of which a scum will form later on; at the same time the infusion will have acquired a marked putrefactive odour. If we now take a drop of the solution and examine it under a high power of the microscope, we shall find it swarming with elliptical or rod-like or jointed bodies in active motion. These are the moving bacteria. An examination of the scum shows the bacteria in their resting stage. Mixed with the bacteria proper, both in the pellicle and the fluid beneath, we may find a number of forms of living beings.

The question arises whether the bacterium is an animal or a plant. It has a continuous cell-wall, and the power of forming a protein from inorganic matter, such as ammonium tartrate, which are distinctly vegetable characteristics. On account of its absorbing oxygen and giving off carbonic acid, and on account of its power of motion, it has been placed by many naturalists in the animal kingdom. But the whole group of fungi—plants which contain neither chlorophyll nor starch—absorb oxygen and give off carbonic acid, and many of the lower plants, especially in the group of Algæ, give rise, under certain circumstances, to locomotive bodies propelled by cilia. On the power which bacteria possess of seizing on the nitrogen of organic matter and appropriating it in the building up of their own proto-plasm, probably depends their power of exciting putrefaction. They have their place in nature as the universal destroyers of nitrogenous substances; they appropriate, for their own growth, the nitrogen which they steal. The germs of Torula are abundantly present in the air. In all fermentible liquids exposed to the air fermentation ensues sooner or later from the access of these germs. On the other hand the germs of bacteria, as Dr. Burdon Sanderson's experiments show, are not present in the air, but are abundant in water and on all surfaces not chemically clean. They exist in the purest waters, even in distilled water (unless very special care has been taken in its prepartion to exclude all possible source of contamination), and on the surfaces of all vessels.

Bacteria are not only interesting as natural objects and as the universal exciters of putrefaction, but they derive additional interest from their close association with certain forms of disease in the higher animals. It has been shown that in acute infective inflammation microzymes abound in the exudation liquids, and that the same forms are also to be found in the blood of the infected animals, their presence being a constant accompaniment of all acute infective suppurations. As to the part which bacteria play in the causation of these diseases, Dr. B. Sanderson says: "The presence of characteristic organic forms in infective liquids affords *in itself* no conclusive evidence that these bodies are themselves the *cause* of the infectiveness. If we inferred from the constancy of their characteristics and from their invariable presence that they are the *agents* which produce the pathological results, we might be as seriously in error as those who maintain, in the face of all the investigations made during the last few years, that they are without pathological significance. There is nothing in nature, and particularly in organic nature, without significance; nor ought it to diminish the interest which we take in any phenomenon, that we are unacquainted with its relation to the other phenomena with which we find it associated. If these infinitely minute organisms are present in every intensely infective inflammation, we may be quite sure that they stand in important relation to the morbid process."

Not only in acute infective inflammation, but also in diphtheria and erysipelas, microzymes, such as we find associated with ordinary putrefactive processes, have been discovered.

Beyond the discovery of the relation which microzymes (such as excite ordinary putrefaction), hold to what may be called the common process of disease, *e.g.*, infective inflammations, diphtheria, and erysipelas, our knowledge has advanced so as to enable us to connect certain specific diseases with specific organic vegetable forms. A large number of diseases have one character in common. They are capable of being communicated from one animal to another, either of the same or some other species. They are popularly spoken of as "catching," and scientifically, as infectious or contagious (communicable would be a better word), as in all such diseases the infecting agent or contagium consists of particles of extreme minuteness, with respect to which it can be asserted that the material of which it is composed is (1) not soluble in animal liquids, (2) is not volatile at ordinary temperatures, (3) that it possesses a specific gravity very slightly different from the liquid in which the particles are suspended.

The fever and other morbid processes which ensue at a short interval of time after the entrance of the germs into the system, are (probably) closely connected with their growth and multiplication. The smallest amount of contagium capable of exciting disease has an almost indefinite power of multiplication in the body.

I have already said that a connection has been traced between certain diseases and specific vegetable forms. These forms of vegetation have been found to be present in the contagious liquids;

they are forms which differ from those either after death in the normal tissues or liquids of the body, or during life in the products of primary or secondary inflammation. The diseases in which such forms have been discovered are small-pox, sheep-pox, a peculiar disease of horses and cattle known as splenic fever, relapsing fever, and lastly enteric fever. I take as examples the two diseases investigated by Dr. Klein with such brilliant success—sheep-pox and enteric fever. The former disease does not occur in man, not being communicable to him, but it has a very close resemblance to ordinary small-pox, a resemblance so close that we must believe the pathogeny of the two to be the same.

Dr. Philpot illustrated, by diagrams enlarged from the drawing of Dr. Klein, the various structures discovered by that observer in the lymph taken from the vesicles, and pointed out the highly refractive spheroid regarded by Dr. Klein as the only form characteristic of the lymph of sheep-pox in its active condition.

When the sheep is innoculated with the lymph in addition to ordinary anatomical changes occurring at the seat of innoculation in the development of the primary pock, Dr. Klein observed changes connected with the growth and reproduction of the micrococci. The lymphatic vessels in connection with the pock become distended with a matter which resembles coagulated plasma. In this, organised bodies appeared which neither belonged to the tissue, nor are referable to anatomical type, viz., spheroid or ovoid bodies, having the characters of micrococci and branched filaments. The process thus commenced makes rapid progress. After one or two days the greater number of lymphatics of the affected parts of the corium become filled with the vegetation above described; and on careful examination of the masses it is seen that they present the character of a mycelium from which necklace-like terminal filaments spring, each of which breaks off at its free end into condia. In most of the filaments a jointed structure can be made out. When the vesicles have formed they are seen to contain masses of vegetation similar to those found in the lymphatics, with this difference, filaments of which the masses are composed are of such extreme tenuity and the conidia are so small and numerous, that the whole possesses the character of zoogloea rather than of mycelium. Similar changes take place in the secondary pustules.

In the case of enteric fever, experienced pathologists had already argued that it was a disease due to a specific poison, that the contagium is a specific and living organism, which, when transmitted from a diseased to a healthy individual, produces the same disease in the latter; and further, that the chief if not the only vesicles of the poison are the ejecta from the bowels of an infected person. Contagium in the form of a living organism could not be expected to produce infection at once, and the theory that it is organised is *prima facie* justified by the circumstance that a period elapses between the reception of the contagium and the manifestation of the disease (the period of incubation) during which the poison lies dormant, but is in reality ripening towards an active condition. According to Dr. Klein no other view of the poison affords any explanation of the incubation period. No one had hitherto succeeded in pointing out any specific organic form as the probable cause of enteric fever. Dr. Klein discovered in the stools of patients suffering from enteric fever numerous bright, highly refractive, spherical, micrococci, of varying size, both solitary and in chains or necklaces, and at times rod-like structures from which these micrococci could be traced to originate. He traced these not only in the stools, but also in abundance in the mucous membrane of the bowel (the ileum) in the stages proceeding ulceration. In these parts of the ileum which at the commencement of enteric fever appear to the unaided eye only to be slightly increased in thickness, Lieberkuhn's crypts are seen to contain, in smaller or larger masses, corpuscles of a greenish yellow colour, highly refractive, varying in form and also in size from about twice the size of a human blood corpuscule to that of a minute granule; and it is evident, from the appearances they at times present, that they multiply by transverse division from their character. Dr. Klein concludes that they must be of the nature of vegetable organisms, and that we have to do with a fungus which possesses mycelium threads of very unequal joints. In some parts of these threads—probably the terminal parts—their contents split into macro-gonidia and micro-gonidia, and the gonidia, when discharged, undergo rapid division so as to form a kind of zoogloea. Dr. Klein, therefore, identifies the contagium of enteric fever with a low form of vegetable life. The fungus is not only found in Lieberkuhn's follicles, but in the tissue of the mucous membrane near to Peyer's glands, and the spores and micrococci find their way through Lieberkuhn's follicles into the lymphatics and blood vessels, and even into the mesenteric glands. Dr. Klein remarks that the appearance presented by this organism corresponds closely with those described by Cohn as characteristic of the vegetation discovered by him in the well water in a district in Breslau, famous for enteric fever—the Crenothrix Polyspora. The discovery will prove of value in preventive rather than curative medicine. It confirms the view which was previously arrived at by nearly all sanitarians of experience, viz., enteric or typhoid fever is a specific infectious disease (as infectious in its way as small-pox), communicated to the healthy by a specific contagium contained in the ejecta from the intestines of individuals suffering from the disease. The disease-germs find an entrance to the bodies of the healthy in one or two ways, either with the air that is breathed, or with water or food that is swallowed. Moist air from infected sewers, or water or food polluted with infected sewage are the conveyors of the disease. You will see with me, therefore, how futile it is to talk of atmospheric influences giving rise to enteric fever, or to account for the epidemics of the disease in one place by the fact of its prevalence in other and distant parts. Happily for us such is not the case; if it were so we must cease to talk of enteric fever as a preventible disease. I say emphatically all our knowledge proves that enteric fever is an eminently preventible disease, and is caused solely and entirely by local remediable sanitary defects—defects which allow the air from infected sewers to escape into our houses, or defects such as permit infected sewage to mix with our water or our food. It only remains for me to acknowledge my indebtedness to the writings of Huxley, Burdon-Sanderson, and Klein, for the materials of my paper, which lays no claim to originality; and to thank you for your kind attention.

Dr. Carpenter, being called upon by the President, remarked that for himself he was much obliged to Dr. Philpot for having so nicely condensed the observations of Dr. Klein, Burdon-Sanderson, and others. He had shown very nicely the way in which certain specific forms set up certain diseases in the human frame. He had explained this from its commencement down to the very forms of life, and he (Dr. Carpenter) gathered that bacteria and the forms connected with them were vegetable rather than animal. The alliance that existed between those and fungi must be manifest. They knew that fungi did discharge functions in the same way as human beings, but, at the same time, they had no possible reason for being considered animals. They were vegetables, and he (Dr. Carpenter) could not help thinking bacteria had some alliance. They, perhaps, might occupy the ground between vegetable and animal life, and, as they were aware, there was no real break in nature. Here appeared to be the meeting point. There were many matters in connection with this subject which at present physiologists did not understand. The work this Society, with others all over the country, was doing by bringing their powers to bear on microscopical research, would help to solve some points in time, but each point required considerable time and research, and it was only one out of 50,000 who had a chance of working them out in the way Dr. Klein had done. The observations that gentleman had made with reference to enteric fever had proved most conclusively that that disease was, at any rate, in close connection with a portion of vegetable matter in the human economy. Whether it was the cause of the fever, or whether it was the effect, was a disputed point. He (the speaker) was very much inclined to agree with Dr. Klein that it was the cause of the fever, because, wherever they transported these germs, they found, in all probability, fever set up. There were some points in connection with the subject which were very curious ones, and it was in connection with certain forms of disease, where it was found the introduction of bacteria in the blood of animals and even human beings had not set up the mischief supposed to result from them. It was a curious circumstance that bacteria, perfectly the same to all intents and purposes, had not set up the disease in question, and certain results of a similar character had followed from the injection of these germs. It might appear at first sight that this was much opposed to the deductions of Dr. Klein; but there were plenty of instances in nature that showed that this was not so. If they took the spores produced from the ordinary mushroom and placed them in a garden flower-pot with fine mould they would not grow. They had to be brought in communication with the mucous membrane of the horse, by using dung or by other means. There might be some point of connection wanted with reference to this very matter, and that it must come into being with certain conditions of the human economy, which were not necessarily always present, but that it took root and grew. His impression was that if a person was in perfect health—if there was no excretion retained in the body which ought to be out of it—there was no manure in him in which that fungus could grow. But if that person lived in a house improperly ventilated, in which emanations from sewers were found to exist, or lived in a confined situation, there was produced a ground in himself in which the fungus could take root, and this person was subject to typhoid fever. He thought this would explain some of the points which appeared to be doubtful at first sight. Gardeners well knew that there were many ways in which the plants under their care were altered in their character without the root being interfered with, and it might be that human beings had alterations take place in the way shown by Dr. Klein. He (Dr. Carpenter) thought the Society should be much obliged to Dr. Philpot for having so clearly put before them some of the important points in his paper.

No other member having any remarks to make, a vote of thanks was accorded Dr. Philpot for his interesting paper, and a similar compliment was paid to Dr. Carpenter for the valuable observations he had made.

The following gentlemen placed their microscopes at Dr. Philpot's disposal:—Messrs. J. Berney, W. H. Beeby, P. Crowley, J. S. Johnson, H. Kemp Welch, E. Lovett, H. Turner, and E. B. Sturge.

back wrapper. Keeper to see that
Geol. Dept. CDT

Mr. JOHN FLOWER exhibited and described a male Hybrid, between the Black Grouse *(Tetrao tetrix)*, and the Hazel Grouse *(Bonasa betulina)*, which he had purchased at the shop of Mr. Smithers, poulterer, Cannon Street, London, on March 16th, 1876. The Black Grouse has been known to cross with the Capircailly, the Willow Grouse, the Common Pheasant, and even with the Barn Door Fowl: all of which species are polygamous. It has also been known, on one or two occasions, to cross with the Red Grouse, which is monogamous, but this is the only instance on record of a hybrid between the Black Grouse and the Hazel Grouse, which is also a monogamous species. Judging from the plumage this bird seems to be the produce of a Hazel Cock, and a Grey Hen. Mr. Flower called particular attention to the peculiar structure of the bird's feet, which much resemble those of the Black Grouse, and are specially formed to enable the bird to walk with ease and comfort over soft and yielding or hard and slippery snow. This bird was exhibited at a meeting of the Zoological Society of London, on April 4th, and excited much interest.

At the conclusion of the description, which was listened to with much interest, the President expressed the thanks of the Club to Mr. Flower, and the meeting was soon afterwards brought to a close.

April 26th, 1876.—Extra Meeting held in the Public Hall. The President, HENRY LEE, Esq., in the chair.

Lecture on "ANTIQUITY OF MAN," illustrated by the Contents of Caves and Relics of the Cave Folk, by PROFESSOR RUPERT JONES, F.R.S., F.G.S., &c., &c.

Mr. H. LEE, the President, in introducing the Lecturer to the audience, said when the Croydon Microscopical Club was established, just six years ago, and a preliminary meeting of its promoters was held at his house, little more was anticipaied of it than that a few men interested in microscopical science might meet together for their mutual pleasure and advantage at each other's residences; but before they had actually started, so many expressed a desire to join the movement that they had about forty members. Their opening meeting was honoured by the presence of many first-class men, among whom was the founder of the Microscopical Society of London, now the Royal Microscopical Society. They started, therefore, with good assistance, and since then, he was happy to say, they had made rapid, though sure and steady progress, and the Club now numbered nearly 200 members. (Cheers.) They soon found that the funds at their disposal, obtained by small subscriptions from a large number, enabled them to invite their lady friends to attend a soirée, to admire various beautiful objects which could be seen under the microscope, as well as curiosities and specimens that were lent them for exhibition. Soon afterwards they saw their way clearly to occupy wider ground, and they altered the Club so that it might take up its position as the Natural History Club of this district of Surrey. They felt also that it was right that they should utilize their funds for the advantage of their present members, as well as keep a prudent balance for proper contingencies, and whilst accumulating a library of books, and a cabinet of objects, they found themselves in a position to extend their invitations to the spring as well as the autumn season, and listen to a first-class lecture by a first-class man. Their first lecture was given by Professor Morris, on "The Geology of Croydon." He ventured to say that the lecture was one which would be an honour to any society, and that it would take its place in the literature of this country as long as time should last. It seemed to him that the lecture Professor Jones was about to deliver would be a fitting sequel to the lecture of his predecessor, and that after hearing Professor John Morris deliver his masterly address on the physical changes which had taken place on the earth, they might very well ask Professor Rupert Jones, who was equally well known, to be kind enough to come there and tell them what science had proved with respect to the first appearance of man upon the globe, and those who were the former inhabitants of our country. He then formally introduced Professor Jones to the audience.

Professor Jones introduced his subject by reminding his hearers that antiquaries can trace back the successive periods of governments and dynasties by the relics and ruins beneath London, from the Georgian to the Roman age. He referred to Colonel Lane Fox's discovery of the old pile-village of the Romano-British period in the Finsbury Marsh, and to the indications of still older aboriginal wattled huts in pit dwellings on the gravel subsoil beneath Paul's Cross, in Cheapside. The fossil contents of this gravel, under various parts of London, lead us further back in time beyond the historic and pre-historic ages to what geologists termed the Pleistocene period, when the Thames, much wider than now, formed great shoals of gravelly shingle and wide-spread flats of loamy flood-mud, and drifted away the carcases of mammoth, rhinoceros, lion, urus, musk ox, and other animals now strange to the district. The relics of man, such as implements of stone, were found here and there, with the bones of these Pleistocene animals in the valley gravels of the Thames and its tributaries; also in similar gravels in neighbouring valleys, both in England and France, and in the caves of limestone districts, where similar conditions existed. The subsequent decrease of the river, leaving its margin of gravel and loam, and the ultimate coating of peat over the marshy flats bordering its now narrow channel, completed the history of the changes down to the historic period. In these later river deposits, and in the peat bogs, implements of polished stone, of bronze, and of iron, were found to have been successively deposited; but in the older gravels, and associated loams, whether in the valleys or in the caves, stone implements (shaped only by chipping), were found, and the oldest kind, have given the name "Palæolithic" to their period, whilst the subsequent age, when man had got the habit of sharpening his weapons of stone by grinding, is termed "Neolithic." The great lapse of time required to complete the formation of the Danish peat-bogs in which implements of iron, bronze, and polished stone are successively accompanied by the beech of the present period, the older oak, and the still more ancient fir tree, belonging to these three changes of conditions, and of the associated animal life was next dwelt upon. An account of the Swiss lake-dwellings, or pile-villages, was then given; and the indications of successive generations of peoples, using iron, bronze, and polished stone tools, in more or less distinct gradations, were pointed out. Those using implements of stone were not altogether uncivilized; and yet, if the incomplete evidence of geographical changes be accepted, they lived some 6,000 years ago, before the Roman conquests of western Europe. They did not possess the reindeer, though the animal had been hunted near by in earlier times by cave-dwellers (Canton Schaffhausen), and in France, and then the climate must have been cold enough for its existence so far south, and cold enough for the habitation of rock shelters or sunny slopes, where, during the present summers of France, even for the stench-bearing Esquimaux to abide, with the heaps of garbage, stinking flesh and bones, would have been impossible; but there, the hunters of the reindeer, horse, and musk ox, did live, using chipped flint tools, and knowing not how to grind and polish them—though they used some kind of grindstones in preparing food and paint, and were artistically inclined. They cleverly engraved outlines of animals and other things on bone, ivory, and stone, with pointed flints and shaped bone and ivory, into handles of poniards and quaint statuettes. Among their drawings is a lively figure of the hairy high-fronted elephant (Mammoth), which they therefore must have seen, and which ranged over colder regions of the western hemisphere. The long and unknown space of time requisite for the change of climate from Arctic conditions in South France and Switzerland to warmer winters and hotter summers, unfavourable to the existence of mammoth, reindeer, and musk-ox, divided the cave-dwellers using chipped flakes, from the lake-dwellers using polished stone implements. These cave-folk of Dordogne and elsewhere, however, were by no means the oldest inhabitants of caves. They lived at, or near the level of existing rivers; but there are caves containing relics of human inhabitants, which have been left high up in the limestone cliffs, whilst the rivers have worn away the gorge below to a great depth. This is shown by the presence of certain pebbles in the deposits within the cave, which must have rolled across the interval, from the other side of the valley, whilst a floor existed at the level of the cave. If this excavation be due to the violent rush of the torrent from the increased slope of its channel, caused by the rising of the land, what was the rate of elevation? Further, some few of the caves contain stone implements of ruder make than those left in others; and the valley gravels left behind as terraces and isolated patches by the rivers, which have deepened and narrowed thin channels, also contain such rude and even ruder implements, carefully, but roughly chipped, and doubtless serving very well the purpose to which these early people applied them. These gravels contain remains of the Arctic animals. Their age is to be reckoned by the time required for their formation and their distribution. The subsequent excavation of lower valleys, and the other stages of time already indicated, necessarily lengthen their chronology. Their existence is owing to the early formation of gravel plats and plains of loam out of the débris of the land, when it was far above its present height; and when Western Europe had been raised so high out of water as to comprise the British Islands as far as the well-known "hundred-fathom-line," which when raised to the water level would of course add at least 600-ft. to the height of the land's surface. The Alps were much higher than now; and probably Snowdon stood at least 2,000-ft. higher than at present. This elevation originated in the great alteration of the earth's crust in this portion of the globe, by contraction of its axis, immediately after the long "Tertiary Period" of geologists, bringing in the new conditions of geography, hydrography, and distribution of life in what is known as the "Pleistocene Period." The great uprise of land was probably then; it introduced enormous glaciers, grooving out the great gorges, which, after vast and continuous changes, the greatest rivers have scarcely yet filled up with their plain-making detritus. Whether men existed or not in this earliest part of the Pleistocene period is as yet unproved. A great reaction took place, and a great and gradual subsidence lowered plain and mountain, until Snowdon sank to be an island not more than 1,000-ft. at most in height, and the shoulders of the mountain were below the great Northern Sea; for when it rose again, Moel Tryfaen (now 1,300-ft. above the sea) bore up the well-known sands and shingle with marine shells, in witness of the change. Man had set foot in this region by that time, for when the glaciers, during some of their oscillations, occupied the great vales of Western Yorkshire, one of them left some of the characteristic laminated mud in a cave opening against its lateral moraine, and this mud buried up some old cave earth, in which are bones of elephants, rhinoceros, hippopotamus, hyænas, and man. This glacial clay was surmounted by a cave earth, formed after the glacier had melted away and left the valley open but cold, for reindeer bones occur in this layer. Subsequently the face of the cliff slowly shed its frost-bitten fragments, and formed a talus of great thickness, on the slope of which Neolithic men came and went. These, after some 500 years (as measured by the state of formation of the talus), the Romano-British (or Brit-Welsh), driven from their cities by invaders (Picts or Saxons) lodged in the cave, and left their riches on the sunny slope outside; and these are covered by the fallen trees of 1,200 years. Add these small sums of historic and pre-historic years together; allow for the period of reindeer life in Yorkshire; measure out a time for the glacier's coming and going; and add the many years and ages whilst the great Pleistecene animals roamed over the changing scenes, and some notion will be gained of the antiquity of man. To allow for the last uprise of Snowdon, for its previous subsidence, and still earlier and higher elevation, some 200,000 years at least is required, when the glacial period came in. If not before this period, certainly during some part of the time, whilst England was continuous with the Continent, the mammoth and man existed here together; and the many great changes that have occurred since Palæolithic man left his implements in lakes, rivers, and caves, have required a large proportion of those two thousand centuries.

Dr. Carpenter said he rose at the command of the President for the purpose of asking the audience to join with him in presenting a vote of thanks to the learned lecturer for the admirable way in which he had put the subject before them. He had told them that they were now still living in a stone age. He (Dr. Carpenter) was quite sure that the present time belonged to the neolithic or polished stone age, and he was equally certain that it was right to accord to him the vote of thanks that was undoubtedly due to him for the admirable way in which he had entertained them that evening. The almost perfect silence with which his lecture had been listened to must have told him the interest it awakened, and also that the audience would fully understand all that he so plainly put before them. He asked them to join with him in a most hearty vote of thanks.

The motion having been seconded by Mr. F. West, was carried by acclamation, to which Professor Jones briefly replied.

The Lecture was attended by 78 members, and 409 friends of members.

Mrs. J. W. Flower and Mr. John Flower, kindly lent a large and valuable collection of flint implements.

May 1st, 1876.—Conversational Meeting—Five members present.

May 17th, 1876.—Paper read by Mr. CHARLES STEWART, F.R.M.S., &c., President of the South London Microscopical Club, on "SEA STARS AND SEA URCHINS." The President, Mr. HENRY LEE, in the chair.

The minutes of the last meeting were read and confirmed.

Mr. STEWART OVERTON, Selsdon Road, was proposed for membership.

The PRESIDENT alluded in feeling terms to the loss sustained by the Club in the sudden death of Mr. Frederick West and it was resolved unanimously, "That the Honorary Secretary be requested to write a letter of condolence to Mrs. West, expressing the respect and esteem in which Mr. West was held by members of the Club, and their sympathy with his family in their bereavement."

The PRESIDENT announced that the excursions of the season would take place in connection with the Quekett and South London Microscopical Clubs.

Mr. E. LOVETT very kindly presented six slides of interesting objects for the Club cabinet, and received the thanks of the members.

Mr. CHARLES STEWART then gave an interesting account of "Sea Stars and Sea Urchins," describing the habits, appearance, and peculiarities of the various kinds of *Echinodermata*, including the Lily Star Fish, and the snake-armed Star Fish; illustrating the paper by drawings on the black board in coloured chalks.

After some discussion by the President and others a very cordial vote of thanks was given to Mr. Stewart.

The President, Mr. W. H. Beeby, Mr. P. Crowley, Mr. F. E. Fletcher, Mr. E. Lovett, Mr. George Manners, Dr. Strong, Mr. E. B. Sturge, Mr. H. Turner, and Mr. A. D. Taylor, placed their microscopes at Mr. Stewart's disposal in order to exhibit the very beautiful specimens he had brought down to the meeting.

A few fossils were also exhibited by Mr. E. Lovett and Mr. E. B. Sturge.

The proceedings of the Club were then adjourned until Wednesday, 20th September.

July 3rd, 1876.—Conversational meeting—Two members present.

August 1st, 1876.—Conversational meeting—Six members present, several of whom brought microscopes and exhibited various shells of diatoms, foraminiferæ, &c.

September 4th, 1876.—Conversational meeting—Six members present.

September 20th, 1876.—Paper read by Mr. Henry Turner, on "Trilobites and their Modern Representatives." The President, Mr. Henry Lee, in the chair.

The minutes of the last meeting were read and confirmed.

Mr. Stewart Overton was ballotted for and duly elected a member.

The following gentlemen were proposed for membership:—Mr. T. Loftus, Outram Lodge, Lower Addiscombe Road; Mr. Harvey Roberts, Norfolk House, Cheam Road, Sutton; Mr. James Packham, 16, Katherine Street, Croydon; Mr. John Albert Toms, of Lytchett Villa, Bedford Park, Croydon; and Dr. Williams, of Oakfield, Duppas Hill, Croydon.

The President announced that the Committee had decided to hold the annual *soirée* on Wednesday, 29th November.

Mr. H. Turner then read a paper on "Trilobites and their Modern Representatives." He said that Trilobites had always been objects of special interest to the geologist on account, partly of the former obscurity of their nature, partly by reason of their great beauty and variety of form; but chiefly, he thought, because of—even to the geologist—their amazing antiquity, for they were, until somewhat recently, considered to have been among the earliest of living things. In order that they might properly understand what was known of these long extinct animals, it was necessary that they should know somewhat of the nature and habits of existing crustacea which, if not their lineal descendants, may be considered the modern representatives of the Trilobites. As his type of crustacea, Mr. Turner took the common edible lobster *(homarus vulgaris)*, with whose general appearance everybody was familiar, and the anatomy and physiology of which he described minutely, commencing at the body, which comprises the abdomen, commonly called the tail, and the cephalo-thorax, consisting of the head and chest. These were composed of 20 rings, called "somites," more or less like each other; of these the head contained six, the thorax eight, and the abdomen six. The latter are connected by flexible integument; they overlap each other from front to rear, and are moveable, so that the animal can double himself up and use this part of his body as a powerful instrument of propulsion. Those of the head and thorax were welded together into one piece, called the "carapace," having, however, a slight depression which distinguishes the head from the thorax. Of the abdominal somites Mr. Turner took the third as a typical segment, which he fully described, and also explained that all the other somites were formed upon this plan, but were variously modified. Referring to the internal organisation of the lobster, Mr. Turner said the shell was, of course, filled partly with muscular tissue, by means of which the animal moved about, and which was the indigestible stuff people ate when they partook of a lobster supper. He described the pericardium, the heart, the respiratory apparatus, the stomach, the nervous system of the articulata and the vertebrata, and the reproductive organs, and with this he concluded his sketch of the lobster as an example of the general plan upon which the crustacea were constructed. Of the other groups of crustacea, one need only glance at some of them to see that, although constructed upon this same general plan, they departed very widely from the type he had selected—some more, others less, to suit their various modes of life, and the conditions by which they might be surrounded.

Mr. Turner, in referring to the structure of the Trilobite, said that of its external organization, we know nothing; but we might fairly presume that—to some extent, at any rate —it resembled that of living crustacea, and was upon the same general plan, although, perhaps, differing widely in details. The only living animal whose form approaches that of the Trilobite is the Limulus, or King Crab of the Eastern Seas. This animal has a horse-shoe-like carapace, sword-like tail, and limbs, some of which are used for swimming, others for jaws. Limuloid forms are found in the carboniferous rocks. The most striking feature in the outward structure of the Trilobite is that from which the family name is derived, namely, its longitudinal trilobation or division into three lobes. This trilobation is common to all Trilobites, but is more distinct in some genera than in others. Besides this longitudinal division by furrows more or less deep, the exo-skeleton is divided into three lateral parts—the head, thorax and pygidium, or tail. These large divisions are composed of rings or segments which vary in number in different genera and species. Those of the head are united into a kind of carapace or cephalic shield; the segments of the thorax and tail being distinct by means of furrows, as in the abdomen of the lobster. The middle lobe of the Trilobite, answering to the back of the lobster, is called the axis, and the side lobes the pleura. The posterior angles of the cephalic shield are frequently prolonged into spines of a greater or less length, as are also the pleura of the thorax and tail, thus giving the animal the appearance of great beauty, and probably serving also for defence. The body, too, is sometimes tuberculated, especially the head, thus adding to the beauty of the creature.

Respecting the under aspect of the creature, Mr. Turner said but little was known. It was true, that a few years ago, we heard of somebody having found, in Canada, what he believed to be the legs of a Trilobite, but Mr. Turner was not aware that the discovery had been confirmed. Hundreds of these creatures had passed through his hands, but he had never seen anything like legs or swimmers; though he believed he had found something like antennæ in one or two species. Whether these creatures had legs, whether in the absence of legs they crawled along on the bottom of the sea in which they lived, whether they propelled themselves through the water by means of the tail, as the lobster propelled itself, he did not know. But some at all events—the Calymene, for instance—had the power of rolling themselves into a kind of ball, like the wood-louse, in which state they were buried. The only appendages of which we are at all certain are the eyes and the lips. The eyes are extremely interesting. In some genera—for example the Encrinurus—the eyes were stalked, as in the lobster; in others they were sessile; while some trilobites are considered to have been blind. Further, the eyes of many are beautifully and numerously faceted, as in the Phacops and others; some are large, and many so small as scarcely to be visible to the naked eye; and it is singular that these small eyes have always been found detached from the animal that bore them. What a wonderful series of thoughts is suggested to the mind as one gazes upon these beautifully preserved relics of a time so long passed away. The fossil remains of trilobites are more generally found in fragments than whole; occasionally separate segments only are met with. The reason for this is, that the attachment between the several divisions—head, thorax, and tail—was weaker than that between the segments of the same division, and that decomposition and the separation of these parts occurred before burial. Just the same was the case with the vertebrata, the mammalia, the saurians, and the fishes, and with the bivalve mollusca, whose shells are often found apart.

Now there is as wide a departure from the trilobite among the ancient crustacea as from the lobster type among the modern crustacea. Trilobites vary very much, both in size and form; some have been found, both in Wales and America, nearly two feet long, while others are so small as to be scarcely visible to the naked eye. The variations in the form of the head, in the number of rings in the thorax, or tail, the presence or absence of spines, the form of the eyes, and the like, give rise to the division of the trilobites, but it is thought that some of the forms may be only the young of others more mature. (Mr. Turner here enumerated a few of the most common genera pretty nearly in their order of time, some of which were illustrated by large drawings in the room). Many of the genera and specific names, he said, were arbitrary rather than descriptive, being derived sometimes from the discoverer, sometimes from the locality where first found or where abounding, and sometimes purely poetical.

These animals had a very extensive range both in space and time. As regards space, the remains of the same genera are found in the palæozoic rocks of the Old World, America, and Australia; while as to time they may be traced through the immense palæozoic rocks from the Cambrian, in which they first appear, to the coal measures, beyond which, as yet, we find no trace of their existence. This represents a period of time concerning the length of which the human mind cannot form the faintest conception. How much earlier they may have existed, or how much later they may have continued, we at present do not know. But the trilobites are not equally distributed through the palæozoic rocks, either in space or time. They abound in some localities on the same level more than others, just as cockles and oysters, crabs and shrimps do now, their abundance or variety depending probably upon the plenty or scarcity of food and other circumstances. Some rocks literally swarm with their remains, whilst others of the same material, close by, are almost or quite barren. They appear, also, to have reached their maximum both in the number of genera and species in the upper beds of Lower Silurian rocks, after which they gradually died out in the coal measures. Moreover, the genera and species seem to have had their limited range, though often a long and wide range, in space and time. One cannot but be desirous to know what were the habits of these animals, their colour and form, whether they frequented deep or shallow water, and whether they were carnivorous or vegetarians. Their remains are found most abundantly in mud-formed or limestone rocks, and less frequently, I think, in sandstone deposits, which seem to indicate that they lived at some distance from the shore, in water somewhat deep and still; or it may be that the sand did not preserve their remains so effectually as the mud.

Below the lower Cambrian rocks—the Menevians of St. David's—which yield the great Paradoxides, lie the still older Harlech grits and Barmouth sandstones, in which have been discovered, besides Paradoxites, Agnosti, and others, a genus of trilobite called Plutonia Sedgwickii, "which" says Sir C. Lyell, "is comparable in size to the large Paradoxides Davidis; has well developed eyes, and is covered with tubercles." What are we to conclude from this? Are we to suppose that these large and well-developed forms bounded, so to speak, upon the stage of life, or may we not presume that they were preceded by humbler forms whose remains may yet be found, by patient investigation, in English or other rocks still older than those pointing to the crustacean forms in times so remote as to be beyond the grasp of the most powerful conception? And may we not also as fairly presume that trilobite forms may yet be discovered in rocks newer than the coal measures, so bringing down their existence to times nearer our own? Here is holiday work and recreation for those who have the inclination and the opportunity.

One remark in conclusion. To what purpose was all this variety and beauty of form, and profusion of ornament, when and where there was no human eye to see them? Gray, in his exquisitely polished verse, says:—

> Full many a gem of purest ray serene,
> The dark unfathomed caves of ocean bear;
> Full many a flower is born to blush unseen,
> And waste its sweetness on the desert air.

—I cannot entirely agree with the poet. I rather believe that the colour and fragrance of flowers serve some purpose to bird or insect even in the desert. I cannot believe that there can be any waste in the vast laboratory of the Great Chemist, but that everything is made to serve some beneficent purpose in the wise economy of nature.

The paper was illustrated by a dissection of a lobster.

The President having invited remarks,

Mr. Snelling asked if there was any means of ascertaining whether the eye of the creature was concentrated upon a single object, or upon a number of objects before an impression was conveyed to the brain?

The President said he had no doubt that only one image was received by the eyes of the animal, although he might have all sorts of images around him. A man had two eyes, but he did not see double unless he was drunk.

Mr. Perry thought the trilobite must have been an inhabitant of very deep water, and that the immense number of facets were probably to collect all possible rays of light that might pass down into the great depth of water. He had looked at the eye a good many times, and had come to that conclusion.

The President dissented from this opinion, and after making a few remarks upon the admirable paper of Mr. Turner, and the nice way in which it had been illustrated by specimens and diagrams, tendered on behalf of the Club a hearty vote of thanks to that gentleman.

Mr. Turner, in reply, said he should be amply rewarded for any trouble that he had taken in the matter if he should be the means of causing some of them to work among the old rocks themselves, and see if some new forms could not be brought to light and to Croydon for their inspection.

The President exhibited a very fine specimen of a King Crab. The following members placed their instruments at Mr. Turner's disposal, and also exhibited numerous specimens of fossils, crustacea, &c., in connection with the subject of the paper:—Messrs. J. S. Johnson, H. M. Klaassen, E. Lovett, G. N. Price, G. Manners, A. D. Taylor, Dr. Strong, and Mr. E. B. Sturge. Dr. Carpenter exhibited a specimen of the American pokeweed in full seed. Mr. Klaassen exhibited a sea-urchin (*Echinus*), as found at present on sea shores, a fossil from the chalk at Caterham, and a flint specimen from a Croydon road, also some beautiful specimens of fossil sponges, collected near Swindon, and some ammonites, collected at Whitby. Mr. E. Lovett exhibited some young forms of crustacea, perfect forms of foraminifera, globigerina, &c., with spines, *in situ*, from the South Pacific, also some fresh water crustacea (*artacus fluviatilis*) from the Thames, near Cricklade, Wiltshire.

Mr. E. Lovett presented six slides for the club cabinet, and received the thanks of the members.

October 2nd, 1876.—Conversational Meeting. Six Members present.

Mr. Klaassen exhibited Vegetable Preparations; Mr. Lovett Fossil and recent specimens of Teredo Navalis and Foraminiferous Rock from Clifton.

October 18th, 1876.—Paper read by Mr. W. H. Beeby, F.R.M.S., on "The Crystals of Lime Salts found in Plants." The President, Mr. Henry Lee, in the chair. The minutes of the last meeting were read and confirmed. The following gentlemen were ballotted and duly elected Members:—Mr. T. Loftus, Mr. Harvey Roberts, Mr. James Packham, Mr. John Albert Toms, and Dr. Williams. Mr. Egbert Alfred Crowley, 62, High Street, Croydon, and the Rev. A. J. Bennoch, Woodside, were nominated for election.

The President announced that Mr. John Flower would read a paper in November, "On the Natural History of Pallas Sand Grouse" *(Syrrhaptes Paradoxus)*, and Dr. Carpenter one in December, "On the Circulation of Sap in Plants."

Mr. W. H. Beeby then read a paper "On the Crystals of Lime Salts Found in Plants."—Mr. Beeby said the above subject had not hitherto received much attention, either from Botanists or Microscopists generally, but probably every one present was aware that a very large number of plants contained, within the cells of which they were composed, crystals of various salts of lime. For some time past all plant crystals of whatever shape had been confounded under the common name of "Raphides;" that name, however, was only properly applied to that particular form of crystal to which it was originally given, viz., the needle-shaped or acicular. Professor Gulliver—to whose researches we owed almost everything that is known of these crystals—had classified them according to their form in the following order:—1st, Raphides; 2nd, Crystal Prisms; and 3rd, Sphœraphides. The Raphides were generally found in small bundles within the cell; they presented less variety of form than the other crystals, differing only in size and comparative length and breadth. They were to be easily obtained from the black bryony, by simply squeezing out a drop of juice from a ripe berry on to a slide, when the raphides would be seen, some lying loosely about, while others remained in compact bundles. These crystals were to be found in a number of our native plants, amongst which were mentioned arum maculatum, lemna triscula, orchids, typha latifolia; and amongst foreign plants, in the grape-vine, Virginian creeper, aloes, American poke-weed, &c. The crystal prisms were the most varied in form of all; they were divided into the long and short prismatic crystals. They were found in the testa, or seed-coat of the elm; in the testa and pericarp of our wild geraniums; in the leaves, calyx, and stipules of many representatives of the pea tribe; as in our wild vetches, clovers, &c. The sphœraphides were distinct from these two classes, and as to variety of form were intermediate between them. They were to be found in many of the pink tribe of plants, in the common dog-mercury, and in many representatives of the dock and nettle tribes. The value of these crystals in systematic botany, and the size and compositions of the crystals, were also explained by Mr. Beeby, who then proceeded as follows:—

Respecting the office which these crystals fill in the economy of the plant, it has sometimes been maintained that they are no use whatever, but that they are merely of accidental occurrence—the results of an abnormal condition of the plant. This, however, is not the case, though when once deposited they are probably of no further use to the plant, unless, as seems possible in some very succulent species in which they occur in great quantities, they may act as a kind of skeleton to help in supporting the plant. As to the mode in which some of the crystals are deposited, I will read a short quotation from the text book of botany by Dr. Julius Sachs. He says, "A large part of the calcium taken up by plants is precipitated by oxalic acid, and remains inactive. The importance of calcium must therefore be sought partly in its serving as a vehicle for sulphuric and phosphoric acid in the absorption of food-material, and partly in its fixing the oxalic acid, which is even poisonous to the plant, and rendering it harmless." Connected with this part of the subject is the bearing which the study of these crystals may have on agriculture. Professor Gulliver has already called attention to this point. I was told recently, and shall be glad of information on this question, that when a farmer desires to change a grass field into a clover field, he simply manures it heavily with lime, without necessarily sowing any clover seeds. I thought at the time that there was probably some connection between this and the fact that the clovers abound in crystals of oxalate of lime. If I am correct as to the facts, I believe the explanation to be as follows:—We know that the clovers in a healthy state contain vast numbers of crystals of oxalate of lime, and that they must therefore secrete oxalic acid. Professor Gulliver, indeed, has calculated that one inch of the midrib of a leaflet of clover contains 17,500 without counting the smaller veins. If the plant cannot get sufficient lime to fix the oxalic acid, which Dr. Sachs tells us is poisonous to the plant, it naturally remains poor and small, and is easily overpowered by the grass; when, however, it gets the lime it requires, it becomes strong, and in its turn overpowers the grass—that is, of course, presuming that there is already some clover in the grass field, which is usually the case. I may mention also, in support of this view, that crystals of lime salts are not found in any grass. It appears to me that we learn from this that those plants which, in a healthy state, are found to secrete these crystals should be manured accordingly, and I think it would be a very interesting experiment to watch the effect of different manures on some plants like the garden-pea, which, as I have already said, contains very large numbers of these crystals. It seems probable also that the presence or absence of these crystals may possibly account for the distribution of some plants. Professor Gulliver has said that every British orchid yet examined has been found to contain raphides. Now nearly all of our British orchids are chalk-loving plants, and indeed they will not exist without it. On the other hand, Professor Gulliver informs me that he has also found raphides in foreign epiphytal species, while in other epiphytal species he has been unable to detect them. Again the dog-mercury (*mercurialis perennis*) abounds in sphœraphides, whether growing on chalk or not, so that there are many apparent contradictions to this view. I think that the subject of manures for plants, and the distribution of plants, would form together an interesting study in connection with these crystals. My remarks on these two points are intended to be regarded rather as suggestions for future investigations than as established facts. In conclusion, I will, with your permission, read one more extract from Professor Gulliver's published writings on this subject. He says—" When we consider the importance of lime in the economy of animals, we may well admire this one of several sources by which, as we now see, nature has so abundantly provided this earth in that very provender on which many animals greedily feed. Has any chemist ever determined the percentage of lime and starch and its derivatives, in the leguminous plants used as fodder for ruminant and other animals, and the relation of such constituents to the value of such food? What are their absolute and relative qualities in a truss of clover or sainfoin? Surely questions of this rational sort will have to be solved, sooner or later, in the interest of scientific agriculture. We can now perceive some of the significance of these crystals. But why they should be constantly present in certain parts of the structure of one plant or group of plants, and as regularly absent from the same parts of others; why, instead of the form of shapeless precipitates the lime should occur in crystals within beautifully-organized cells, arranged with exquisite regularity, we can nowise understand. Here science is in complete darkness, utterly unable to see the cause of these phenomena. And it is so as regards such lowly objects, we may derive from them—and their number is legion—lessons of humility which should not be without use to those philosophers who believe themselves able to unveil, by mere physical inquiries, the mysteries of the highest creation."

On the termination of the paper a short discussion ensued, in which Dr. Strong, Dr. Carpenter, and other members took part, after which the President accorded to Mr. Beeby the cordial thanks of the Club for his paper, upon which he had been at work ever since the recess. This was a great compliment to the Club, and a great credit to himself.

The paper was illustrated by diagrams and microscopical specimens, the latter being exhibited under microscopes placed at Mr. Beeby's disposal by the following members:—The President, Mr. P. Crowley, Mr. J. S. Johnson, Mr. H. M. Klaassen, Mr. E. Lovett, Mr. George Manners, Mr. George Perry, Dr. Strong, Mr. E. B. Sturge, and Mr. A. D. Taylor.

Dr. Carpenter called attention to an admirable specimen of a fossil sponge which had been dug up in gravel that had been deposited in the Brighton-road. It was the most perfect specimen he had ever seen.

The President remarked that they were generally called fossil mushrooms by the stone-breakers.

Mr. H. Turner called attention to a singular phenomenon he had lately witnessed in connection with the stars.

November 6th, 1876.—Conversational Meeting. Seven members present.

November 15th, 1876.—Paper read by Mr. John Flower, M.A., on Pallas' Sand Grouse *(Syrrhaptes Paradoxus).* The President, Mr. H. Lee, in the chair.

The minutes of the last meeting were read by the Hon. Secretary, Mr. E, B. Sturge, and confirmed.

Mr. Egbert Alfred Crowley and Rev. A. J. Bennoch were elected members.

The following gentlemen were nominated for election at the next meeting, viz.:—Mr. H. Salmon, 8, Warwick Villas, Clyde-road, Addiscombe; Mr. Alfred Walton, Lauriston House, Tavistock-road, Croydon; Mr. Allen Lambert, junior, High-street, Croydon; Mr. Robert Hall, Garth Villas, Addiscombe; Mr. J. W. Wallis, Lansdowne Gardens, Croydon; Mr. William N. Coates, Fairfield-road, Croydon; Mr. A. G. Blake, Dingwall-road, Croydon.

The President stated that some little time ago a wish was expressed that a little more time should be given to the exhibition of microscopes and for conversation, and he was glad to inform them that arrangements had been made that the room should be open at seven o'clock and remain open till ten. Many of the exhibitors were not aware of this arrangement, and it would greatly oblige the members if they would keep their microscopes on exhibition a little longer than at present, but, of course, if the gentlemen wished to catch a train, or to leave earlier than usual, they would not be expected to put themselves to inconvenience. Although on this occasion it was not a microscopical evening, he was just as pleased to see microscopes present, and he hoped there would not be an evening when microscopes would not be brought because they had a lecture on Natural History. He asked those gentlemen who intended to exhibit at the approaching soirèe to send in their names as soon as possible. He hoped the Club would figure well on the occasion, and that it would be strongly represented. A large amount of influence had been exerted to make the soirèe successful, and a number of gentlemen from other microscopical societies had promised to give their attendance and exhibit their microscopes. That was a reason why the members of the Club should endeavour to use their best exertions on that occasion, and he had no doubt that they would do all in their power to make the soirèe equal to, if not surpass, the soirèes previously held under the auspices of the Club. He also mentioned that the Committee had decided to add to the library the following works:—Sach's Botany" (translated by Professor Thistleton Dyer and Mr. A. W. Bennett) and the new edition of "Carpenter on the Microscope."

Mr. Flower said—The two birds which I have brought for your inspection this evening are two specimens, both females, of Pallas's Sand Grouse *(Syrrhaptes Paradoxus of Pallas)* which have been kindly lent to me by my friend and neighbour Mr. W. N. Coates. They were killed in the afternoon (about 4.30 p.m.) on October 4th last, at Knockanilly, the estate of Mr. W. C. Coates, near Kilcock, County Kildare, in Ireland, which is about twenty miles due west of Dublin, and they are the same two birds as are mentioned in *The Field* of October 21. The estate on which the birds were killed is described to me as being in a rather wild and open country, of rich land, thinly populated, and having very large grass fields. It stands high, and the particular field where these birds were killed commands a very extensive view on all sides. Mr. W. C. Coates and his uncle, Mr. W. N. Coates, were out partridge shooting when these birds were met with. They were found in a stubble field, and the dog who found them, a setter, at first could not make them out at all. He approached them wagging his tail, as setters always do when they are not sure of their game, but eventually set them. These two birds were the only ones seen, and when they rose Mr. W. C. Coates shot the one which has the long tail feathers, and his uncle the other. Mr. W. N. Coates showed me the bird which he killed on the morning of October 7th, and he afterwards sent it to Mr. Ashmead, of Bishopsgate-street, who has preserved it as you now see it. I saw this bird weighed before it was skinned. It was in very good condition, with a considerable quantity of fat about the intestines, and it weighed exactly 10½ ozs., which is less than half the weight of a female red grouse. This weight is important, as it shows that the bird was in exceptionally good condition, and from this fact, it seems probable that it, and probably its companion, whose weight, unfortunately, was not taken, had been in the neighbourhood where they were found, undisturbed, for some little time, and had not just arrived after a long journey. Mr. Ashmead sent me the body of the bird which he stuffed, after he had skinned it, and I carefully dissected it. The state of the crop and gizzard proved clearly that the bird had not suffered from want of food: they were full of vegetable matter, consisting chiefly of the seeds of the common orache *(Atriplex Patula)* with a few seeds of a species of *Polygonum*, probably the copse buck wheat *(P. Dumetorum)*, both of which plants are common weeds all over the British Islands; but I could find no trace at all of insects*. I believe this agrees with the result

* Since this paper was read, the contents of the crop and gizzard have been submitted to Dr. Hooker, and are now in the Museum of the Royal Gardens at Kew. Dr. Hooker is of opinion that the seeds are more probably those of the *Atriplex hastuta* and *Polygonum maritime*, both maritime plants. If so, these birds had probably been frequenting some part of the sea coast, and at the time when they were killed had gone inland to feed.—J. F.

of all previous examinations of the crop and gizzard of these birds; in no case have any remains of insects been detected. I have the contents of the crop and gizzard here, and you can examine them for yourselves. The state of its plumage shows that this bird has not yet completed its autumn moult. If the moult had been completed, both birds would have been handsomer than they are, as they would have had the peculiar long feathers in the wings and in the tail which are so characteristic of the species. The bird which has the long tail feathers has been preserved by Messrs. Williams and Son, of Dame-street, Dublin. Like the other, it is not in very good plumage, as it is, apparently, in the middle of its moult. In order that you may see what these birds are like when in perfect plumage, I have here the volume of *Gould's British Birds*, which contains a plate of this species, and which has been kindly brought this evening by Mr. Crowley. This drawing, like most of Mr. Gould's, is very beautiful; but the colours in it are, I think, more light and more bright than you will find in any living specimen. In this species, the brighter portions of the plumage soon fade after death, and Mr. Gould's colours will therefore differ still more from those in a stuffed specimen. I think this is about all that is to be told about these particular specimens, but Mr. W. N. Coates, who shot one of the birds, is here, and, no doubt, will be happy to give you any further information as to them which he possesses. I propose now to give you a short account of the species, as its history is most remarkable and highly interesting. Pallas Sand Grouse takes its name from Pallas, the well-known naturalist, who was the first person to make the bird known in Europe. It is a member of the great order *Rasores*, or scraping birds, an order which comprises, besides the Sand Grouse, all the pigeons, pheasants, partridges, and grouse proper, and all our domestic fowls, and the birds nearly allied to them. In this order the Sand Grouse form a highly specialised and distinct group, and, accordingly, they are classed in a distinct family (*Pteroclidæ*). One very striking feature about them is their very peculiar colouring, which is remarkably well adapted to conceal them in a sandy desert. They are found all over Africa and Madagascar, and the greater part of Asia—wherever they can meet with the large sandy tracts which they frequent. Some few stragglers may find their way into southern Europe, but only two species—*Pt. alchata* and *Pt. arenarius*—are known to breed there. Although commonly called grouse, they are not really grouse at all, but, as we shall presently see, are much more closely allied to the pigeons, and strongly resemble pigeons in many of their habits and ways. The family *Pteroclidæ* consists of but two genera: *Pterocles*, from which the family takes its name, and *Syrrhaptes*. The last-named genus contains but two species: Pallas Sand Grouse (the more immediate subject of this paper) and a large species, about double the size of Pallas bird, which was obtained by Lord Gifford, on the banks of the Tsumureri Lake, in Thibet, and was first described by Mr. Gould in 1850. These two birds have a close general resemblance, both in structure and habits, to the other members of the family, but they are distinguished from all other known Sand Grouse by the following characteristics:—(1) The hind toe is entirely wanting. (2) The front toes are united by a web, and therefore the bird, although essentially a land bird, is strictly web-footed. As to this singular feature I shall have more to say later on. (3) The first primary feather in each wing terminates in a long filament, like the two central tail feathers in some other Sand Grouse. This is well shewn in Mr. Gould's plate. (4) The legs, instead of being feathered only in front, as in the other members of the family, are entirely covered, down to the extremity of the toes, with short, dense feathers. Of the genus *Pterocles*, the British Museum collection contains fourteen species. Mr. H. Chasemore has kindly sent here this evening a case containing three specimens of the Singed Sand Grouse, or Rock Pigeon (*Pt. exustus*). These birds belong to a species which is common to North Africa and South Asia, and it is the most abundant species of Sand Grouse throughout India. It frequents the bare, open plains, and is very partial to ploughed lands and bare fallow fields. It goes regularly twice a day—at about nine in the morning and four in the afternoon—to some river or tank to drink. In parts of the country where water is scarce, they come from great distances, flying at a great height, and assemble at the tanks in thousands. They remain a few minutes at the water's edge, and then fly off and return as they came. As they are very good eating they form one of the chief game birds of India. Like many of the other species of Sand Grouse, these birds are more or less migratory in their habits, and at Mhow and Sangor most of them leave the district after breeding in July, and do not return till the end of the rains. In Upper Egypt they breed in April and May. Another Asiatic species, the large pin-tailed Sand Grouse, or Khata (*Pt. alchata*), is decidedly the handsomest bird of the whole family, and it has, besides, an exceptional interest attached to it, in that it is believed to be the bird upon which the Israelites fed in the Wilderness of Sin, as recorded in Exodus, ch. 16, and at Kibroth Hataavah, as recorded in Numbers, ch. 11, and which is spoken of in our translation of the Bible as "the quail." This bird is comparatively rare in India, and is only seen there in the cold season. It is said to exist in countless numbers in Palestine, where they appear in very large flocks, and when these flocks leave the ground and fly off into the air, the effect is said to be very striking. In the mountains of Edom they are so abundant that the Arab boys are said sometimes to kill as many as two or three at a time by throwing a stick into the flock. This species, and probably others of the Pteroclidæ, have the same very singular way of feeding their young that pigeons have—the female disgorging from her own crop, food, partially digested, into the crop of the young bird. I have also two specimens of my own of another species, the large Sand Grouse, or Ganga *(Ptarenariu)*, from Bombay. This species is common in India during the cold season, from the end of September to March. It seems, like most of its family, to be confined to open plains during the day, and flies in vast flocks. It has the same habit as the Singed Sand Grouse of going regularly twice a day to drink: and it generally seeks its food on grassy plains and stubble fields, early in the morning and again at dusk. Its flight is exceedingly strong and rapid, and, as its flesh is remarkably good, it is one of the most esteemed of the game birds of India. In rising from the ground these birds make the same peculiar rattling noise with their wings as a flight of pigeons. They have a curious way of catching this species in the Canary Islands. Small paths leading to their drinking places are made by placing rows of stones. Over these the birds will not step, owing to the shortness of their legs. They run down the paths, and are then easily taken in nooses.

To return now to the bird the more immediate subject of this paper. Pallas' Sand Grouse is not, strictly speaking, a true British bird at all. It is not known to have occurred in the British Islands previous to the year 1859, and that is the reason why it is not mentioned in "Yarrell's History of British Birds," or in any work on English ornithology published prior to that date. The bird exists in great numbers in Central Asia, which is its proper home. It is found all through the Asiatic Continent, from the Caspian Sea to the east coast. It extends as far south as the Himalaya Mountains, but how far north it extends I am unable to say.

In the winter of 1860, which you will remember was the year of the Chinese war, this species was particularly abundant on the plains between Pekin and Tientsin and on the banks of the river Peiho downwards. They formed a welcome addition to the food of the English and French soldiers. Several living specimens were brought home to England by officers attached to the expedition, and amongst others Mr. James Stuart Wortley presented no less than 34 to the Zoological Society, out of 73 which he started with; and one of these birds laid several eggs in confinement.

In 1858 Pallas' Sand Grouse is mentioned by Herr Möschler as a very rare species, in a list of birds met with at Sarepta in the Lower Wolga, and this appears to be the earliest authentic record of its actual occurrence in Europe. Early in July, 1859, a male specimen was killed near King's Lynn, in Norfolk, and is now in the museum of that town. This bird was alone when it was shot, but at least one other, apparently of the same species, was observed in the neighbourhood about the same time, but was not procured. On the 9th of the same month a second was killed at Tremadoc, in North Wales, which may possibly have been the second bird seen at King's Lynn, and in November of the same year a third was killed at New Romney, in Kent. These three birds are the first which are recorded as having been seen in any part of the British Islands. In the same year, five more specimens are recorded to have been killed at various places on the Continent, so that altogether nine birds (or possibly only eight) are recorded as having occurred in Europe in 1859, and of these three, as we have have seen, were killed in England and Wales. No further specimens of this bird were observed in England, or, so far as is known, in Europe, until 1863. In that year a most extraordinary irruption of the species took place, an irruption which is entirely without a parallel in ornithology. An enormous number of these birds, probably in one flock, seem to have left their proper home in Central Asia, and to have swept uninterruptedly onward, in a north-westerly direction, at a tolerably uniform rate of progress. Small bands seem to have detached themselves from the main body, at intervals, as they passed along, and these again separated themselves into pairs in the districts where they stopped. The remains of this great host crossed over into England. As some were killed as far west as the coast of Donegal, in Ireland, and the island of Benbecula, in the Outer Hebrides, there can be no reasonable doubt that they would have gone still further west if they had not been stopped by the Atlantic. They might certainly have gone on to St. Kilda, which is fifty miles further west, but, after that, there would be no land between them and America. Northward, some members of the flock reached as far up as the Fœroes, and southward as far down as Biscarolle, in Gascony. The flight of this strange host has been very carefully investigated and worked out by Professor Newton, and he has traced the progress of the flock through more than 33 degrees of longitude—from Brody, in Galicia, to Naran, on the north-west coast of Ireland. The earliest date given with precision seems to be May 6th, on which day they were observed at Sokolnitz, in Moravia, in longitude 16 degrees 40 seconds E. There seems to be some slight doubt as to the exact date on which the flock reached England. Professor Newton considers May 21 to be the date, on which day three were killed, out of a flock of 14, at Thrapton, in Northumberland; but it seems probable that some few, at all events, of these birds crossed into England a few days before May 21st. It is worth while pausing for a moment to consider the distance which these birds must have come. If they started from the country lying immediately to the east of the Caspian Sea, which is the nearest point they could have come from, and they may quite well have come from still further eastward, then, starting from about longitude 55 degrees E., those which reached the west coats of Ireland got as far as 8 degrees west longitude, or thereabouts, and this represents in round figures about 4,500 English miles. How much further they might have gone if they had not been brought up by the Atlantic Ocean it is impossible to say. Professor Newton estimates the number of the birds which thus visited Europe in 1863 to be 700; and the total number out of these which were killed at 500 or thereabouts. The strong indignation which the Professor expresses at this wholesale and reckless slaughter cannot but be reciprocated by everyone who is at all interested in birds and their habits. Professor Newton adds that of these 500 birds those which were killed in France were mostly eaten; those which were killed in Germany were mostly preserved, but in public museums; while those killed in England were mostly preserved, but in private collections. The national characteristics of the French, German, and English nations thus showed themselves even in that comparatively small matter. As regards England, I can supplement Professor Newton's remark by saying that there is not, at this moment, a single specimen of this species, killed in the British Islands, either in the British Museum or in the Museum of the College of Surgeons.

To return to the English birds. It would be very tedious to give you a detailed list of all the birds seen and killed in England in the summer and autumn of 1863. They are all carefully recorded by Professor Newton, in an admirable article in "The Ibis" of 1864, and by Mr. Stephenson, in his work on the Birds of Norfolk, vol. 1, p.p. 376 to 404, from both of which articles I have borrowed freely. The Scotch specimens are recorded by Mr. Gray in his birds of the West of Scotland, p.p. 238 to 240. It will be enough for our present purpose if I tell you that between May, 1863, and the early part of 1864, a very large number were seen, and about 250 were killed in various parts of the United Kingdom. The last of these was obtained at Haverford West, on 8th February, 1864. The largest flock seen at any one place was one of 100, which was seen at Oswestry.

It is quite possible that some of these birds may have bred here in 1863. They certainly bred, in June or July of that year, in Denmark, as several nests and eggs were found on the East coast of that country. They are also stated to have bred in Holland, but no eggs or young birds have ever been seen in England.

Two birds only are recorded as having been seen in Europe in 1864 after February 8th. One of these was killed on the 9th of February, 1864, and the other was caught alive in the following June. These were no doubt part of the flock of 1863.

No more of these birds were seen in England till 1872. A small flock are said to have appeared on the Northumberland coast, opposite the Fern Islands, in the last week of May of that year, and to have continued there as late as June 6th, and on June 22nd, 1872, four, probably part of the same flock, are said to have been seen at Girvan in Ayrshire.

The occurrence in Ireland of the two birds which we have here this evening, is of exceptional interest, as they are, I believe, the only ones of the species which have been seen in the British Isles this year, or indeed since 1872; and their occurence seems to prove that there has been another irruption, though on a small scale, in 1876.†

A good deal of speculation has naturally been indulged in as to the reason for the very remarkable invasions which I have described, but of all the conjectures that have been hazarded none appear to me so simple and reasonable as that put forward by Professor Newton. He is of opinion that these singular events are nothing more than the natural overflow of a very prolific species, and that, in all probability, they will be repeated.

It only remains for me now to point out to you one or two interesting facts, as to the structure of this species.

When the birds before you were killed, one of the party present, who was not an ornithologist, but was a gentleman with a good practical knowledge of birds, pronounced them to be "something between a partridge and a pigeon." He had, by a happy hit, exactly expressed their zoological character. To show you this, it will not be necessary for me to give you a long technical description of the three birds; I will confine myself to pointing out a few of the more prominent characters.

If you will compare the Sand Grouse with the Turtle Dove *(C. Turtur)* on the one hand, and with the Red Grouse *(L. Scoticus)* which is very closely allied to the partridge, and very much resembles it in structure, on the other, and they now stand between these two birds on the table, you will see that the Sand Grouse are intermediate in form between the two. The beak and head, and the general appearance of the birds, are more like those of the dove. So also are the short feet and legs, which, except in Pallas' bird, are feathered only in front, as is the case in many pigeons. An examination of the skeleton shows the same relationship. I have here the breastbone of the Red Grouse, and if you will compare the breastbone of the Sand Grouse, which is here, with that of the Red Grouse on the one hand, and that of the

† Since the paper was read I have been informed by Professor Newton, that a small flock of Pallas' Sand Grouse were seen off the Island of Heligoland, in May or June, 1876, and that one of them was procured. The two birds killed in Ireland were probably a remnant of this little flock.

Common Ring Dove *(C. Palumbus)*, which is also here, on the other, you will see that there is very little difference between the breastbones of the Sand Grouse and Ring Dove, while the difference between those of the Sand Grouse and the Red Grouse is immense.

Mr. H. E. Dresser has kindly lent me a proof of the number of his well-known work on the Birds of Europe, which contains Pallas Sand Grouse, and I have made free use of its contents. I find it stated in it that *Falco Hendersoni* is the only bird of prey which persecutes the Sand Grouse, and even this swift falcon cannot always capture them. An examination of the skeleton seems to bear this out, and to prove this species to be a bird of very rapid flight. The long wing feathers do not seem to hinder its speed, and, as they are moved very rapidly during its flight, they produce a noise like the fall of a shower of hail.

If you will examine the breastbone of Pallas Sand Grouse you will see that the depth of the keel, which gives attachment to the pectoral muscles, is very great compared with that of the Red Grouse. The length of its breast bone is four inches ; that of the Sand Grouse is two and a half inches, and yet the depth of the keel is the same in both, namely, one inch, and the shape of this bone shews that the bird can not only fly very rapidly, but is capable of long flights, and of keeping on the wing for a considerable space of time.

I have reserved for the last the most remarkable feature of this interesting bird, viz., the structure of its feet, and this is so peculiar that the scientific name by which the bird is known is founded upon it. Mr. Flower then exhibited and described the feet of the Ptarmigan and Black Grouse, of the Swamp Hen of New Zealand, and the Avocet, all of which are specially adapted to enable the bird to walk over a soft yielding surface ; but none of them would have suited a bird like a Sand Grouse, whose natural home is a sandy plain, which affords a soft yielding surface, but that surface, hard and gritty, and often hot, and, accordingly, this bird has been provided with a foot most beautifully adapted for its wants. Although the bird is as essentially a land bird as our common fowl, yet its little feet are webbed like those of a duck, which enables it to walk over the sand which it frequents without sinking in, and with ease and rapidity.

I have now, I think, told you pretty well all that is known about these birds. They form a groupof exceptional interest, and behind their curious and eventful history, we cannot, I think, fail to discern the hand of that great power in nature which guides and sustains all living things.

The paper was received with general applause, and was followed by a short discussion, in the course of which the Rev. R. R. Suffield and other gentlemen asked numerous questions with reference to the speed at which the birds could fly.

Mr. Flower said this had never been ascertained, but the power of flight of these birds must be very considerable, as they must have got over the 4,500 miles which they traversed in coming from Asia, in about a month.

The President having expressed regret that Mr. W. H. Rowland was not present, said he had invited Mr. Bartlett, the Superintendent of the Zoological Gardens, to attend the meeting, but unfortunately he was unable to be present.

A cordial vote of thanks was then passed to Mr. Flower for his interesting and able paper, and that gentleman having briefly replied, the proceedings of the evening were brought to a close.

Wednesday, 29th November.—The Annual Soirée took place at the Public Hall, and was attended by Fellows of the Royal Microscopical Society, and Members of the Quekett, South London, Sydenham and Forest Hill, Greenwich, New Cross, Tower Hill, Old Change, and Brighton Microscopical and Natural History Clubs, as follows:—

Croydon.—Messrs. Adams, Berney, Brodie, Beeby, Bindley, Corry, Cooper, P. Crowley, E. A. Crowley, Drummond, Flower, Fletcher, Gard'ner, Hovenden, James, Jones, Johnson, Klaassen, Loftus, Long, Linney, Henry Lee (President), Harry Lee, W. Lee, Lovett, Moules, G. Manners, C. Manners, Moseley, Nation, Overton, Purser, Perry, Price, Swaine, Sturge, Taylor, Toms, West, Whitling, Warren, and Drs. Adams, Carpenter, Lanchester, Philpot, and Strong.

Royal.—Messrs. Butler, Baker, Boosey, Blankley, Goodinge, Norman, Smith, Tyndall, White, and Williams.

Quekett.—Messrs. Andrews, Bailey, Coles, Collins, Dunning, Enock, Fryer, Gay, Hadland, Halley, Hainworth, Ingpen, Meachers, Matthews, Messenger, Nelson, Pearce, Pearse, Prickett, Priest, Reeve, Rowlett, Smith, Slade, Smart, Waller, T. C. White, and E. E. White.

South London.—Messrs. Brewer, Dadswell, F. Hovenden, R. G. Hovenden, Inskipp, Park, Rogers, Russell, Rawlings, Stidstone, J. A. Smith, R. A. Smith, W. B. Smith, Suffolk, Terry, West, Worster, and Hembry.

Sydenham and Forest Hill.—Messrs. Anelay, Beeton, Bird, Deacon, Etheridge, George, Hardy, Hind, Millidge, Northey, Perrins, Pickett, Simpson, and Terry.

Greenwich.—Messrs. Bishop, Blomfield, Collins, C. Dannatt, T. W. Dannatt, Malyon, Trickett, and Vasey.

New Cross.—Messrs. Auld, Hicks, and Harvey.

Tower Hill.—Messrs. Alston, Crosfield, Harrison, Harrod, Levien, Macdonald, Sedgwick, Simpson, and Waller.

Old Change.—Messrs. Batcheller, Francis, Green, Gribbell, Ives, King, and Piper.

Brighton.—Messrs. Haselwood and Sawyer.

General Exhibitors and Makers.—Messrs. W. R. Adams, Crouch, Electric Writing Co., How, Justican, Mennell, Routledge, Richardson, Moginie, Dr. Dempsey, W. F. Stanley, and Atkinson.

The number of instruments were:—Croydon Club, 51; Royal Microscopical Society, 12; Quekett, 29; South London, 18; Sydenham, 14; Greenwich, 8; New Cross, 2; Tower Hill, 9; Old Change, 7; Brighton, 2; Makers and Private, 16; total, 168.

Many other interesting objects were exhibited, among them being—Pallas' Sand-grouse, by Mr. John Flower; Anglo-Saxon and Roman remains from Beddington, and Fossils, by Dr. Carpenter; a Dutch Bible, published in Amsterdam, 1664, Harris's Aurelian on butterflies, published in 1776, and a catalogue of the sale at the Portland Museum, 1786, by Mr. Sturge; diagrams and dissections of mussels, by Mr. J. S. Johnson; crustacea and transparencies, "Denizens of the Deep," and birds' eggs, by Mr. E. Lovett; five drawers of shells, by Mr. H. T. Mennell; eight cases of butterflies, by Mr. Auld; a pair of pistols, formerly owned by Napoleon I., by Mr. Gard'ner; Bohemian and Hybrid pheasants, by Mr. W. H. Rowland; a case of crystals, by Mr. T. D. Russell; crystals from the human body and the ox, by Mr. J. H. Hadland; a revolving stereoscope, by Mr. Moginie; shark's teeth, from the Cambridgeshire Coprolite beds, by Mr. G. Purser. The President, as usual, exhibited many novelties, among which some Gorgonias claimed especial notice. Mr. A. D. Taylor's pretty little aquariam was one of the features of the exhibition.

The platform was decorated by Messrs. Ridge & Son, and was further embellished with some fine foliage plants, kindly lent by Mr. J. H. Ley.

The attendance included 129 Members, with 654 visitors and exhibitors, making a total of 783; the largest on record. The number of tickets sold was 281.

December 4th, 1876.—Conversational meeting. Four Members present.

The subject of staining vegetable preparation was the principal topic at this meeting.

December 20th, 1876.—Paper read by Alfred Carpenter, Esq. M.D., on "THE CIRCULATION OF SAP IN PLANTS."

The President, Mr. Henry Lee, in the chair.

The minutes of the last meeting were read and confirmed.

The following gentlemen were ballotted for and duly elected members :—Messrs. H. Salmon, A. Walton, A. Lambert, Jun., Robt. Hall, J. W. Wallis, W. N. Coates, and A. G. Blake ; and E. W. Puxon, Park-hill, A. Freeland, Fairfield-road, W. H. Hebb, Heathfield-road, John Pelton, Stroud Green, were nominated for election.

The President announced that the Annual Meeting for the reception of the Report of the Club's Proceedings for the year 1876, and for the Election of Officers for the ensuing year would take place on 17th January.

It was proposed by Mr. H. M. KLAASSEN, seconded by Mr. A. D. TAYLOR, and carried unanimously, "That Mr. Howard Martin and Mr. Theophilus Bindley be appointed Auditors for the past year's accounts."

DR. CARPENTER then read a paper on "THE CIRCULATION OF SAP IN PLANTS," and said he was sometimes asked whether trees were not injurious to health when they were planted near to houses; whether an open down was not purer than a situation near to a wood; and whether it was not a mistake to plant trees in our suburban roads, because of their interference with ventilation. Many persons imagined that a grove was at all times an undesirable place of residence, only to be tolerated in hot weather, when the cool shade was so refreshing. He proposed, by a reference to the actual mode of the growth of trees, to answer these enquiries. In the year 1856 six young limes were planted in his garden. They were nearly equal in size and strength. In 1860 they were all from nine to ten inches in circumference, at four feet from the ground. They had now been planted twenty years. Three of them were 27, 26, and 26 inches respectively in circumference ; two were 22 and 23 inches; and one was 16½ inches only. Proceeding to explain the reason why there was a decrease of three inches of absolute growth of wood in the diameter of one of the trees, he stated that in the autumn of 1860 he selected three branches on three of the trees in nearly the same position on each four or five feet from the ground. He cut out a ring of bark from each branch, about an inch and a half from the trunk, and about a quarter of an inch in breadth. The operation did not appear to influence the growth of the branch in the least. The leaves came out as usual in 1861, and were shed at the usual time. In 1862 he observed that the edges of the wound inflicted in 1860 on trees Nos. 1 and 2 had closed. A fresh incision was made, a ring of bark being again removed. No effect upon the branches resulted from this operation. The leaves were of the same size, and were shed at the same time as were those on the untouched trees. In 1865 all evidence of the removal of the rim from the branch of tree No. 3 (which was done in 1860) had disappeared; the cut in the bark had completely healed, and could not be discovered by external observation. He left it alone; but, two years afterwards, it was accidentally broken off, and, therefore, no further observations had been recorded with regard to that tree. A fresh rim of bark was removed from tree No. 1, about half an inch in breadth, and with a rim of woody matter extending abour one-third of an inch into the alburnum. A similar operation was performed on tree No. 2, but not to so large an extent. The result of the operation appeared to delay the formation of buds, or rather the production of leaves. The leaves came out earlier on other parts of the tree than they did on the branch itself of tree No. 1. The delay was not so decided on No. 2; but, as if to make up for their later appearance, the leaves were larger and finer than their fellows, but had not quite so dark a hue as those on other parts of the tree. They changed colour, and became yellow earlier in the season, and dropped off so that the branch became bare before any leaves had fallen from the other trees. He did not again operate on tree No. 2, but left it to take its chance. The rim that was cut into the alburnum of the branch healed up completely, and at this time it is not to be discovered, an enlargement of the truuk of the tree having covered it up, and obliterated all trace of the operation. The branch appeared to be as sound and as well as any other on the tree; but the tree itself was the least flourishing of the six, except the tree to which his observations would now alone apply. He did not conclude that this want of growth had been caused by the operation upon one of its branches, but it was quite possible. In 1868, and in the autumn of each succeeding year, he removed a thin rim of woody matter from the branch, always cutting at the edge, away from the trunk of the tree. Each succeeding year a strong effort was made to repair the breech. The only absolute change in the tree itself was the fact that the leaves were always the last to come out, and the first to be shed, and that no flowers appeared on the branch itself. The late appearance of the leaves applied at first to the branch only, but now it applied to the whole of the tree, and not to the damaged branch alone. In the autumn of last year he removed a thin rim of wood without interfering with the bark. This year small twigs on the branch had died away, and it being evident that he had reached the limit of endurance on the part of the patient, and that another vivisection would be fatal to the branch, he removed it altogether from the tree about a month since, and he now presented it in section. The first vivisection, when made in 1860, was nearly 1½ inches from the trunk of the tree. The whole length of the branch below the incision had now been absorbed into the trunk, clearly showing that there was no extension in the length of the wood of the branch below the incision, and that no deposit of woody fibre took place in the remainder of the branch between the incision and the trunk. There was no alteration at all in the condition of the bark below the cut. The bark might be seen in the specimen almost unaltered on the part which represented the absorbed branch on its upper surface, or in that which is called the axil of the branch. It goes down deep into the trunk of the tree, leaving a thin groove of epidermis, which is not in common with the groove of the trunk of the tree itself. This inability to come into actual union—an inability which was kept up by repeated vivisections—had led to a line being left and a way provided along which matter, foreign to ordinary trees, might find its way into the trunk. It is by channels such as this that fungus germs, parasitic plants, or other causes of decay gain access to the heart wood of trees, and eventually cause the destruction of the giants of our forests. The branch itself gave very little indication of its age—more than sixteen years—but branches on the other trees of similar age were ten times the size. The circumference of the branch, four inches above the cut, was three inches, or one inch in diameter. The circumference of a branch of corresponding age from tree No. 6, was 11½ inches. He had removed that branch, and a section of it was before the audience. It showed the rings which indicated its age, although they could not be made out in the lime tree with the same accuracy as they could in many other trees, in consequence of the little difference in colour which existed between the woody, the vascular, and the cellular tissue. It might be compared with a section of the branch which was operated on 16 years ago, when each branch was of the same size. Sixteen rings could be made out in the section on the larger branch which had been cut off about a foot from the trunk. It indicated at least two years less than the real age of the branch. Some of the rings were much more defined and much broader than the others. There was an equal number of rings in the thinner and smaller branch which had been cut from the branch operated on ; but they were so undefined that they could not be made out except by microscopic aid. The appearance showed most clearly that the growth of branches might be stunted by such operations without their vitality being destroyed, provided the operation did not cut too deeply into the woody tissue. The difference in the growth of the trunk above the wound, as compared with the part below, was also easily seen. The bark of the tree just below the wound was not thicker than it was on the branch tself, whilst the bark on the trunk above the wound showed a considerable increase in thickness. There was a thickening of the bark below and to the right of the direct line from above downwards, which indicated that the growth from the tree itself spread round the branch, but not immediately beneath it. The arrest of growth was shown by the enlargement of the branch just above the wound. This enlargement led at once to the idea that the cause of such enlargement was from the descent of material from above, and not from the rise of sap from below. "The rise of sap" was a common expression, and was strictly true; for the rise of sap did take place, and the uninstructed would expect that swelling would take place below a vivisection, rather than above it; but it was clearly shown in this case that the growth of wood was from above downwards, and not in the contrary direction. Leaving specimens No. 1 for a time, he proceeded to show some of the deductions which might be made from No. 2. It was the main trunk of an arbor vitæ in which accident had produced a result similar to that which arose from design as shown on No. 1. He rescued it from a rubbish heap to which a gardener was about to consign it. The tree had grown for some years after a piece of tarred string had been tied round it. This year the upper part of it died without assignable reason; but a section through the trunk explained the cause of death. To make this clear he referred to the causes which give rise to the ascent of the crude and the descent of the elaborated sap. After stating that all living structures, animal, as well as vegetable, have their first origin in a homogenous matter called protoplasm or bioplasm, which develops into cell life, he said the circulation in plants consisted in the movement of a gelatinous matter slowly up one side of the cell wall across the end and down the other, generally taking somewhat of a spiral course.

The cell wall is lined by material in which chlorophyll granules are embedded. They form through the vital action which sets up the current, and it is continued by the chemical action which arises when the starch or sugar of the absorbed matter is changed into chlorophyll or some other product. The movement is especially active in sunlight, which is absolutely required for the formation of the green matter of plant life. This cell circulation is easily seen in various kinds of water-plants in which the cells are large. In Valisneria the chlorophyll granules move with the current. The rapidity varies with the activity of the growth of the plant. It is most rapid in warmth and sunlight, provided the heat is not excessive, but a temperature of 112 degrees Fahrenheit stops it in all plants that live in temperate climates. An electric current stops it for a time, and so does pressure. It can be seen in the labellum of an orchid, and in the hairs of many rapid-growing plants; also in lycopods and ferns; but a very little pressure stopped it. The circulation is limited to each cell. It is established by the vital power which exists in the bioplasm, and it is then con-

tinued by the chemical action which leads the gas produced to find its way out of the cell in the direction in which that particular gas finds a way opened for it by exosmosis. As these actions proceed, the cell becomes changed in its character. The cell either doubles itself, or is developed into some other form of tissue, or it becomes filled with formed material or dead tissue which may be the special product of the plant. There is multiplication of bioplasm first, as shown by deduplication of cell life, and subsequently formed material is laid down in readiness for the nourishment of the bioplasm which is about to become dormant. Bioplasm requires light, warmth, and moisture to bring out its vitality, and if one or all of these be absent or deficient in amount a new birth does not arise—a cyclosis is not set up. This, however, is not the circulation of sap as ordinarily understood; but it is the way in which plant life commences and is renewed every spring. If light, warmth, moisture, and air are forthcoming, the two latter supply material which is combined with the pabulum already in the seed; growth is promoted, and circulation arises. Trees might be considered as hybernating in the winter, circulation being reduced to a minimum; but a living tree is warmer than a dead tree, as might be seen trom the snow melting sooner on it than on the latter. Not only a circulation but a respiration goes on all the year ronnd, and minute quantities of carbonic acid are given out by a tree from all parts of its structure. Directly leaves are produced they begin their proper functions, which are to act as exhaling organs, giving out watery vapour to the air, and with it the oxygen that has been set free by the act of growth. This exhalation of moisture necessitates the abstraction of liquid from below. The cellular and libro vascular tissue of the tree itself parts with liquid; a current is established from below upwards in each cell, and an endosmosis arises. A powerful *vis a fronte* is set in motion like that of a pump at millions of points on the tree, which becomes an irresistible force in raising fluids from below upwards. This action rapidly extends downwards from the buds and leaves to the roots of the tree. It is not, however, by a *vis a fronte* alone that the circulation is carried on. There is a *vis a tergo* as well which acts as powerfully. The earth receives and retains its warmth more persistently than do the buds. Heat is not lost so rapldly as it in the buds themselves. A new vitality arises in the roots as well as in the branches, commencing earlier than that which begins in the buds. New life develops at the extremity of each fibre below the ground. Each extreme cell contains dormant protoplasm as well as the buds, and with returning sprihg there is new growth. Trees cast off minute hair-like processes from on the fibrillæ of the roots every autumn. As soon as the function of the leaf ceases, the rapid absorption of aqueous matter is no longer required; and one of the great advantages which attend upon the equinoctial gales and the

winter storms is that the fibrilllæ of the rootlets are absolutely separated from the cellular layer which envelopes them, and the hair-like processes are removed from immediate contact with the cells which are to set up the new growth. This is accomplished by vibration. If a plant be examined in the summer, the rootlets are found terminating in fibrillæ. If these are carefully manipulated, they are seen to be covered with microscopic hairs which extend for some distance from the plant. He had traced them for some inches in the case of the fibrillæ of rye-grass. They could not be seen by the naked eye; it is probable that they extend many feet. They extend by cell growth, and as they extend they transmit sap upwards into the radicles and through the fibro vascular tissue of the root to the trunk of the tree, but not into the bark. This sap in all cases consists at first of water containing carbonic acid, albumen, sugar, and gum in solution with the varicus salts which are capable of solution and absorption by plant life. A powerful capillary attraction is superadded to the endosmosis which arises in the cells of the root-hairs, and together they produce the *vis a tergo* upon which the circulation partly depends.

As soon as the minute hair-like processes on the roots have fulfilled their mission, aod the leaves cease to decompose the carbonic acid in the sap, they become useless; oxygen ceases to be discharged, some is used up in the oxidising process by which a change of colour is produced in the leaf itself. The winter storms then, by swaying the tree backwards and forwards, remove the cellular matter which is in close proximity to the rootlets and allow a minute rift in the soil, along which the air which is required for the new growth can find its way. The floods of spring wash away the cellular exuviæ, the water carrying down with it carbonic acid and ammonia compounds as well as oxgyen ready for use as soon as the germ of protoplasm at the extremity of each root-fibre awakes from its dormant state. Thus there is cell-growth beneath the soil as well as above it, and the more rapid that cell-growth is the more rapid will be the growth of the plant. In the case of certain cereals, as wheat and oats, the fine hair-like fibres have been traced to a depth of from five to six feet from the surface of the ground. In the case of rye-grass a felt-like web is formed on the surface of the soil which appears able to digest albuminous matter, and especially to absorb bioplasm. Chemically there does not appear to be any difference between the albumen of plant life and the albumen of the blood. They are mutually convertible by the aid of the vital power which exists in the fibrillæ of the plant as well as in the digestive organs of the animal, and thus one class of plants are able to grow with intense rapidity because the particular pabulum which has passed through the cell by an action which they reqnire is ready at hand in a state fit for immediate assimilation. These observations were intended to apply more especially to exogens. He explained that a circulation was set up by the act of growth in certain cells. This is called cyclosis. The cell, according to its particular attribute, forms a particular kind of tissue, and transmits the fluid by a process which is styled "endosmose." This action is easily produced by placing liquids of different densities on different sides of a thin membrane, as a bladder. The one fluid attracts the other is a peculiar manner, so as to be able to support a considerable column of the mixed fluids above the level of the one which is attracted. Thus sugar and water attract water with great avidity; so does alcohol. This endosmose action is the *vis a tergo*—the force which raises the liquid from the soil to the upper part of the tree, and it is the force also which leads the ogygen to give place in the leaf to carbonic acid. But the question arise as to the channel through which it passed. The examples he had produced answered the question. It did not go through the bark, because that was removed in the one case and strangled in the other; neither did it go through the outer layer of of woody tissue, but through the layers of tissue lying upon the duramen. It was probable that in its transmission upwards it prepared certain portions of a tree for the reception of used-up woody matter, which is taken away from the descending sap, and which is the formed matter eorresponding to an excretion in an animal; but as support is required, and the tree continues to grow, the formed material, as used up, provides that support, and thus the extension of an exogenous tree is, as far as size is concerned, unlimited. Describing the respiratory process of trees by which the carbonic acid in the atmosphere is kept at a minimum, and its place supplied by that which is necessary for animal life, Dr. Carpenter stated that this interchange of gas takes place through the stomata or so-called breathing pores which exist more or less on all leaves, there being as many as 160,000 in some instances on each square inch of surface; so that the dense foliage of a forest is one of the helps which a kind Providence has supplied to keep our atmosphere at its proper healthy standard. As forests are cut down it is man's duty to provide distributed lungs, and the more the country is disforested the more necessary it is to secure an abundance of trees in our midst. After further explaining the interesting peculiarities of the circulation of sap in trees, Dr. Carpenter stated that it was between the bark and the wood that the new layer of tissue was first laid down, and thus might be perceived the reason why no new wood was formed below the cut on tree No. 1 that he had referred to, or below the legature in No. 2. Dr. Carpenter next referred to the lactiferous vessels in plants, the bark of exogenous trees, and the manner in which they may be destroyed by fungus growth and parasites.

He showed a section of the great fir-tree which for many years had been a land-mark at the rectory at Sanderstead, which was now destroyed. The section of the tree was taken 35 feet from the ground, and showed some eighty rings. A large number of the outer rings were undistinguishable from decay, but the tree was probably 120 years old. A ring for a year is the usual calculation as to the life of a tree, and it is a correct one as regards those years in which the tree is vigorous and in full growth, but it is not correct as to the whole life. It was twenty years since the branches appeared which were in section before the audience; but he could only make out sixteen rings in the untouched branch, whilst in the other they were undistinguishable, although of equal age. It appeared, therefore, that the early years of the life of a tree were to be easily made out, whilst its later years, as was the case with the Sanderstead fir, if interfered with by causes which affect its vigour, may be altered in such a way as to prevent accuracy of computation. Atmospheric causes might lead to multiplication. An early spring followed by a cold summer, and this succeeded by a warm autumn, might develop the appearance of two rings by the checks to vegetation which are produced by frosts in June. In conclusion, Dr. Carpenter remarkek that there was scope for microscopical observation both in structures of woody matter, in growth of tissue, and in changes which such growth produces, well worthy the atttention of the Microscopical Society.

The paper was illustrated by numerous specimens and diagrams, and the following members placed their microscopes at Dr. Carpenter's disposal:—Mr. J. Be ney, Mr. J. S. Johnson, Mr. H. M. Klaassen, Mr. E. Lovett, Mr. E. B. Sturge, and Mr. H. Turner.

After a short discussion It was proposed by the President and seconded by Mr. Turner, and carried unanimously, that a very cordial vote of thanks be given to Dr. Carpenter.

THE LIBRARY.

RULES FOR THE CIRCULATION OF BOOKS.

1.—Books to be lent out to Members at any time when the Library of the Literary Institution, at the Public Hall, is open, on application to Mr. Pusey, the Librarian.

2.—All books and periodicals to be marked with the stamp of the Club and numbered before being circulated, and kept in such a place as shall from time to time be determined by the Committee.

3.—Members may obtain books by making personal or written application for them, and by signing a receipt for the same, which shall be held by the Librarian until the book is returned. No Member shall have more than one work at a time, nor shall he keep any work for a longer period than one month; but it may be returned for exchange any time within that period when the Library may be open.

4.—When a book is returned by a Member it may be borrowed by him again, provided it has not been bespoken by any other Member. Books which have been bespoken shall circulate in rotation, according to priority of application.

5.—Standard works, as shall be named by the Committee, to be kept for reference, and not to be lent out.

6.—Members retaining books longer than the specified time shall be subject to a fine of one penny per day. If any book be retained by a Member for two months, and be not returned after written application has been made for it, the Committee may order it to be replaced and charge the Member in default with the amount thus incurred, in addition to the fine. If any book, when returned by a Member, is found to have been damaged during the period such Member has had it, a fine equivalent to the injury shall be paid by the Member.

LIST OF BOOKS BELONGING TO THE CROYDON MICROSCOPICAL CLUB.

Achromatic Microscope	*Beck.*
Address before the Royal Microscopical Society ...	*Rev. J. B. Reade.*
British Diatomacœ (vol. 1.)	*Smith.*
British Diatomacœ (vol. 2)	*Smith.*
British Shells	*Turton.*
Collection and Preparation of Algœ	*John Nave.*
Cryptogamic Botany	*Berkley.*
Dyer and Bennett's Translation of Sach's Botany ...	*Sachs.*
Foraminifera	*Dr. W. B. Carpenter.*
Flora (vol. 1)	*Bentham.*
Flora (vol. 2)	*Bentham.*
How to Work with the Microscope	*Dr. L. Beale.*
Human Microscopic Anatomy	*Kölliker.*
Lectures on Histology	*Quekett.*
Marvels of Pond Life	*H. J. Slack.*
Microscopical Manipulation	*Suffolk.*
Microscope The, Edition, 1868	*Dr. W. B. Carpenter.*
Microscope The, Edition 1875	*Dr. W. B. Carpenter.*
Polarized Light	*Woodward.*
Preparation and Mounting of Microscopical Objects	*Davies.*
Spectrum Analysis	*Suffolk.*
Opticians' Catalogues	*Beck and others,*
Journals of Quekett Club.	

THE CABINET.

Slides of various objects, presented to the Club by Members and others.

CROYDON MICROSCOPICAL CLUB.

RULES.

OBJECTS OF THE CLUB.

The Club is constituted for the mutual help of its Members; for the discussion of subjects connected with, or dependent upon, Microscopical research; for the exhibition and exchange of Microscopic Objects and Preparations; and for the promotion of the study of Microscopy and Natural History generally.

MANAGEMENT OF THE CLUB.

The business of the Club shall be conducted by the President, Treasurer, and Hon. Secretary (*ex-officio*), and nine other Members, who shall be elected by ballot at the Annual General Meeting. Three to form a quorum.

MEMBERSHIP.

1.—Every candidate for Membership shall be proposed by two or more Members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the Form appended. The certificate shall be read from the chair, and the candidate therein recommended ballotted for at the following meeting. Three black balls to exclude.

2.—The Annual Subscription shall be 10s., payable in advance on the 1st of January, or on election if previous to November, and no person shall be entitled to the privileges of the Club until his Subscription shall have been paid.

3.—Distinguished men may be elected Honorary Members of the Club, provided they do not reside within the district; such Honorary and Corresponding Members shall not be subject to any of the expenses of the Club, and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall by their merit satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No Member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any Member from the Club, the same shall be done by a resolution of the Committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the Members present shall vote for such Member's expulsion, he shall no longer be considered a Member.

7.—Any Member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the Member by whom he is introduced, in a book to be kept for that purpose.

ORDINARY MEETINGS.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at seven o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other time as the Committee may appoint.

2.—The ordinary course of proceedings shall be as follows :—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.

II.—The names of candidates for Membership shall be read, and the ballot for the election of Members shall take place.

III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the Members present at any ordinary meeting shall elect a chairman for that evening.

4.—No paper shall be read which has not received the sanction of the Committee ; and, whenever it is possible, early notice of the subject of the papers to be read shall be given, by the Secretary, to the Members. No paper shall exceed fifteen minutes in the actual reading, unless by the especial permission of the Chairman.

5.—In addition to the above ordinary meetings, others, for conversation and the exhibition of Microscopical objects and Natural History specimens, shall be held on the first Monday in each month, at eight o'clock in the evening.

BUSINESS MEETINGS AND ELECTION OF OFFICERS.

1.—The accounts of the Club shall be audited by two Members appointed at the ordinary meeting in December. No Member of the Committee shall be eligible as an auditor.

2.—At the same meeting notice of the Annual Meeting in January shall be given from the chair.

3.—An Annual Meeting of the Club shall be held, in the place of the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the committee on the affairs of the Club, and the balance-sheet, duly signed by the auditors, shall be read.

4.—No permanent alteration in the rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or addition must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

CROYDON MICROSCOPICAL CLUB.

Mr.

of

being desirous of becoming a Member of this Club, we beg to recommend him for Election.

(on my personal knowledge).

This Certificate was read 187

The Ballot will take place 187

NOTE.—Original Rules, drawn and adopted at a meeting held on the 16th March, 1870.

Rules, as to Election of Officers, and number of Committeemen, revised January, 1872.

Rules, as to payment of Subscriptions and establishment of Conversational Meetings, revised and adopted January, 1876.

PUBLICATIONS OF THE CLUB.

LECTURE

ON THE

GEOLOGY OF CROYDON,

IN RELATION TO THE

GEOLOGY OF THE LONDON BASIN,

AND OTHER LOCALITIES.

WITH MAP, COLOURED GEOLOGICALLY.

DELIVERED BEFORE THE MEMBERS FEBRUARY 17th, 1875,

BY

PROFESSOR J. MORRIS, F.G.S., &c.

LECTURE

ON THE

ANTIQUITY OF MAN,

ILLUSTRATED BY THE

CONTENTS OF CAVES AND RELICS OF THE CAVE FOLK.

DELIVERED BEFORE THE MEMBERS APRIL 26th, 1876,

BY

PROFESSOR T. RUPERT JONES, F.R.S., F.G.S., &c.

PRICE 1s. EACH.

PROCEEDINGS

AND

TRANSACTIONS

OF THE

Croydon Microscopical and Natural History Club,

FROM

FEBRUARY 20th, 1878,

TO

JANUARY 19th, 1881.

CROYDON:

PRINTED BY JESSE W. WARD, AT THE "CROYDON ADVERTISER" OFFICES,
14 AND 15, KATHARINE STREET.

t/

CONTENTS.

PROCEEDINGS

OF THE

Croydon Microscopical and Natural History Club.

Ordinary Meeting, 20th Feb., 1878.

ALFRED CARPENTER, ESQ., M.D., President, in the Chair.

The minutes of the last meeting having been read and confirmed, the Rev. D. Long, Mr. E. Straker, Mr. C. W. Mather, Mr. J. H. Mitchiner, and Mr. J. W. Baillie, were elected members of the Club.

The PRESIDENT announced the receipt, from Mr. E. Gill, of two slides of Oolite, for the cabinet of the Club.

Mr. J. W. WALLIS read an interesting paper on "Man Nomadic," which was followed by a discussion, more particularly as to the origin of language, in which the President, Mr. R. A. James, and Mr. H. M. Klaassen took part.

The following objects were exhibited:—Mr. J. S. Johnson, Cypris Tristiata, Fresh-water Crustacean; Mr. H. Long, specimen of Yeast; Mr. E. Lovett, section of Fossil Wood, shewing the introduction of iron pyrites into the structure, and South American Snake, shewing the manner of casting the skin; Mr. J. A. Richardson, Spindle-celled Sarcoma, Cat's Ovary; Mr. H. M. Klaassen, Bilder-Atlas of Ethnography, published in Leipzig.

Ordinary Meeting, 20th March, 1878.

ALFRED CARPENTER, ESQ., M.D., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. C. Cooper, Mr. Benjamin Hanscomb, and Mr. Wm. Field were balloted for and elected members.

The PRESIDENT announced that the Committee having fully considered the subject of the annual lecture, had decided to abandon it for this year, as the expense of the delivery and printing of the lectures delivered in previous years had pressed rather heavily upon the funds of the Club.

Mr. W. J. Nation read a paper on "Ivory," which was followed by an interesting discussion, in which the President, Mr. A. C. Davies, Mr. H. M. Klaassen, and Mr. H. Turner took part.

In addition to numerous specimens of carved ivory exhibited by Mr. Nation, Mr. Pitt, and Mr. Lambert, the following objects were exhibited:—The President, Japanese ivory figures; Mr. J. S. Johnson, molar tooth of elephant; E. Lovett, fossil ivory, from Berkshire; vegetable ivory; J. H. Ley, flower case of palm, open and unopen; T. M. Loftus, diatoms; H. Long, vegetable ivory; K. McKean, sections of elephants' teeth from Ceylon, spiculum of helix aspersa; E. B. Sturge, fungi—vegetable ivory; A. D. Taylor, a greenhouse pest; A. Warner, spicules of glass rope sponge; E. Williams, white blackbird; A. M. Davis, ivory boat, specimen of Japanese workmanship; H. M. Klaassen, fresh water aquarium.

Ordinary Meeting, April 17th, 1878.

Alfred Carpenter, Esq., M.D., President, in the Chair.

The minutes of the last meeting were read and confirmed, and Mr. M. D. Northey was elected a member of the Club.

The President announced that Mr. R. B. Douglass had presented a spectroscope to the Club, and the thanks of the Club were accorded to Mr. Douglass for the gift.

A paper was read by Mr. George Corden on "The Meteorology of Croydon," * and the various matters treated of in the paper became the subject of a prolonged and interesting discussion between the President, Mr. Corden, Mr. H. M. Klaassen, Mr. A. C. Davies, Mr. P. Crowley, and Mr. H. Long.

At its close a cordial vote of thanks was given to Mr. Corden for his valuable paper.

The following objects of interest were exhibited:—Mr. W. F. Stanley, Six's day and night thermometer for self-registration, Mason's hygrometer for showing the humidity of the air, Lind's anenometer or wind gauge for registering the pressure of the wind in pounds on the square inch; two aneroid barometers for registering altitudes and depths; Mr. W. H. Beeby, sepal of geranium robertianum showing sphœraphides; Mr.

* This paper has been printed separately, and has been circulated among the members of the Club.

E. Lovett, silicious sponge from the Cape of Good Hope, containing young bivalve mollusca, also a barometrical chart showing fluctuations from the 1st February, 1877; Mr. K. McKean, the young of Limnœus Pereger, hatched last summer; and Mr. H. Long a section of ivory.

Ordinary Meeting, 15th May, 1878.

ALFRED CARPENTER, ESQ., M.D., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The PRESIDENT called attention to the very small number of members who were present at the conversational meetings, which were held on the first Monday in each month, and reminded the members that these meetings were tried as an experiment only, and that if they were not better attended in the future it would become necessary to consider whether it would not be desirable to discontinue them.

Mr. C. T. HODGES read a very interesting paper on "The Natural History and Instinct of the Bee," which was followed by a paper by Mr. T. J. BALDWIN, on "Bees and their management."

The subjects dealt with in these papers were discussed at considerable length by Mr. Hodges, Mr. Baldwin, the President, and Mr. Frewer.

The following objects were exhibited:—Messrs. Neighbour and Sons, an improved cottage hive, a Stewarton hive, and a frame hive, with their new sectional supers; Mr. Baldwin, a unicomb glass hive with living bees, Ligurian queen, and an improved frame hive; Mr. E. Lovett, the cast skin of a green lizard (Lacerta Viridis); Mr. S. Overton, microscopical objects.

The PRESIDENT announced that this was the last meeting of the session, and that the next ordinary meeting of the Club would be on September 18th.

EXCURSION TO REDHILL, NUTFIELD, AND BLETCHINGLEY.

Saturday, 15th June, 1878.

In this, which was the first excursion of the season, the members left East Croydon at 2.44 for Redhill Junction, where they were joined by members of the Royal Microscopical Society, and of the Quekett and South London Clubs. The party then proceeded to Nutfield, having received permission from J. Cawley, Esq., to visit and inspect the Fuller's-earth works, known as Cockley Pits, and lying to the left of the road between Nutfield Priory and the village. The excavations nearest the road were first inspected, and the strata examined and explained. Some fossil wood was found, and some fine specimens of Ammonites were shown by the workmen. The Fuller's-earth bed, however, had here only just been reached, and the foreman of the works accordingly conducted the party to a lower excavation a short distance off, where this peculiar clay had been worked to a considerable depth. There is, it is believed, but one place in England, besides Nutfield, where this useful article can be procured. It is extensively used in dressing woollen and silken fabrics, and for bleaching purposes, and is also looked upon as a valuable adjunct to an infant's toilet. It was incidentally mentioned that it would take at least fifty years yet to exhaust the supply of clay upon this estate alone. After visiting the drying and storing houses, seeing some fossils that have been found in sinking through the lower greensand beds that lie above the Fuller's-earth bed, and securing a few specimens, the party walked across the fields to Pendell Court, Bletchingley, where they were warmly and hospitably received by Sir George Macleay, K.C.M.G., the owner of this charming property. The drawing-room, dining-room, and library, of this fine old 16th century mansion, with their polished oak floors, and oak wainscotting in almost perfect preservation, were each in turn inspected by the visitors, who found much to delight them. Sir George afterwards accompanied the party over the beautiful gardens, filled with a great variety of English and foreign flowers, and the varied grounds, and through the extensive greenhouses and hot-houses. To many of the party the walk through Sir George Macleay's grounds and "houses" gave more pleasure than the whole of the day's proceedings besides. From Pendell Court, after cordially acknowledging Sir George's courtesy and kindness, the party proceeded on their way to Bletchingley, which was reached about 7 p.m. Here a halt for rest and refreshment was made for about an hour, when the start was made for Redhill and Croydon, the latter place being regained about 9.30 p.m., after a very enjoyable and instructive day.

EXCURSION TO ADDINGTON.—*Saturday, 20th July,* 1878.

The members met on Addington Hills at 3.30 p.m., and proceeded to the beautiful park of the Archbishop of Canterbury. Dr. Carpenter, the President of the Club, was present, and acted as guide to the party. After exploring the woods and plantations for nearly two hours, Addington was reached, and the visitors inspected the Church and burial ground, afterwards returning through the park to the Ballards, where Mr. Goschen very kindly provided tea and substantial refreshments. From the keeper's lodge, which is one of the highest points on the range of hills, in clear weather the most beautiful panoramic views may be obtained, portions of Kent, Essex, Middlesex, Berkshire, Oxfordshire, and Buckinghamshire, in addition to the greater part of the County of Surrey, being visible. On this occasion the atmosphere was somewhat cloudy, and the more distant prospect was obscured. After enjoying the rest here, the party returned to Croydon, which was reached about 8.30 p.m.

Ordinary Meeting, 18th September, 1878.

ALFRED CARPENTER, ESQ., M.D., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. John Drage was balloted for, and elected.

The PRESIDENT called attention to a wasp's nest, taken at Wye, Kent, which had been presented to the Club by Mr. Stampa Lambert, and to a very fine oyster shell, and some lignite, which had been found in a sewer cutting in the Holmesdale-road, about eight feet below the surface, and forwarded by Mr. Brooks.

Mr. EDWIN ROPER read an interesting paper on "The Microscope and its uses;" and, after sketching shortly the history and gradual development of the microscope, called attention to the effect which its use had produced in the study of the lower forms of animal life, and of Cryptogamic plants. He further described many of the discoveries which had been made, by the aid of the microscope, as to the nature and origin of some forms of disease, and in the natural history of many animal and vegetable parasites, and spoke at length of its valuable assistance in investigating the phenomena of vegetable nutrition, the nature of the process by which the ovule was fecundated by the pollen tube, and the metamorphoses of the lower animals. Mr. Roper concluded by giving some interesting instances of the practical value of the microscope in medical cases.

The paper was followed by a discussion, in which the President, Mr. J. Berney, and Mr. E. Roper took part.

Mr. E. Gill showed hairs of myosotis, spiral and hooked; Mr. Long, hair worms; Mr. K. McKean, living phylloxera devastatrix, from a vineyard of the Upper Douro; Mr. S. Overton, longitudinal section of ivory; Mr. E. Roper, section of stomach, shewing secreting glands; Mr. A. D. Taylor, young newt; Mr. Warner, spicules of holothuria; Mr. E. B. Sturge, French diagram plates, hoof of horse, mule, and ox, the honey bee and apiculture. Batrachospermum, taken from Cæsar's Well, Keston Common, was shewn with the camera lucida, by Mr. Klaassen.

Ordinary Meeting, October 16*th*, 1878.

Alfred Carpenter, Esq., M.D., President, in the Chair.

The minutes of the last meeting having been read and confirmed, Mr. Lewis Browne was balloted for, and elected.

The President announced that the South London Microscopical Club had forwarded a map of the district which they had selected for their work, and the map was laid upon the table for inspection by the members.

The President called attention to a fact which he had observed, viz., the number of spring flowers which had come into bloom this autumn, and produced specimens of rhododendron, laburnum, common primrose, and common strawberry, all in flower, which he had picked that afternoon in a garden at Duppas Hill. He also mentioned that he had had both apple and pear trees in bloom in his garden last week, but the flowers were now too far gone to be picked, or he would have brought them with the others.

Mr. Maitland Gardner stated that he also had had some pear trees in flower in his garden last week, and he had intended to call attention to this fact, as it was not at all a common occurrence.

The President also related a remarkable instance of the power of instinct in a terrier dog belonging to his son, who was a student at St. Thomas's Hospital. His son took the dog with him from Croydon by railway, and left it at his lodgings in Lambeth, which were near the hospital. It remained there till five o'clock in the afternoon of the day after its arrival, when it escaped, and in a little over two hours after its escape, it found its way back to his house at Croydon. The dog had never before been on the road between London and Croydon.

The President also read a paper "On the Natural History of Hard Water, and on its softening by Clark's process." *(Vide p. 1.)*

A discussion ensued, in which Mr. G. F. Linney, Mr. H. M. Klaassen, Dr. Strong, and the President took part.

In addition to the collection of minerals, &c., exhibited by the President in illustration of his paper, Mr. J. Packham, of Katharine-street, exhibited 22,000 grains, equal to 3-lb. 2¼-oz. of solid matter which had been obtained by distillation, from 1,000 gallons of Croydon water; Mr. A. D. Taylor, Lavender, with scent ducts; Mr. K. McKean, Larva; Mr. E. Lovett, Parasite of Flying Fox, also an improved method for illumination of objects; Mr. Edward Williams, Fungi.

Ninth Annual Soiree.

Held on Wednesday, Nov. 6th, 1878.

This was held, as hitherto, in the Large and Small Public Halls, and was attended by: 140 members, 53 of whom exhibited; 106 exhibitors from other clubs; and 549 visitors, making a total of 795, as against 770 in 1877. 173 microscopes were exhibited.

The musical arrangements were again under the care of Mr. George Webb, who attended with four instrumentalists.

Many interesting objects were exhibited, among which may be mentioned a collection of crystals by the President; the Quadruple Electro Chronograph which was used for the observations on the transit of Venus in 1874, exhibited by Mr. Thomas Cushing, by permission of the Secretary of State for India; a Phoneidoscope, an instrument for observing the colour figures of liquid films, under the action of sonorous vibrations, by Dr. Philpot; Butterflies from the Malay Archipelago, among which were specimens of the Leaf butterfly *(Kallima paralekta)*, of Sumatra, by Mr. Alfred Russel Wallace; two Roman cinerary urns of glass, a number of skulls of Mammalia, stuffed birds, and a portion of the trunk of a horse chesnut tree in which an iron chain had become embedded, by Mr. John Flower; Aquaria, by Mr. H. M. Klaassen and Mr. A. D. Taylor; mineralogical specimens by Mr. J. Toms and Mr. H. Long; crustacea, by Mr. Lovett; fossils by Mr. Henry Turner and Mr. J. R. Frewer; a carbon candle as used in the Jablochkoff system of electric lighting, by Mr. Thomas Cushing; specimens of silk-producing insects, by Mr. J. A. Clark; weather charts, by Mr. George Corden. Microscopical specimens were also kindly lent by Dr. Ord, and exhibited by the President.

Microscopes were exhibited by members of the following clubs:

Croydon.—The President, Messrs. W. R. Adams, Berney, Baldock, Bindley, Beeby, Corry, W. Cooper, P. Crowley, A. Drummond, Harrod, Hall, Ingrams, Johnson, James, Klaassen, Long, H. Lee, Harry Lee, Loftus, Lovett, Linney, G. Manners, C. Manners, H. Moules, E. R. Moules, Northey, Overton, Owen, Oswald, Palmer, Roper, Richardson, Sarjeant, Sturge, Straker, J. A. Toms, Taylor, Turner, West, Whitling, Wallace, Williams, and Drs. Carpenter, Lanchester, Rosser, and Strong.

Royal.—Messrs. Goodinge, Williams, and Brindley.

Quekett.—Messrs. Adkins, Andrew, Addis, Cocks, Dunning, Enock, Hainworth, Hunter, Ingpen, Messenger, Nelson, Pearce, Russell, Reed, Reeve, Smith, White, Watson, Batchelor, Brown, and Dr. Matthews.

South London. — Messrs. Brewer, Ersser, Hovenden, Hardess, Hembrey, Marriott, Short, W. B. Smith, J. A. Smith, R. A. Smith, West, Dodswell, and Stidstone.

Sydenham and Forest Hill.—Messrs. Arch, Bird, Crossland, George, S. Milledge, A. Milledge, Purdue, and Terry.

Greenwich.—Messrs. Blomfield, Colsell, T. W. Dannatt, G. Dannatt, Dowsett, Daish, Scarr, Trickett, and Higgins.

New Cross.—Messrs. Auld, Collingwood, Loxley, Poland, Stewart, Wrangham, Willcock, Swinburn, and the Rev. S. Thackrah.

Tower Hill.—Messrs. Alston, Crosfield, Harrod, Menzies, Sedgewick, Simpson, and Thompson.

Old Change.—Messrs. Batchelor, Green, and Gribbell.

Hackney.—Messrs. Addis, Clark, Crossfield, Duggan, Goldthwaite, Hardy, Rose, Smith, Willmott, Wood, Bartlett.

Private.—Messrs. Appleford, Day, Howes, Justican, Lightwood, Payne, Scargill, Bossey, Tyndall, Christian, Gregory.

Makers.—Messrs. Beck, Bailey, Baker, Crouch, How, Stanley, Christmas.

General Exhibitors.—Mr. J. W. Bailey, new folding microscope; Mr. Chumley, pen and ink drawings and oil paintings, by E. G. H. Lucas; Mr. O. C. Goldthwaite, cases of lepidoptera; Mr. O. T. Hodges, Cloisonné ware; Mr. G. Howes, collection of bones, skulls, &c.; Mr. G. Manners, map of Paris, 1792, assignats, 1792; Mr. T. D. Russell, crustacea, Madagascar; Mr. J. A. Richardson, mounting cabinet; Mr. E. B. Sturge, fungi from Addington Hills; Mr. E. Straker, plans of Surrey churchyards and measurement of yews, shewn by sections of the tree; Mr. F. W. Silvester, specimen of hazel; Mr. H. D. Turner, oil paintings; Mr. J. R. Gregory, meteoric stones; Mr. W. Saward, coins.

Ordinary Meeting, Nov. 20th, 1878.

Alfred Carpenter, Esq., M.D., President, in the Chair.

The minutes of the last meeting having been read and confirmed, Mr. J. Truman, Mr. Walter Cooper, and Mr. Samuel Palmer were balloted for and elected.

The President announced that Mr. Howard Martin had retired from the committee of the Club, in consequence of his many other engagements, and that the committee had decided not to fill up the place thus left in the committee, but to leave it to be filled up by the General Meeting in January. He also announced that the paper which was read by Mr. George Corden on "The Meteorology of Croydon" on April 17th last, had been separately printed, and that a copy of it would be forwarded to every member of the Club.

Mr. J. Chisholm read a paper "On a Geological Section in Park Hill Rise." Mr. Chisholm first referred to the labours of Professor Prestwich, who, about 30 years ago, clearly demonstrated the Lower London Tertiaries, which occur between the London clay and the chalk formations, to be separable into three great divisions, which now go by the names of the Oldhaven, the Woolwich and Reading, and the Thanet beds respectively. Their position at Park Hill was illustrated by a diagram enlarged from a drawing in a paper by Professor Prestwich, in Vol. 10 of the Quarterly Journal of the Geological Society, p. 99, and their general structure and distribution commented on. Attention was next directed to a section taken from a pit in a garden at the top of Park Hill-rise. The various strata uncovered were explained, and a number of fossils, ostrea bellovacina, calyptrœa trochiformis, cyrena, &c., found in some of the beds were exhibited. The point of interest in this section was the apparent overlying of the Oldhaven pebbles by the Woolwich and Reading beds, the second member of the Lower Tertiaries, and Mr. Chisholm brought forward several reasons for supposing this to be really the case. He also stated that he had received a letter from Mr. Whitaker, the well-known member of the Survey, in which it was suggested that there might be a "reversed fault" at this spot. The result of a number of other openings in the neighbourhood was then given; among others that of a boring 20-ft. deep made by Mr. Baldwin Latham in his garden for the purpose of making researches into the underground temperature. As a general conclusion, Mr. Chisholm believed that the bed of Oldhaven pebbles would be found to cover a considerable part of the northerly slope of Park Hill, and the plastic clay of the Woolwich series continued along the top of the hill between

Park Hill-rise and the Waterworks tower. After referring to the unavoidable mistake that had been made owing to the absence of sections when this neighbourhood was first mapped by the Survey, and to a slight inaccuracy that had been consequently found to exist in the map that accompanies Professor Morris's lecture on the geology of Croydon, Mr. Chisholm said he should take advantage of this error on the part of the Survey, to point out the utility that would attach to a record of local sections as that which had that evening been brought forward, and suggested that the examination and recording of these sections should be done systematically by a sub-committee of this club. Even one isolated section might not be without some use, but the combined record of a great many sections would be of far greater and more practical importance. A great part of the neighbourhood of Croydon was covered by a superficial deposit of gravel which filled up the hollows, and effectually concealed every indication of the stratification beneath. It was only when some opening in the gravel chanced to be seen and the dip of the underlying strata noted, that a calculation could be made of their probable direction underneath, and the spot at which they terminated. Thus, when our acquaintance with the solid geology, as it is called, in its minor ramifications, was founded on one or two only of such sections, it was little more than guess work, and it would be necessary to multiply observation upon observation to attain anything like exact knowledge. In a growing neighbourhood like this, constant opportunities were presenting themselves for a better acquaintance with the ground beneath us; openings were being made on every side, and these were so numerous, and in so many different localities, that it required the co-operation of many observers to take note of any large proportion of them. They could not expect a member of the Survey to be always on the spot to take note of sections; such work must be left to residents. If it were undertaken we should have the data ready to our hand to assist us in carrying out more thoroughly our drainage operations, and thus in approaching a more perfect sanitary condition, and a consequently higher standard of health.

In the discussion which ensued, Mr. F. Warren and Mr. H. M. Klaassen took part.

Mr. Turner said he had been invited last spring by Mr. Chisholm to inspect the section, under circumstances less favourable than he could have desired. The conflicting appearance of the section puzzled him, and he had some difficulty in making out the relation of the different beds to each other, and therefore the opinion he was about to offer might not be worth much. Mr. Whitaker maintained that in all probability there had been a reversed fault; but he (Mr. Turner) could not see how a reversed fault could have taken place in a locality like this, and he expressed an opinion that the confusion of strata was due to a subsidence, and not a reversed fault. Under any circumstances, he considered that great benefits would result from the discovery and record of phenomena such as this.

The PRESIDENT expressed his approval of the idea of a geological sub-committee being formed for dealing with these subjects similar to the botanical sub-committee, and said he should take care that this was brought under the notice of the committee. He congratulated Mr. Chisholm on the artistic and most satisfactory manner in which he had explained some of the differences in the strata of the neighbourhood, and referred to the fact that the same kind of fossils which Mr. Turner had brought from a distance were to be found at Selhurst, at Duppas Hill, and on the site of the present Gas Works. In explanation of the confusion and irregularity of the strata, he expressed his belief that it could be accounted for by denudation, adducing in support of his argument the immense displacement of chalk from the hills by the action of rain in the course of many thousands and perhaps millions of years. For every seven gallons of rainfall each year, one pound of chalk was removed. During that long period the chalk had been gradually washed out, and the subsidence thus occasioned had probably led to the confusion of strata. He had never seen it accounted for in this way; but he thought it was a point worthy of consideration.

Mr. J. FLOWER read a paper on a portion of the trunk of a horse chestnut tree, which he had exhibited at the soiree, and in which an iron chain had become imbedded. *(Vide p. 5.)*

The PRESIDENT reminded the members that a short time since he had exhibited a portion of an arbor vitœ tree, which had a piece of tarred string tied tightly round it. The effect of this, however, was different to that of the chain on the horse chestnut tree, inasmuch as an abnormal growth was produced above the string, and there was no unusual growth below it.

The following were exhibitors:—Mr. J. W. Chisholm, collection of fossils from Park Hill; Mr. H. Turner, fossils; Mr. H. M. Klaassen, fossil oysters from Park Hill; Mr. E. Lovett, specimens of rocks composing the earth's crust (arranged according to strata); Mr. E. Gill, xanthidia in flint; Mr. J. S. Johnson, section of fern in coal; Mr. S. Overton, head of blowfly, mounted without pressure.

Ordinary Meeting, Dec. 18th, 1878.

ALFRED CARPENTER, ESQ., M.D., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. J. W. Ward, Mr. C. James Egg, and Mr. F. M. Walton were balloted for and elected.

Mr. Thomas Cushing and Mr. Henry Turner were appointed to audit the accounts of the Club for the current year.

The PRESIDENT announced that Professor Rupert Jones had presented the Club with two pamphlets—"On recent Foraminifera of County Down and Antrim," by Joseph Wright, F.G.S., and published in the transactions of the Belfast Naturalists' Field Club; and "Les Foraminiferes Vivants et Fossiles de la Jamaique," by Professor T. Rupert Jones, W. K. Parker, and H. B. Brady.

The PRESIDENT drew attention to a new and very ingenious section cutting machine, which was exhibited by the inventor, Mr. W. L. Sarjeant, a member of the Club.

Mr. FLOWER next read the first report of the Botanical Sub-Committee *(vide p. 8)*, which was illustrated by numerous dried plants from the neighbourhood of Croydon, which were exhibited by the members of the Botanical Sub-committee. To this report was added some remarks by Mr. Flower, on some of the more interesting of the plants mentioned in the report.

In the discussion which ensued, the PRESIDENT expressed his opinion that the report was a very valuable contribution to the work of the Club, and pointed out very clearly the direction they should follow. Mr. Flower had shown them that the list was not complete, and he thought they could not do better than ask the sub-committee to continue the work. He believed it would be their wish that in due course the report should be put in type. Subsequent reports might be added, so that in the future they would have a "Flora" of their own.

Mr. KLAASSEN thought it was a wise conclusion not to publish the places where the several species were discovered, and mentioned one instance where a certain flower had disappeared from the neighbourhood in which it was found owing to the raids made by persons who, except for such publicity, would have been ignorant of the locality in which it grew. He hoped that in future the sub-committee would make known the soil upon which the plants grew. He understood Mr. Flower to say that 750 species had been found. He thought that there were altogether about 950 species to be found near Croydon.

Mr. FLOWER said the sub-committee was not yet in a position to put forward a classification of plants with regard to soils, but in the future they hoped to do this. He also expressed his opinion that the district round Croydon was rich in plants, and in proof of this he mentioned that on the railway bank between the foot-bridge near the Fairfield and the bridge in Coombe-lane there were about 150 species of flowering plants. How some of them got there it was difficult to explain. In the gravel pit there were some plants which were probably brought there with ballast. He also expressed a hope that members of the Club who were interested in plants would help the sub-committee, and if they saw a plant which they thought was strange, would let the sub-committee know of it, or send it to them in the best condition they could. If they could not send the whole plant even a portion might be sufficient.

Mr. Field next read a paper "On a piece of chalk," which was followed by a discussion, in which the President, Mr. H. Turner, and Mr. J. W. Chisholm took part.

The following objects were exhibited:—Foraminifera, Croydon chalk, Mr. J. W. Chisholm; ditto, "Challenger" expedition, Mr. J. S. Johnson; section of kidney of Guinea pig, Mr. H. M. Klaassen; chalk in process of formation from the Atlantic, 2,300 fathoms, Mr. K. McKean; hybrid primulas, Mr. E. Straker; lichen and fungi, Mr. E. B. Sturge; foraminifera, Gravesend chalk, Mr. H. Turner.

Annual Meeting, January 15th, 1879.

Alfred Carpenter, Esq., M.D., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The President announced that the soiree of the South London Microscopical Club would be held at the Crystal Palace on February 19th, and that in consequence of this the ordinary meeting of this Club would be postponed to February 26th.

The President further announced that the New Cross Microscopical Club had fixed their soirée for the 28th inst.

The receipt was also announced of two slides of Phylloxera Devastatrix from the vineyards of the Upper Douro, from Mr. K. McKean; and two slides of Belemnite from the Yorkshire coast, from Mr. E. Gill; also two copies of weather charts, which had been tabulated by Mr. Corden, from 1867 to 1877.

The Hon. Secretary then read the report of the committee and statement of accounts for the past year.

Report.

The committee have again the pleasure of submitting to the members of the Club their annual report of its proceedings.

During the year 25 members have been elected; 14 have resigned (chiefly on account of removal from Croydon or from inability to attend the meetings), and the committee regret to add that five members, viz.: Mr. J. M. Eastty, J.P., Mr. C. W. Johnson, F.R.S., Dr. Henry Owens, Mr. C. H. Maltby, and Mr. William Harrison have died. The total number of members on the 31st December, 1878, was 241, one being an honorary member.

The following papers have been read:—

Feb. 20th.—Mr. J. W. Wallis, "On Man Nomadic."

March 20th.—Mr. W. J. Nation, "On Ivory."

April 17th.—Mr. George Corden, "On the Meteorology of Croydon." A full copy of this paper will be forwarded to each member of the Club in the course of the ensuing month.

May 15th.—Mr. O. T. Hodges, "On the Natural History and Instinct of the Bee;" Mr. S. J. Baldwin, "On Bees and their Management."

Sept. 18th.—Mr. Edwin Roper, "On the Microscope and its uses."

Oct. 16th.—The President (Dr. Alfred Carpenter) "On the Microscopical Appearances and Natural History of Hard Water, and its softening by Clark's process."

Nov. 20th.—Mr. J. W. Chisholm, "On a Geological Section in Park Hill Rise;" Mr. John Flower, M.A., "On a portion of the trunk of a Horse Chestnut Tree, in which was embedded an iron chain which had been placed round the tree."

Dec. 18th.—The report of the Botanical Sub-Committee and list of plants found by them in the neighbourhood of Croydon; and notes by Mr. John Flower, M.A., on some of the rarer and more interesting plants comprised in the sub-committee's list; Mr. William Field, "On a piece of Chalk."

The success which has attended the appointment of the Botanical Sub-Committee appears to justify the opinion that there is room for further development in this direction, viz., by the formation of sub-committees in other branches of science.

Excursions were made on the 15th June to Redhill, Nutfield, and Bletchingley, in conjunction with the Quekett and South London Microscopical Clubs, on which occasion the Clubs were kindly and hospitably entertained by Sir George Macleay, K.C.M.G., at Pendell Court; and on the 20th July to Addington Park, when the members of the Club were also kindly and hospitably entertained by Mr. Charles H. Goschen, of Ballards.

In the last report attention was drawn to the thin attendance at the conversational meetings, and the committee regret that they cannot announce any improvement.

The Ninth Annual Soiree took place at the Public Hall, on Wednesday evening, 6th November, and was attended by fellows of the Royal Microscopical Society, and members of the Quekett, South London, Sydenham, Greenwich, New Cross, Tower Hill, Old Change, and Hackney Clubs, and others, by whom, and by members of the Club, 173 microscopes were exhibited, besides many interesting objects in natural history, antiquities, works of art, &c. The attendance was the largest on record, being 140 members, 106 exhibitors, and 549 visitors; total, 795, as against 770 at the Soirée in 1877.

The members of the Club gave an exhibition of microscopes at the Working Men's Club, on October 14th.

The reports and Journals of the Quekett, South London, Watford, Brighton and Sussex, Berwickshire, Sydenham and Forest Hill, New Cross, East Kent, Eastbourne, and Belgian Clubs and Societies have been received.

The donations to the Club during 1878 are as follows:—Mr. E. Gill, two slides, Oolite; Mr. R. B. Douglass, a spectroscope; Mr. George Corden, volume of weather charts for 11 years, 1867 to 1877; Professor T. Rupert Jones, F.R.S., &c., papers on recent Foraminifera of Down and Antrim, by Joseph Wright, F.G.S., and "Living and Fossil Foraminifera of Jamaica, by Professor T. Rupert Jones, F.R.S.; Professor W. K. Parker, F.R.S.; Professor H. B. Brady, F.R.S.; and Mr. S. W. Lambert, Wasps' Nest from Wye, Kent.

During the year the reports for 1876 and 1877 have been printed and duly issued to the members and corresponding Clubs and Societies. The Club series is now complete to date, with the exception of 1871, which it is hoped may be shortly completed.

The attendance at the ordinary meetings has been good, and equal to the average of the previous year.

The thanks of the Club are again due to the local press for the very full reports of the various meetings, which have appeared in the columns of the *Croydon Advertiser*, *Croydon Chronicle*, and *Croydon Guardian*.

Signed on behalf of the Committee,

ALFRED CARPENTER, President.

Croydon, 15th January, 1879.

BALANCE SHEET FOR THE YEAR ENDING 31st DECEMBER, 1878.

RECEIPTS.	£	s.	d.
To Balance in hand, 1st January	15	3	11
,, Subscriptions	119	10	0
,, Sale of Lectures and Reports	8	2	1
,, Sale of Soiree Tickets	21	12	6
	£164	8	6
To Balance brought down	7	2	8

EXPENDITURE.	£	s.	d.	£	s.	d.
By Hire of Rooms				6	15	0
,, Printing and Advertising				12	17	2
,, Stationery				0	11	9
,, Postages				5	18	0
,, Printing Seventh and Eighth Reports				53	12	9
,, Collection of Subscriptions				7	1	5
,, Attendance at Hall and care of Lamps				1	3	1
,, Refreshments at Annual Meeting				2	5	0
,, Gratuities				1	8	6
,, Insurance				0	8	1
,, Sundries				1	9	7
SOIREE ACCOUNT.						
,, Hire of Rooms	7	19	6			
,, Printing and Advertising	12	4	3			
,, Tables	11	8	6			
,, Postages	4	0	0			
,, Police and Attendants	0	15	0			
,, Music	5	15	0			
,, Decorating Platform	2	0	0			
,, Refreshments	16	10	9			
,, Lamps	2	10	6			
,, Cartage of Plants	0	12	0			
				63	15	6
Balance forward				7	2	8
				£164	8	6

PHILIP CROWLEY, TREASURER.

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct according to the vouchers and the bankers' pass-book.

6th January, 1879.

HENRY TURNER,
THOS. CUSHING, } AUDITORS.

The PRESIDENT, in moving the adoption of the report, said it was on the whole a very satisfactory one. The Club, during the year, had lost nothing of its prestige; the number of members had been augmented, and the financial year terminated with a balance in its favour. Papers of intrinsic worth had been read, and although the work done in microscopical research, he believed, was not so great as in some of the previous years, there was an undercurrent of work in some of their members which would bring its reward hereafter. The balance at the end of the year was not so large as that at the commencement, and this was to be accounted for by the bringing up of arrears in the printing of the annual records of the proceedings. Two of these had been printed during the past year, and there now remained only one of the earlier years to be completed. In consequence of this additional expenditure it had been thought desirable that the annual lecture, which had hitherto been given, should for the present be discontinued. There had also been a large expenditure connected with the soiree, but when they considered the amount of pleasure that was afforded to the large number of visitors, and the interest they manifested in examining the varied objects exhibited, he thought the money spent had been well invested. As this would be the last occasion on which, as their President, he should have the pleasure of addressing them, he would take this opportunity of acknowledging the kindness and support he had invariably received from the committee, who although they sometimes very properly differed in opinion, worked amicably together for the common interests of the Club; and he should look back to those committee meetings with a considerable amount of pleasure. He moved that the report and accounts be received and adopted, and that they be printed and circulated amongst the members.

Mr. J. FLOWER, in seconding this motion, referred to the recommendation of the committee that additional sub-committees should be appointed, and cordially endorsed that recommendation. In the earlier stages of its existence the work of the Club was chiefly microscopical, but latterly the Natural History element had been developed, and he thought it very desirable that this part of the work of the Club should be organised and put into a more systematic form; this could best be done by the appointment of sub-committees, whose particular duty it would be to develope the work of the Club each in its own department. In 1877, a botanical sub-committee was formed to work the district, and the experiment had been so successful that he thought they might follow it up by appointing three more sub-committees in other branches—such as geology, meteorology, and zoology. It might be necessary, hereafter, to sub-divide these, but for the present he did not think it advisable to have more than four. He hoped that at the next meeting the appointment of sub-committees for the three branches he had mentioned would be announced.

The motion for the adoption of the report was then put and carried.

Election of President.

Dr. Carpenter said he had much pleasure in rising to propose that Mr. John Flower be elected President of the Club for the ensuing year. The way in which Mr. Flower had supported the Club, and the knowledge which he would bring to bear upon the subjects which would come before it would, he was satisfied, render him a very valuable and efficient head of the Club.

Mr. Henry Lee seconded the motion, which was carried by acclamation.

Mr. Flower, in thanking the Club for the high compliment they had paid him, said he had much pleasure in accepting the honour they had conferred upon him. Although they might have selected some one with more leisure at his command, and with greater skill in the use of the microscope, he did not think they could have found one who would be more anxious to promote the development of the Club, and to extend its usefulness. At the same time, he was quite conscious that the duty which would devolve upon him would not be a sinecure, but on the contrary, would involve a large amount of responsibility and careful attention. He had no doubt, however, that he should receive the cordial co-operation of the officers and members of the Club, and that he should be able with that help to maintain the present high standard of the Club.

Appointment of Treasurer and Secretary.

Mr. H. Lee then proposed the re-appointment of Mr. Philip Crowley, as treasurer, and Mr. E. B. Sturge, as honorary secretary.

Dr. Carpenter, in seconding the proposition, paid a well-merited tribute to the care and attention of their hon. secretary.

The motion having been put and carried,

Mr. Crowley and Mr. Sturge briefly acknowledged the compliment that had been paid them.

Appointment of Committee.

Mr. G. F. Linney then moved the re-appointment of the committee as follows:—Mr. W. H. Beeby, Dr. Carpenter, Mr. Thomas Cushing, Mr. J. S. Johnson, Mr. H. Lee, Mr. G. Manners, Mr. K. McKean, Mr. H. Turner, and Mr. A. D. Taylor.

Mr. J. BERNEY seconded the motion, which was put and carried.

Mr. LEE proposed a vote of thanks to the President, to the treasurer, hon. secretary, and other officers during the past year; also to Mr. Corden, for his valuable tables on the meteorology of Croydon, the result of laborious and painstaking work during a period of ten years, and for which, as an addition to their library, Mr. Corden was entitled to a special vote of thanks from the Club.

The PRESIDENT having briefly acknowledged the vote of thanks, expressed a hope that some of the members would break through their reserve and come to the front in a way they were fully competent to do, by reading papers on subjects which could not fail to impart instruction to the Club. He should like them to look upon their fellow-members as students, anxious to instruct each other; and they would find that, in compiling their papers, they would learn things that they never knew before. He thanked the Club for the kind support they had invariably extended to him, and he had no doubt that his successor would be equally well supported.

Dr. STRONG then suggested that a few pounds should be expended in works of reference for the library.

Mr. LEE explained that if it were found that the members applied for books the committee would be happy to consider Dr. Strong's suggestion, but at present few applications were made.

Mr. J. BERNEY said that unless the Club had a room of its own, the demand for books would not be great, as it was sometimes necessary for members to have their microscopes with them when they consulted their books.

Mr. LEE said the books were in the care of the librarian of the Literary and Scientific Institution, and might be obtained at any time by members, who would be at liberty to take the books home with them. A list of the books was published in the records of their transactions.

Mr. KLAASSEN then called attention to the wording of the first rule of the Club, which was somewhat ambiguous, and Mr. Lee, on behalf of the committee undertook that this should be considered with a view to the amendment of the rule in accordance with Mr. Klaassen's suggestion.

This brought the proceedings to a termination.

The following objects were exhibited:—Mr. E. Gill, Larva of gnat; H. M. Klaassen, Human nerve; E. Lovett, Parasite of calf; H. Long, Parasite of goldfinch, wheat mildew; K. McKean, Larva of beetle; Mr. R. Owen, Fungus; A. D. Taylor, Pollen of Godetia; A. Warner, Section of stem of exotic fern, stained in two colors; W. L. Serjeant, soap films.

Ordinary Meeting, Feb. 26th, 1879.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. Alfred Russel Wallace was balloted for and elected.

The PRESIDENT announced that Mr. G. Corden had forwarded to the secretary a copy of a letter written by him to the *Croydon Advertiser* which contained some interesting particulars as to the very remarkable thunder storm which broke over Croydon on Sunday, June 23rd, 1878, and the letter was laid on the table for perusal by the members. *(See p.* 32*).*

He also announced that Mr. Mason, photographer, of George-street, had taken three very good photographs of the piece of the chestnut tree with the iron chain embedded in it, which was exhibited at the soiree, and described at the meeting on November 20th, 1878, and he presented copies of the three photographs to the Club.

He further intimated that the soiree of the Quekett Microscopical Society would be held at University College, Gower-street, London, on Friday, March 14th.

Mr. H. TURNER read an interesting paper "On Yeast," and Mr. HENRY LEE read a short paper, by Mr. H. Long, who was unavoidably absent, on the same subject.

A discussion took place on these papers, in which the President, Mr. H. M. Klaassen, Mr. J. S. Johnson, and others took part. Mr. Klaassen solved one of the difficulties felt by Mr. Long, by explaining that two varieties of yeast, distinguished by the Germans as the "Ober-hefe," or surface yeast, and the "Unter-hefe," or sediment yeast, were now recognized by naturalists, and explained and described the peculiarities of each. Mr. Long's experiments had probably been made with the surface yeast, which, when dried, became converted into a "tough horny substance," as described by Mr. Long: whereas the sediment yeast, when dried, appeared as a fine powder. Mr. J. S. Johnson, at the request of the President, also explained how it was that yeast cells were commonly found in some parts of the urinary system of the human body in certain diseases.

The following objects were exhibited:—Mr. H. Turner, torulæ, cells of yeast plant under high power; Mr. A. D. Taylor, polypodium vulgare, showing sori; Mr. J. S. Johnson, clematis, stained; Mr. K. McKean, mould from jam; Mr. H. M. Klaassen, yeast plant, and experiments with soap bubbles to illustrate cell division of torulæ; Mr. E. Lovett, orbilolites, eocene, Isle of Wight, pupa cases and larva, from China; Mr. E. B. Sturge, two vols. Ephraim Chambers' Cyclopædia, published 1738; Mr. J. Toms, diatoms.

Ordinary Meeting, March 19th, 1879.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The following gentlemen were balloted for and elected:—Mr. Richard Backwell, Mr. E. Mawley, Mr. H. T. Mennell, Mr. J. Poland, Mr. W. R. Harwood.

The PRESIDENT proposed four gentlemen for election as honorary members, and, in doing so, remarked that when the Club was in its infancy it was felt that they could hardly ask distinguished men to be connected with it, but now that the Club had increased to very considerable dimensions, and had come to be known beyond the limits of Croydon, the time had come when they could properly ask men who were eminent in science to accept the honorary membership of the Club. He had, therefore, pleasure in proposing Mr. John Evans, D.C.L., F.R.S., of Nash Mills, Hemel Hempstead, Herts; Professor W. H. Flower, LL.D., F.R.S., President of the Zoological Society of London, of the Royal College of Surgeons, Lincoln's Inn Fields, London; Professor Joseph Prestwich, M.A., F.R.S., Professor of Geology in the University of Oxford, of No. 34, Broad-street, Oxford; and Professor George Rolleston, D.M., F.R.S., Linacre Professor of Anatomy and Physiology in the University of Oxford.

The proposal was seconded by Dr. Carpenter, and the PRESIDENT announced that these gentlemen, having been duly nominated, would be balloted for, in accordance with the rules of the Club, at the next meeting on April 16th.

The PRESIDENT called attention to what had passed at the annual meeting, on January 15th, with reference to the wording of the rules of the Club, and stated that the matter having been considered by the committee, they recommended that the rules should be altered in the following respects:—That the first paragraph should be as follows—

TITLE AND OBJECTS OF THE CLUB.

The Club shall be called "The Croydon Microscopical and Natural History Club," and shall have for its objects the mutual help of its members in the study of Microscopy and Natural History, the investigation of the Meteorology, Geology, Botany, and Zoology of the neighbourhood of Croydon and the County of Surrey, and the dissemination amongst its members of information on the subjects of Microscopy and Natural History.

That two merely verbal alterations be made in the Rule as to the management of the Club.

That in the Rule as to honorary members, the words "provided they do not reside within the district," "and corresponding" be struck out.

And that in Rule 4 as to ordinary meetings, the time limited for the reading of papers be increased to twenty minutes.

And gave notice that at the meeting on April 16th he would move that the Rules of the Club be altered as recommended by the committee.

The PRESIDENT further announced that the recommendation in the committee's last report, that the number of sub-committees should be increased, had been acted upon, and that three more sub-committees, to be called the Meteorological, Geological, and Zoological sub-committees, had been constituted, and that the following gentlemen had consented to act as members of them :—

Meteorological Sub-Committee.—Mr. E. Mawley, Mr. H. S. Eaton, Mr. G. Corden.

Geological Sub-Committee.—Dr. Carpenter, Mr. H. Turner, Mr. J. Chisholm, Mr. H. M. Klaassen.

Zoological Sub-Committee.—Mr. J. Berney, Mr. E. Lovett, Mr. A. D. Taylor, Mr. P. Crowley, Mr. K. McKean.

Mr. H. T. Mennell had also joined the Botanical sub-committee.

The President of the Club for the time being would be an *ex-officio* member of each of these sub-committees.

These sub-committees could not, however, as yet, be considered as complete, as it was hoped that other members who had made some of the various branches of Natural History their particular study would be willing to join them.

The PRESIDENT further announced that letters had been received from the secretaries of the Geological Society of London and the Hackney Microscopical and Natural History Club, acknowledging with thanks copies of Mr. Corden's paper on the "Meteorology of Croydon," which had been forwarded to them.

Dr. CARPENTER exhibited, and made some remarks upon two pieces of lead pipe, which had been used as water pipes, and had been gnawed through by rats. Both exhibited the marks of the teeth of the animals very plainly. One had been sent to him by Mr. R. Pelton, of Tunbridge Wells. The other specimen in the room had been brought by a member of the club (Mr. E. Straker). He passed the pieces of pipe round for inspection, and read the following letter as to one of them from Mr. Pelton:—

68, Parade, Tunbridge Wells, March 23rd, 1879.

DEAR SIR,—It may possibly be interesting to the members of the Croydon Microscopical Club to see a piece of lead pipe gnawed through by rats, as described in the extract from *Nature*, at the foot of a letter in the *Croydon Advertiser*, signed H. M. Klaassen.

The pipe from which this piece is taken runs along on a concrete floor at the basement of my house, and is of course exposed, although a wood flooring is above the concrete. During a severe frost a few winters ago the cistern was found empty, and on opening the floor the water had escaped through the hole made by the rats in the piece of pipe I send herewith. It is possible that during the severe frost the usual supplies of water which the rats were in the habit of getting their drink from had frozen up, and as they say these animals get very desperate when thirsty, they must have had instinct strong enough to know that water was in the pipe, and attacked it accordingly. Two facts noticed were curious—1st, the almost entire absence of the lead filings round the hole made; 2nd, the largeness of the hole. Taking No. 2 first I may say the pipe was fully charged from a rather large cistern, and consequently I conclude that the hole must have been small at first, and the water would probably then rush through and perhaps frighten these four-footed engineers away until the cistern emptied itself. When this was done they must have come back again, and probably tempted by the trickling of a little water at the bottom of the pipe, commenced gnawing until they made the hole large enough to get their noses in. As to the absence of the lead filings, some of them doubtless got washed away, some of them were around the hole and in the pipe, and I cannot but think that some of them were eaten; whether they were good for digestion or not you are a much better judge than myself.

I am, &c., yours obediently,

R. PELTON.

—Dr. Carpenter went on to remark that rats had a great deal to do with the destruction of the atmospheric railway which used to run from Croydon to London. He explained the principle on which that railway was constructed, viz., the exhaustion of air from a so-called pneumatic tube, and stated that by the rats gnawing some of the leather the tube was no longer air-tight, and the carriages in consequence frequently came to a dead stop.

Dr. Carpenter also exhibited a piece of the lower part of the trunk of a laburnum tree from the garden of the Rev. M. Farrar, of Shirley, in which a colony of Ants (Formica Umbrata?) had formed their abode, and described shortly the history and habits of the various species of ants, contrasting them with bees. He also alluded to their propensity for eating flesh, and explained how by the agency of ants, good skeletons of small animals could often be obtained. In proof of this he took up the skull of an animal which was lying on the table, and which had been cleaned in a most beautiful and effectual manner by those insects. In the piece of the laburnum tree which was exhibited, the arrangement of the nest was seen in a very clear manner. Unfortunately the tree had been split open before the existence of the formicarium was discovered. A portion of the nest had been sent to the British Museum. The remainder was before the meeting. The covered ways, the winding stair-case like passages, and the extensive apartments in which the eggs of the ant were stowed away, and moved about, were very manifest. It would appear that the ant was an acute observer of the state of the atmosphere, that, without either barometer or dew point measure other than those existing on their own persons, they were able to judge as to the kind of day in store for them, and used to arrange their eggs and pupa accordingly, with almost unerring certainty. Dr. Carpenter also called attention to the walls of the nest, which were arranged so as to limit the action of cold and moisture to the fullest extent.

In the discussion which ensued,

Mr. W. H. Rowland asked whether the water-rat, in addition to living upon vegetable matter, did not also eat fish. When he had been snipe shooting he had found pieces of cray-fish shell which had apparently been eaten by water-rats, and he thought that in addition to vegetable matter these rats indulged in food of this kind.

The President said that about almost every river, especially if near a town, there were two kinds of rat—the water-rat (Arvicola amphibia), and the common brown rat (Mus decumanus). The latter was very fond of water, and was constantly seen upon river banks, and would eat anything. The water-rat on the other hand was more like a beaver, and as a rule lived upon vegetable food only. He was very much inclined to think that the cray-fish referred to by Mr. Rowland had been eaten by the common brown rat, and not by the water-rat. The two were very often confused, but they were very distinct animals in their habits and their structure.

The President called particular attention to a very interesting series of nests, 47 in number, exhibited by Mr. P. Crowley, in each of which a cuckoo had laid its egg. *(These were again exhibited at the meeting on April 16th.* *See p. 38).* He also called attention to a skull, to which Dr. Carpenter had referred as having been cleaned by ants, which was exhibited by Mr. Maitland Gardner.

Mr. A. R. Wallace being appealed to, explained that this was the skull of a species of Pig, the Babirusa, or Pig Deer (Barbirusa alfurus), an animal with which he was well acquainted. It is found only in the Island of Celebes, the Sula islands, and the island of Bouru, all in the Malay Archipelago; but as regards Bouru it is probably not indigenous, but has been introduced by the natives. Mr. Wallace called attention to and described the long curved tusks in the upper and lower jaws. These were probably once useful to the animal, but changed conditions of life have rendered them unnecessary, and, no longer being worn down as fast as they grew, they now develope into a monstrous form, just as the incisors of rodents do if the opposite teeth do not wear them away. The history and structure of the creature all seem to indicate that it is a survival of a very ancient form.*

The President read some notes on a sterile Grey Hen, the Cirl Bunting, the Stock Dove, and a foot of a cock Pheasant with an additional toe. *(See p. 34).*

The following objects were also exhibited:—By the President, nest and eggs of the Common Yellow Bunting; Mr. J. Berney, volvox; Mr. P. Crowley, specimen of yeast; Mr. E. Gill, White Ant; Mr. E. Lovett, Black Ants (Glyciphagus plumiger) from Gibraltar; Mr. H. Long, fermentation of malt liquor, and shewing fermentation of surface yeast; Mr. H. R. Owen, Coralline; Mr. E. B. Sturge, Asterina gibbosa; Mr. W. L. Sarjeant, Peristome of moss and peculiar variety of Lime Hawk Moth; Mr. A. Warner, section of leaf and midrib of Strelitza augusta, stained in two colours; Mr. W. H. Rowland, Globe Fish (Diodon ?).

At the conclusion of the meeting, Mr. G. F. Linney described the Albo-carbon light (patented by the Albo-Carbon Light Company), with which the room in which the meeting was held was lighted.

---

* The skull of the Babirusa is well figured in Mr. A. R. Wallace's work, "The Malay Archipelago," vol. 1, p. 434.

Ordinary Meeting, April 16th, 1879.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The following gentlemen were balloted for, and duly elected honorary members of the Club:—Mr. John Evans, D.C.L., F.R.S., Professor W. H. Flower, LL.D., F.R.S., Professor Joseph Prestwich, M.A., F.R.S., and Professor George Rolleston, D.M., F.R.S.

Mr. H. S. Eaton, Mr. E. Wormald, and Mr. T. J. Duke were balloted for and elected.

Referring to the proposed alterations in the rules of the Club, the PRESIDENT again read and explained the alterations recommended by the committee, and, in pursuance of the notice given at the last meeting, he moved that the rules, as altered by the committee, be adopted as the rules of the Club. This having been seconded, was carried unanimously.

A programme of the excursions which had been arranged by the Quekett Microscopical Club was laid upon the table, and the PRESIDENT announced that one of these, to Caterham and Godstone, would take place on Saturday, May 17th.

A letter was read from the hon. secretary of the Quekett Club, thanking the members of this Club for their assistance at the soiree at University College, Gower-street, on March 14th.

A letter was read from Mr. F. J. Horniman, of Surrey House, Forest Hill, by which the members of the Club were invited to visit his house and examine his various Natural History collections, and the PRESIDENT requested all the members who were desirous of accepting this invitation to send in their names to the hon. secretary, in order that the necessary arrangements for their visit might be made with Mr. Horniman.

The PRESIDENT further announced that Mr. Horniman had also, very kindly, forwarded about 40 boxes of wings of butterflies, for distribution amongst the members of the Club; and he requested all those who would like to have some of these to send in their names to the hon. secretary.

The President exhibited three skins of the water rat (Arvicola amphibia), and referring to the discussion which took place at the last meeting, pointed out the characteristics which distinguished the water rat from the common brown rat (Mus decumanus).

He also exhibited a white dove, one of a wild pair which were shot by the gamekeeper of Edward Wormald, Esq., at Newdigate, Surrey, in the summer of 1877. From the plumage, it was quite impossible to say whether the bird was a white variety of the wild turtle dove (Turtur vulgaris) or was a tame dove, which had escaped from a cage. If the former, the specimen was very interesting, as white varieties of the English turtle dove were exceedingly rare. The small size of the bird, which, however, might be due, to some extent, to bad stuffing, would seem to favour the view that the bird was a tame one which had escaped.

Attention was also called to a Night Jar (Caprimulgus europœus), exhibited by Mr. W. H. Rowland, and to a series of eggs of this bird, which was exhibited by Mr. P. Crowley.

The PRESIDENT also called attention to some plants of Asarabacca (Asarum Europœum) brought by Mr. P. Crowley, and which were now in full flower. These were garden specimens, but the plant was believed to be truly wild in some places in the north of England and in Wiltshire.

A paper was read by Mr. J. W. WALLIS on "Man, his social progress in pre-historic times," which was followed by a discussion, in which the President, Mr. W. H. Rowland, Mr. Lovett, and others, took part.

Mr. P. CROWLEY again exhibited his collection of nests of British birds, which had been selected by the common cuckoo for the deposit of its eggs, and these were described by the President, who also called attention to various matters connected with the history of the cuckoo upon which these nests and eggs seemed to have an important bearing. *(See p.* 38*)*.

In the discussion which ensued on this paper, Mr. A. M. DAVIS mentioned that he had seen a cuckoo take away an egg from the nest of a hedge sparrow in his garden. He distinctly saw the egg in the cuckoo's mouth, and he afterwards found the egg of the cuckoo in the nest of the hedge sparrow. Mr. A. M. Davis expressed his belief that it was usual for the cuckoo, when it laid an egg in a nest, to remove one or more of the eggs which the nest contained.

The PRESIDENT also read a paper "On a peculiarity apparently hitherto undescribed, in the breastbone of the Gannet (Sula bassana)." *(See p.* 42*)*.

Mr. P. CROWLEY read some interesting details as to the quantity of sap which had escaped from the cut branch of a Birch Tree in his garden at Waddon. *(See p.* 44*)*.

Mr. J. W. CHISHOLM communicated the result of an examination by the Geological sub-committee, of a well lately sunk by Messrs. Legrand and Sutcliff, Artesian Well Engineers, of Bunhill Row, London, at the Brewery of Messrs. Pontifex and Hall, at Elmer's End. The depth reached was 180-ft. 6-in., and the beds bored through were as follows :—

Brown sand ...	... ...	3·6	Oldhaven Beds.
Grey ditto ...	... ...	14·6	
Shells and concrete ...	... ...	4·6	Woolwich and Reading Beds.
Ditto and clay	... ...	7·6	
Hard white stone	... ...	2·	
Coloured clay...	... ...	13·0	
Black pebbles...	... ...	4·	
Green sand and ditto	... ...	8·	
Live grey sand	... ...	47·	Thanet Sand.
Dead sand ...	... ...	4·6	
Flints	... ...	1·6	
Chalk and flints	... ...	70·6	
		180·6	

Water rises above the surface four feet.

Specimens of the various beds, which had been kindly lent by the engineers, were also exhibited and described by Mr. Chisholm.

The following objects were also exhibited :—The President, breast-bones of the Greater Black Backed Gull and Green Cormorant, Turtle Dove, Common Wren and House Sparrow; also eggs of the Missel Thrush, Common Wren, and House Sparrow; E. Lovett, Diatoms from Peru, spines of Porcupine Fish; S. Overton, Common Stickleback; H. R. Owen, Seaweed; S. Palmer, Heliopetta; W. L. Sarjeant, Diatoms from Peruvian Guano; A. Warner, section of butcher's broom, stained in two colours; E. B. Sturge, Scales of Butterfly; J. S. Johnson, Diatoms; K. McKean, various.

Excursion to Caterham, Surrey.

(In connexion with the Quekett and South London Clubs.)

Saturday, May 17th, 1879.

The party proceeded by rail to Caterham, thence walking to White Hill, and through the War Coppice, where the ancient British camp was examined. Part of the ancient road, known as the Pilgrim's Way, was traversed, and the party descended the hill to Godstone. The ponds in the district were examined by the members, and some specimens of pond life collected.

The party returned to Croydon and London from Caterham by the 9 p.m. train.

Ordinary Meeting, May 21st, 1879.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Letters were read from Mr. John Evans, F.R.S., Professor Flower, Professor Prestwich, and Professor Rolleston, thanking the Club for their election as honorary members.

Mr. William Russell, the Rev. John Kingscote Hawker, Mr. Frank Mead, Mr. H. S. Cowdell, Mr. G. H. Hall, and Mr. William Rowland were balloted for and elected.

The President announced that the Royal Microscopical Society had lately passed a bye-law by which the council had power to elect the Presidents of kindred societies Honorary Fellows of the Royal Microscopical Society. Some time back the secretary of that society wrote to the committee of this Club and asked if they would accept the honour on the part of their President. A reply was sent back to the effect that they would be pleased to do so, and since the last meeting they had received an intimation that the President of the Croydon Microscopical Club for the time being was now entitled to the privileges of an *ex-officio* member of the Royal Microscopical Society. This was a high compliment to the Club, and one for which they should return their best thanks.

Specimens of the Pill Beetle (Byrrhus pilula), one of which was alive, were exhibited by the President and Mr. A. D. Taylor, and the peculiar mode in which these beetles, when alarmed, draw their legs closely together upon the abdomen, so as to render them almost invisible, and the singular modifications of structure which enable them to do this, were described by the President. This beetle is not uncommon in the immediate neighbourhood of Croydon.

A paper was read by Mr. W. Ingrams on "Diatomaceæ," *(See p. 45).*

In the discussion which ensued, Mr. H. Turner asked whether Mr. Ingrams had examined any mud from the bottom of the ponds in the neighbourhood of Croydon. He asked the question because it was well known that deposits of thick mud accumulated in certain rivers in the northern part of Germany, obstructing the harbours and causing them to be dredged rather frequently. It was also known that in this mud there were considerable deposits formed, almost entirely of diatoms.

Mr. Klaassen asked if Mr. Ingrams knew who was the discoverer of diatoms. He believed the discovery had been credited to Ehrenberg. He also discussed the question whether diatoms were animals or plants. Some writers asserted that they were infusoria, and not vegetable organisms at all. But it seemed now to be generally admitted that they were plants. He also mentioned that in some parts they were eaten, with the mud which contained them, and considered to be a great delicacy.

Dr. Carpenter remarked that but few people had any idea how great a part these minute creatures had played in the world's history. It had been shown that silica was taken out of the water by these organisms, and it was probable that a large portion of the flint found on our chalk hills was extracted from the sea water by their agency, and that the mass of flints was thus indirectly the production of these organisms. It had been supposed by many that the formation of flint had long ceased on the earth, but it was evident that deposits of flints were now being made in different parts of the earth.

Mr. Wallis asked whether the flints contained in the box which Mr. Ingrams had alluded to were the result of his own personal observations?

Mr. Ingrams said they were.

Mr. Ingrams, in reply, said he had no doubt that a large quantity of diatoms would be found in any small portion of the mud at the bottom of Waddon Mill Pond, and there was no doubt that these diatoms had accumulated and caused the obstruction he had mentioned at the bridge. Mr. Klaassen had said something about infusoria. There was, as he had said, a divided opinion as to these diatoms—some agreed that they were animal and others that they were vegetable. The microscope of to-day was a far superior instrument to that of byegone times, and modern researches tended to show that these diatoms were not infusoria, but vegetable.

Mr. E. Straker exhibited a piece of palm willow, about 5-ft. long, around which a honeysuckle had entwined itself so tightly as to cut deeply into the bark. The foliage of the lower part of the tree had been entirely destroyed, but at the top there were signs of life when the bough was discovered.

Mr. G. Corden submitted to the meeting a table of winter temperatures for twelve years, in comparison with that of 1878-79, similar in plan to one published by Mr. G. J. Symons in the April number of the "Monthly Meteorological Magazine." *(See p. 53)*. Mr. Corden pointed out that it appeared from this table that the mean temperature of those four months of the past winter was 36°.5 or 4°.6 below the average of the same months for the twelve previous years, and lower by nearly two degrees than the lowest mean of any of them. The mean of the maximum or highest day temperature for the same period was 40·2 degrees or 5·7 degrees below the average, and the mean of the minimum or lowest night temperatures was 32·8 degrees, or only 3·4 degrees below the average, thus shewing that the deficiency of temperature was much more marked by day than by night. The same excess of deficiency by day was shown taking each month separately. Although there were 63 frosty nights during the four months referred to, the frost was not so severe in character as were the frosts in 1867 and of 1870-71; for there had been but four nights in which the thermometer fell to or below 20 degrees, while in 1870-71 there were 10, and in January alone, in 1867, 10. The quantity of rain which fell was 11 inches, as against 9·6 inches on an average of 10 years. The heaviest fall was 1·16 inches, rain and snow, on the 1st of January. Mr. Corden concluded by expressing his opinion that the long continued low temperature had had little or no effect upon the insects which were destructive in gardens.

The following members placed their microscopes at Mr. Ingram's disposal to illustrate his paper:—The President, Mr. P. Crowley, Mr. J. S. Johnson, Mr. S. Overton, Mr. G. N. Price, Mr. E. B. Sturge, Mr. H. Turner, Mr. A. D. Taylor, and Mr. A. Warner.

The following objects were exhibited:—Mr. P. Crowley, botanical specimens, beetles from wasp's nest; Mr. E. Gill, diatoms; Mr. W. Ingrams, diatoms; Mr. H. M. Klaassen, marine fossil fish from limestone rock, living marine and freshwater diatoms; Mr. W. L. Sarjeant, new form of cell for showing pond life.

Ordinary Meeting, Sept. 17th, 1879.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. H. C. Hibberdine and Mr. J. G. Cowan were balloted for and elected.

Dr. Carpenter exhibited and described a piece of oak, which looked at first sight as if it had been painted green, but which was really so coloured by a fungus, which had permeated the whole of the substance of the wood.

He also described the effect of a river flood which he had lately witnessed in North Wales.

Mr. E. Lovett called attention to the number of chalk flints which were to be found on the shore of the island of Jersey, and gave reasons for his opinions that they had been brought to the island as ballast.

Mr. Snelling exhibited some specimens of pemmican, and they were referred to Mr. J. S. Johnson to examine, and to report upon.

Mr. Klaassen exhibited under polarized light a thin section of granite showing its composition (felspar quartz and mica), and the numerous small and large enclosures in its quartz. He also explained that microscopical examination proves by the large enclosures, which contain liquid carbonic acid, that gases condensed to liquid were present at the formation of granite, and by the presence of crystals and enclosures that the molten granitic mass cooled, slowly and under great pressure, at considerable depth in the earth, where contained gases could not expand. Modern investigation has taken away from granite its old title, "the first formed," the primitive rock upon which the aqueous and volcanic rocks were afterwards superimposed. It is easily conceived, that besides having an upward effect, subterranean heat may extend its influence downwards from the crater of every active volcano to a great depth, so that the volcanic rock, the rock formed by heat above, and the plutonic rock, formed by heat below, each different in texture and sometimes in composition, may now, as in olden time, originate simultaneously.

The following other objects were exhibited :—J. H. Baldock, coal sections ; A. H. Baldock and A. J. Baldock, collection of fossils from the chalk and gault, Dover and Folkestone ; W. H. Beeby, the licerta ; J. W. Chisholm, fossils from Cassel and shells from Dunkirk ; J. S. Johnson, Haliomma, Radiolarian ; S. W. Lambert, wasps' nest ; E. Lovett, air vessel of cockchafer, Lepidodendron and specimens of the rocks of Jersey ; K. McKean, Planorbis marginatus, Limnœus pereger, Helix rotundata ; H. R. Owen, leaf from South Africa ; S. Palmer, red garden spider ; A. D. Taylor, eggs of moth ; E. B. Sturge, fungi ; H. Turner, shells from Woolwich beds ; J. W. Wallis, fossils from Blue Lias, Lyme Regis.

Ordinary Meeting, Oct. 15th, 1879.

John Flower, M.A., F.Z.S., President, in the Chair.

The President announced that the soiree of the Tower Hill Microscopical Club was fixed for November 6th.

Mr. W. J. Nation read a paper on "Wood Sections," which was followed by an interesting discussion, in which the President, Mr. Cooper, Mr. Klaassen, Mr. P. Crowley, Mr. Berney, Mr. Turner, and Mr. Sturge took part.

Mr. R. G. Rice exhibited a small flint implement, about four inches in length, found by him, on the surface of the ground, near the Warehousemen and Clerks' Schools, Russell Hill.

Mr. Cooper exhibited a specimen of the Smew (M. albellus L.) which was obtained, last winter, at Wallingford, Berks, and the history of this species, and its occurrence in the British Isles as a winter migrant only, was explained by the President.

The following objects were also exhibited:—Mr. J. Berney, various sections of wood, section cutting apparatus; Mr. P. Crowley, section of fennel; Mr. J. S. Johnson, striate muscular fibre and acarus: Mr. H. M. Klaassen, transverse sections of stems of fern, cane, and sycamore; Mr. E. Lovett, section of Pteris aquilina, 96 sections of wood, seeds, nuts, &c.; Mr. K. McKean, Anodonta cygnea (var anatina), Unio tumidus, Helix aculeata; Mr. W. J. Nation, various sections; Mr. H. R. Owen, beetles, Central Africa; Mr. W. L. Sarjeant, radial section of pine, polarized; Mr. E. B. Sturge, various sections; Mr. A. D. Taylor, specimens of various woods.

Ordinary Meeting, November 19th, 1879.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. William Blades, Rev. E. M. Geldart, and Mr. B. Puddicombe were balloted for and elected.

The President announced the donation of six slides of wood sections by Mr. Nation, also that Dr. Lionel Beale had presented to the Club a copy of the new edition of his book, "How to work with the Microscope," and the thanks of the Club were accorded to Mr. Nation and to Mr. Beale.

Mr. Thomas Cushing, F.R.A.S., read a paper entitled "Notes on Barometers, with experiments, illustrative of the principles on which they are constructed," and by an elaborate series of experiments, and numerous instruments, explained, very clearly, the structure of the various kinds of barometers, the scientific principles involved in their construction, and the practical uses to which they may be put in scientific investigation. He further explained the manner in which the principle of the barometer was first discovered, and the way in which modern barometers had been gradually developed.

The paper was followed by a discussion, in which the President, Mr. Mawley, and others took part, and a very cordial vote of thanks was accorded to Mr. Cushing for his excellent paper.

Mr. George Curling called attention to the recent discovery of a large per centage of copper in the green colouring matter of some of the wing feathers of the Turako (Corythacola cristata) one of the largest of the Helmet Birds of West Africa, a group which are closely allied to the crows, and exhibited and described a specimen of Touracine solution, containing the colouring matters of the feathers.

Mr. A. Russel Wallace gave some further particulars as to the properties of this colouring matter, and mentioned, amongst other things, that it seemed so far soluble in water, that much of the colour could be washed out of the feathers.

The President also pointed out that these birds were only found in a comparatively small part of Africa, and could only exist where copper was present in the soil. He also expressed the opinion that in all probability they were only to be found in districts where some particular plant, or group of plants, abounded, which contained copper in the seeds or fruit upon which the birds fed. He also remarked upon the very singular fact, mentioned by Mr. Curling, that it was only one or two feathers in the wings of these birds which contained the copper.

Dr. Williams also added some further observations as to the Turako.

The President called attention to a remarkable proof of the voracity of the Great Black Backed Gull which had lately come under his observation. *(See p. 56).* He also exhibited and described some minute red earth worms, which he had received from Mr. J. Chisholm, from the mud of the river Thames, near North Woolwich, and which were found there in such numbers that at low water they quite coloured the mud.

Mr. W. N. Coates exhibited and described a variety of the common snipe (Sc. russata) shot by him in County Meath, last autumn.

The following objects were also exhibited :—The President, head of Black Backed Gull (Larus marinus), Common Gull (Larus canus); Thomas Cushing, standard and wheel and Aneroid barometers, Sympiesometer, Hypsometer, &c.; Henry Long, sulphate of alumina; section stalk of Tobacco; Edward Lovett, Tubes of annelid, microscopic cephalo pod from Bermuda; K. McKean, jaw of Helix ericetorum; H. R. Owen, muscular tissue of Crab; S. Overton, palate of Sting Ray; W. F. Stanley, six genera of exotic ferns, double stained, also chrono-barometer; W. Low Sarjeant, circulation in Vallisneria spiralis; J. Berney, section-cutting machine.

Tenth Annual Soiree,

Held on Wednesday, November 26th, 1879.

This was held, as in previous years, in the Large and Small Public Halls, and the number of persons present was unusually large, being 135 members, 109 exhibitors (non-members), and 571 visitors; total 815, as against 795 in 1878,

The following is a list of exhibitors of microscopes :—

Croydon.—The President, Messrs. H. Berney, J. Berney, T. Bindley, W. H. Beeby, J. H. Baldock, W. Cheshire, T. Compton, W. Cooper, P. Crowley, A.W. B. Drummond, E. Gill, R. Hall, J. Harrod, W. Ingrams, J. Joyce, E. F. Jones, R. A. James, J. S. Johnson, H. Klaassen, T. M. Loftus, E. Lovett, W. Lee, H. Long, K. McKean, M. D. Northey, H. R. Owen, S. Palmer, J. Poland, G. Manners, E. R. Moules, H. Moules, S. Overton, J. C. Oswald, J. C. Swaine, Dr. Strong, W. L. Sarjeant, E. B. Sturge, J. A. Toms, A. D. Taylor, H. Turner, F. West, J. Williams, M.D., E. Williams.

South London.—Messrs. C. W. Balls, J. G. B. Brewer, A. Butt, E. Dadswell, T. D. Errser, George Hardess, F. W. Hembry, R. G. Hovenden, W. J. Parks, J. Saffery, W. Short, D. G. Simpson, J. A. Smith, R. A. Smith, W. B. Smith, W. T. Suffolk, M. Terry, W. West, R. G. West.

Sydenham.—A. J. E. Arch, E. D. Berkeley, R. E. Crossland, E. George, E. L. Hardy, S. Milledge, A. Milledge, A. C. Perrins.

New Cross.—H. A. Auld, A. Bliss, M. Burgess, G. G. Daniel, D. W. Greenhough, F. Harrison, F. J. Hart, J. H. Stanley, F. Stewart, J. H. Swinburn, S. J. Tebbitt, S. R. Thackrah, G. Willcocks.

Royal.—Messrs. W. Brindley, F. Bossey, J. W. Goodinge, and A. C. Goodinge.

Quekett.—Rev. H. M. Clifford, and Messrs. F. W. Andrew, A. L. Corbett, F. Enock, H. J. Fase, J. H. Hadland, J. J. Hunter, J. E. Ingpen, G. A. Messenger, J. Nelson, G. T. Plomer, B. W. Priest, F. Reeve, T. D. Russell, Alpheus Smith, J. E. Simmonds, and T. P. Watson.

Greenwich.—Messrs. W. H. Collins, G. Dannatt, W. A. Dannatt, and J. W. Dannatt.

Hackney.—Messrs. J. K. Crossfield, T. R. Doggan, A. Fieldwick, A. E. Raynes, J. Smith, and C. W. Willmott.

Tower Hill.—Messrs. J. Alstone, J. H. Burn, G. T. Crossfield, W. Simpson, R. Sedgewick, and W. Vernon.

Old Change.—Messrs. J. A. Batchelor, R. W. Cockrayne, and Mr. Gribbell.

Private.—Mr. Bidwell, A. Barker, R. M. Christian, J. Case, S. Henson, J. W. Justican, Legrand and Sutcliff, G. Payne, E. Scargill, C. W. Stidstone, J. P. Taylor, C. Thorpe, J. W. Worster, C. J. N. Yuill.

Makers.—J. W. Bailey, R. and J. Beck, C. Baker, J. Browning, G. A. Christmas, Dring and Fage, How and Co., Murray and Heath, W. Moginie, W. F. Stanley.

The following were the principal objects exhibited :—The President, Mr. J. Flower, contributed a very fine collection of stone implements and weapons; Mr. A. Russel Wallace exhibited a large number of skins of tropical birds; Mr. Bidwell, a series of 264 eggs of the Common Guillemot, shewing the variations in colour and markings; also a collection of stuffed birds "in the down;" Mr. G. Payne, stone implements from Sittingbourne, Kent; Mr. E. Bailey, nest of trap-door spider; Mr. W. Low Sarjeant, British land and fresh water shells; Mr. A. A. Cowdell, Bhuddish manuscripts from Mandalay; Mr. W. Cheshire, a collection illustrating the process of wood engraving.

Through the kindness of Mr. Philip Crowley, the platform was beautifully decorated with a large number of choice exotic plants.

During the evening a band, under the direction of Mr. George Webb, played a selection of music.

Ordinary Meeting, December 17th, 1879.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. W. H. Burbidge, Mr. J. Bonella, and Mr. J. Emery were balloted for and elected.

The President announced that the Annual Meeting to receive the report of the committee, and to elect officers for the ensuing year, would be held on the 21st of January, and would be exclusively a business meeting.

The President further announced that according to the rules of the Club it was necessary to elect two auditors to audit the accounts for 1879. The names of Mr. J. C. Swaine and Mr. J. Chisholm were submitted, and they were duly elected auditors.

Dr. Carpenter expressed a hope that the annual meeting would be a large one, because he was anxious then to bring before the members the subject of the accommodation provided for the Club. The Club had become of that important character that it ought to possess its own library and workrooms. He therefore begged to give notice that at the next meeting he should submit a resolution bearing upon this matter.

The Rev. E. M. GELDART expressed his surprise that the rules of the Club did not permit ladies to attend the ordinary meetings, and gave notice that at the next meeting, with the object of altering the rules which prevented their attendance, he would move that Rule 7 as to membership be altered so as to stand as follows :—

" Any member may introduce a visitor at an ordinary meeting, and the name of such visitor, with that of the member by whom the visitor is introduced, shall be entered in a book to be kept for that purpose."

Mr. W. J. NATION read a paper on "Wood sections," being a continuation of the paper read by him at the meeting on October 15th.

In the discussion which ensued, the PRESIDENT called attention to the fact that every living being, whether animal or vegetable, began its existence as a simple cell, such as Mr. Nation had described, so that, at that stage of their development, there was no appreciable difference between a human being and the commonest weed. In support of this view he read two passages from Dr. W. B. Carpenter's "Principles of Comparative Physiology," pages 95 and 474, and pointed out the very important bearing which this fact had upon the doctrine of evolution.

Mr. E. LOVETT read a short paper on "The presence of chalk flints on a part of the coast of the Island of Jersey," which was followed by a discussion, in which the President and others took part.

The PRESIDENT also read a short paper on a "Hen Pheasant," which had assumed male plumage. *(See p. 57).*

In the discussion which followed this paper, the Rev. E. M. GELDART mentioned that some little time ago, when residing in Cheshire, he caught a female of the Common Orange Tip butterfly (A cardamines) which had to some extent the peculiar colouring of the male of that species. It was well known that in the male Orange Tip about one-half of each of the fore wings was coloured a brilliant orange red, whereas, in the female, the fore wings were very like those of the common garden white, and had no orange colour at all. The female, however, which he caught in Cheshire, had on the left fore wing a single streak of orange, and two little orange spots, which looked as if they had been put in with a paint brush. This curious departure from the normal type had never been satisfactorily explained to him. He thought it most likely that it could be explained in this way. It may be that at one time the orange tip was common to both sexes, and that in course of time it had disappeared from the female, and that in the female which he had mentioned, we had a case of partial reversion to the original type. Possibly the same thing had occurred in the case of the hen pheasant of which the President had spoken.

The PRESIDENT questioned the explanation suggested by Mr. Geldart. In the case of the pheasant there was no reason to suppose that the male plumage was ever common to both sexes, on the contrary, the fact that all young pheasants at first assumed the plumage of the female, seemed rather to show that the plumage of the female was probably, at one time, the plumage of both sexes; and that the peculiar characteristic plumage of the male did not come into existence till a later period, and was always peculiar to the male, being associated with the male sexual organs by the mysterious laws of correlation of growth. It was now well established that a hen pheasant never put on male plumage so long as her ovaries were in a healthy condition, and that in these cases the abnormal plumage was always associated with derangement of the generative organs, and consequently with barrenness. Probably the peculiar colouring in the female butterfly which had been described was due to the same cause. Why females should assume the external characteristics of the male, because their internal organs were diseased, it was impossible to explain, but on the other hand it was equally impossible to explain why males often assumed female characteristics from a similar cause.

The PRESIDENT also exhibited two specimens of Helix revelata, one of the rarest of the British snails, which he had found in the island of St. Mary's, Scilly, in September last.

Mr. K. McKEAN also exhibited a number of British land shells, which were distributed amongst those of the members who wished to have them.

The following objects were also exhibited :—Mr. A. Bennett, fungus; Mr. E. Lovett, nest of trap-door spider, sections of rocks and woods; Mr. W. L. Sarjeant, horizontal section of human foot (fœtal); vertical section of scalp, new form of microtome; Mr. A. Warner, section of Wellingtonia gigantea; Mr. E. B. Sturge, various sections of woods; Mr. E. Williams, sections of woods and coal.

Annual Meeting, January 21st, 1880.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. W. Adamson, jun., Mr. John Browning, Mr. Arnold Pye-Smith, Mr. William J. Fuller, Mr. William C. Dade, and Dr. James T. Hinton, were balloted for and elected.

The PRESIDENT announced that the soiree of the New Cross Microscopical Club was fixed for Tuesday, February 24th.

Referring to the notice given by Dr. Carpenter at the last meeting, of his intention to bring before this meeting a proposal to provide permanent quarters for the Club, the PRESIDENT announced that as Dr. Carpenter was detained in London he would not be able to lay his proposal before the Club.

The HON. SECRETARY then read the report of the committee and their balance-sheet for the year 1879 as follows :—

REPORT.

The committee have again the pleasure of submitting to the members of the Club their annual report of its proceedings, and in doing so draw attention to the fact that this is the tenth annual meeting which has been held, and that on April 6th next, the Club will have completed the tenth year of its existence.

During the year 1879, twenty three ordinary members have been elected, and owing chiefly to the many removals from the neighbourhood, twenty-three members have resigned. The committee regret to add that two members, Mr. W. S. Masterman and Mr. Henry Sykes have died. The following distinguished men have been elected honorary members of the Club :—Mr. John Evans, D.C.L., F.R.S., Professor W. H. Flower, L.L.D., F.R.S., Professor Joseph Prestwich, M.A., F.R.S., Professor George Rolleston, D.M., F.R.S.

The total number of members on 31st December, was 238 ordinary and five honorary members.

The following papers have been read :—

February 26th.—Mr. HENRY TURNER, "On Yeast."

March 19th.—Dr. ALFRED CARPENTER, "On Ants." The PRESIDENT, "Ornithological Notes."

April 16th.—Mr. J. W. WALLIS, "On Man : his social progress in Pre-historic Times." The PRESIDENT, "On the nesting habits of the Cuckoo ;" and "On the anatomy and mechanism of the breastbone of the Gannet."

May 21st.—Mr. WM. INGRAMS, "On Diatomaceœ."

Sept. 17th.—Dr. CARPENTER, remarks "On a fungoid growth on a piece of oak, and "On some recent floods at Llandula, North Wales." Mr. E. LOVETT, "Notes on the Geology of the Island of Jersey."

Oct. 15th.—Mr. W. J. NATION, "On wood sections."

Nov. 19th.—Mr. THOS. CUSHING, F.R.A.S., "Notes on barometers, with experiments, illustrative of the principles on which they are constructed."

Dec. 17th.—Mr. W. J. NATION, "Further remarks in continuation of his former paper 'On wood sections.'" Mr. E. LOVETT, "On the presence of chalk flints on a part of the coast of the Island of Jersey," and in addition to these papers numerous objects of Natural History have been exhibited and described at the various meetings.

An excursion was made on the 17th May to Caterham and Godstone, to meet the members of the Quekett and South London Clubs, and the members of the Club were invited to join the Holmesdale Natural History Society in a botanical ramble on the Addington Hills on 20th September.

A very interesting visit was also made to Mr. F. J. Horniman's Museum at Forest Hill on the 24th May, and the thanks of the members are due to that gentleman for his courtesy and hospitality on the occasion.

The tenth annual soiree took place at the Public Hall on Wednesday, 26th November, and was attended by Fellows of the Royal Microscopical Society, and members of the Quekett, South London, New Cross, Sydenham, Greenwich, Hackney, Tower Hill, The Old Change Clubs, and others, by whom and by members of the Club, 175 microscopes were exhibited, besides many other very interesting objects in Natural History, &c. The number of persons attending the soiree was as follows :—135 members, 109 exhibitors, non-members, and 571 visitors. Total, 815, as against 795 in 1878.

Members of the Club have also attended the Soirees of the Greenwich, New Cross, South London, Quekett, and Tower Hill Clubs, and have also given exhibitions of microscopical objects at the Church of England Young Men's Society Rooms, North End, and at the Christ Church School Rooms, Broad Green.

The journals and reports of the Royal Microscopical Society, the New Cross, Watford, Quekett, Hackney, South London, East Kent, Berwickshire and Belgian Clubs and Societies, have been received, and a great honour has been conferred upon the Club by the Royal Microscopical Society in constituting our President for the time being an *ex-officio* Fellow of that society.

The donations to the Club were as follows :—Two slides Phylloxera devastatrix, by Mr. K. McKean; two slides belemnite from Yorkshire, by Mr. E. Gill; three photographs of horse chestnut tree, by the President; a large quantity of butterfly wings for mounting, by Mr. F. J. Horniman; six slides of wings of tropical Lepidoptera, by Mr. E. Lovett; a list of succulent plants, by Mr. J. J. Peacock; six slides wood sections, by Mr. W. J. Nation; Dr. Beale's work on the Microscope, fifth edition, by the author; "Notes on the Flora of Surrey," by Arthur Bennett, by the author.

Sub-committees on Meteorology, Geology, and Zoology, have been appointed in accordance with the recommendation of the committee in their last report, and are at work on their respective subjects.

The attendance at the ordinary meetings has been up to the usual average, but the conversational meetings have been so badly attended that the committee recommend that they should be discontinued.

The balance to the credit of the Club's account has been increased during the year, but the report and transactions for 1878 have not yet been put in the printer's hands.

The thanks of the Club are again due to the Local Press for the full reports of the various meetings which have appeared in the columns of the *Croydon Advertiser*, *Croydon Chronicle*, and *Croydon Guardian*.

Signed on behalf of the Committee,

Croydon, 21st January, 1880. JOHN FLOWER, President.

BALANCE SHEET FOR THE YEAR ENDING 31st DECEMBER, 1879.

RECEIPTS.	£	s.	d.
To Balance in hand, 1st January	7	2	8
,, Subscriptions	117	10	0
,, Sale of Lectures	2	8	2
,, Sale of Soirée Tickets	28	5	0
	£155	5	10
To Balance brought down	47	4	4

EXPENDITURE.	£	s.	d.	£	s.	d.
By Hire of Rooms				6	5	0
,, Printing and Advertising				12	2	6
,, Stationery				0	7	3
,, Postages				2	16	2
,, Corden's Meteorology				12	0	0
,, Collecting Subscriptions				6	7	6
,, Attendance at Hall and care of Lamps				1	5	3
,, Gratuities				1	8	6
,, Insurance				0	7	6
,, Sundries				0	17	8
SOIREE ACCOUNT.	£	s.	d.			
,, Hire of Rooms	7	14	6			
,, Printing and Advertising	10	14	1			
,, Tables	12	0	0			
,, Postages	4	9	11			
,, Police and attendants	0	18	0			
,, Music	6	0	0			
,, Decorating Platform	1	10	0			
,, Refreshments	17	1	8			
,, Lamps	2	16	0			
,, Cartage of Plants	0	12	6			
,, Sundries	0	7	6			
				64	4	2
Balance forward				47	4	4
				£155	5	10

PHILIP CROWLEY, TREASURER.

We, the undersigned, having examined the above Accounts, and the Vouchers relating thereto, hereby certify that they are correct, according to the Vouchers and the Bankers' Pass-book.

J. C. SWAINE,
JAS. CHISHOLM, } AUDITORS.

10th January, 1880.

The PRESIDENT, in moving the adoption of the report, congratulated the Club upon the past year, which he said had been a year of uninterrupted progress and success. The proceedings at the ordinary meetings had not in any way declined in interest during the year, and the attendance at those meetings had been, if anything, larger than in previous years. As the report pointed out, this was the tenth annual meeting of the club, and on the 6th April the Club would complete the tenth year of its existence. With regard to the honorary members who had been elected during the year, he thought the fact that they had accepted the honorary membership of the Club was a great compliment, and the same might be said of the fact that the Royal Microscopical Society had elected the President of the Club for the time being an *ex-officio* Fellow of that society. With regard to the papers, those read during the past year were certainly as good and as interesting as they had ever had. Some of the meetings had been unusually fully attended, and twice at least the room had been so full that members had not all been able to find seats. With regard to the soiree, he thought that also marked the progress of the Club. Notwithstanding the unfavourable weather, more members and visitors were present than had ever attended on a similar occasion, and the number of microscopes and the objects exhibited were quite as interesting and important as at any previous soiree. The conversational meetings were started in accordance with the suggestion of some of the members, and purely as an experiment. It was thought that if the Club had intermediate meetings between the ordinary meetings some good results might be obtained, but the attendance had been so meagre that the committee did not see their way to recommending the continuance of those meetings. With regard to this subject, however, he should tell the members that one or two suggestions had been made whereby it was hoped that the conversational meetings could be made more attractive and useful to members, and perhaps before any formal resolution was come to to discontinue the meetings, it would be desirable to see what Dr. Carpenter's proposal was as to providing permanent quarters for the Club, because if the Club ever had proper quarters it would not be necessary to have these conversational meetings at all. They would then have rooms which every member could come to in the evening, and which would be very considerably used. In concluding, the President repeated the thanks of the committee to the Local Press, and moved that the report and balance-sheet be received and adopted, and that they be printed and circulated amongst the members.

Mr. T. Cushing seconded the motion, and it was carried unanimously.

Mr. A. R. Wallace then moved the re-appointment of Mr. John Flower, M.A., F.Z.S., as President of the Club for the ensuing year.

Mr. C. C. Morland seconded the motion, which was put and carried unanimously, the President briefly acknowledging the compliment which had been paid to him by his re-election.

Mr. W. J. Mellis next moved that Mr. Philip Crowley be re-elected treasurer for the ensuing year.

The motion having been seconded by Mr. C. Henman, jun., was carried unanimously.

Mr. Crowley, in replying, said his office was a sinecure, for their excellent secretary kept all the accounts. He had simply to sign the cheques, and the bank took care of the balance.

Mr. Maitland Gardner then proposed the re-appointment of Mr. E. B. Sturge as hon. secretary.

The Rev. J. K. Hawker seconded the motion, which was carried by acclamation, and Mr. Sturge briefly acknowledged the renewed expression of confidence that had been reposed in him.

Mr. E. Williams moved the appointment of the following gentlemen as the committee :—Dr. Carpenter, Mr. J. Chisholm, Mr. T. Cushing, Mr. J. S. Johnson, Mr. H. Lee, Mr. G. Manners, Mr. K. McKean, Mr. A. D. Taylor, and Mr. H. Turner.

The motion was seconded by Mr. T. Mitchiner, and carried unanimously.

The Rev. E. M. Geldart then moved, in pursuance of the notice which he had given at the meeting on December 17th, "That Rule 7 as to membership be altered so as to stand as follows :—

'Any member may introduce a visitor at an ordinary meeting, and the name of such visitor, with that of the member by whom the visitor is introduced, shall be entered in a book to be kept for that purpose.' "

—and spoke at some length in support of his proposal.

Mr. A. R. Wallace seconded the motion, and also spoke in favour of the proposed alteration in the rule.

The proposed alteration having been very fully discussed,

The Rev. J. K. Hawker moved by way of compromise, and as an amendment, that a discretionary power be left with the committee to invite the presence of ladies.

Mr. Chisholm seconded the amendment, and stated that if the original motion of Mr. Geldart was put, he should vote against it.

The President held that the meeting could not force a discretionary power such as that proposed by the Rev. Mr. Hawker on the committee, whom, he believed, for reasons which he stated, would decline to receive it.

The amendment, therefore, fell to the ground, and the motion of Mr. GELDART being put to the meeting, 15 members voted for it, and the great majority of the meeting (over four-fifths) voted against it. The motion was therefore lost.

Mr. A. R. WALLACE gave notice that at the meeting on February 18th, he would move the following addition to the rules:—

"That the reader of a paper be allowed the privilege of having lady visitors introduced on the occasion when his paper is read, on announcing his wish at the previous meeting."

The following objects were exhibited:—J. S. Johnson, exuviated shell of Cray-fish from Crystal Palace Aquarium; K. McKean, larval form of leaf insect (phyllium) from Ceylon; J. H. Baldock, double oxalate chromium and potass (polar); H. Long, section of mole's jaw with teeth in situ; K. McKean, White ant, worker; H. R. Owen, diatoms, "Challenger" dredgings; S. Palmer, scale of beetle; W. L. Sarjeant, gill of Mytilus edulis, showing movement of cilia; A. D. Taylor, wing of moth, (S. populi); A. Warner, tortoiseshell rim of eyeglass, from India, partly gnawed, supposed by white ants.

Ordinary Meeting, Feb. 18th, 1880.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. Richard Cooper, Mr. Henry Linton, Dr. Charles Dukes, and Mr. Herbert D. Price, were balloted for and elected.

The PRESIDENT announced that Mr. F. J. Horniman had kindly sent a few more boxes of butterflies' wings for distribution among the members of the Club.

Mr. A. R. WALLACE, in pursuance of notice given at the last meeting, moved that the following be added to the rules:—

"That the reader of a paper be allowed the privilege of having lady visitors introduced on the occasion when his paper is read, on announcing his wish at the previous meeting."

—and supported the motion in a speech of considerable length,

Dr. CARPENTER seconded the motion.

The matter having been debated at considerable length,

Mr. WALLACE replied, and the motion was then put to the meeting, and negatived by a very large majority, only nine members voting in favour of the motion.

Mr. E. R. Pearce read a paper on "The History and Uses of British Medicinal Plants," and therein described the history and medical properties of the Foxglove (D. purpurea), Early Purple Orchis (O. mascula), Common Polypody, (P. vulgare), Hemlock (C. maculatum), Agrimony (A. eupatoria), Henbane (Hyocyamus niger), Adder's Tongue (O. vulgatum), Bitter Sweet (S. dulcamara), Burdock (A. lappa), White Poppy (P. somniferum), Comfrey (S. officinale), Monkshood (A. napellus), Meadow Saffron (C. autumnale), and the Darnel (Lolium temulentum). The paper was illustrated by numerous dried specimens of the plants described.

A discussion followed the paper, in which the President, Mr. P. Crowley, and Dr. Shorthouse took part, the President calling particular attention to the poisonous qualities of many of the plants described, and to the remarkable way in which the same poisons often effected different animals, some animals being able to eat it with impunity, whilst to others it proved rapidly fatal. He also pointed out that nearly all the plants described by Mr. Pearce were to be found wild in the immediate neighbourhood of Croydon.

The following members exhibited objects:—A. Bennett, books on botany; R. F. Crafton, works on medicinal botany; Thomas Compton, wing of lace fly, gall fly, illustration of medicinal plants; E. Gill, Mesogloia virescens; H. M. Klaassen, transverse section of Scotch fir; E. Lovett, Long-eared Owl, shot at Shirley, Diatomaceæ, from London clay, Isle of Sheppy; W. L. Sarjeant, British land and fresh water shells; E. B. Sturge, various works on botany; A. Warner, section of Tape-worm.

Ordinary Meeting, March 17th, 1880.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. Alfred Russel Wallace read an important and highly interesting paper "On the peculiar species of the British Fauna and Flora." *(See p. 58).*

The following objects were exhibited:—A. R. Wallace, case of lepidoptera, from the Isle of Man, showing in some species a remarkable diminution in the size of the wings as compared with the members of the same species in England; P. Crowley, series of stuffed birds of the peculiar British species; E. Lovett, Nephrops Norvegicus, from coast of Northumberland; curious varieties of the tiger moth; W. Adamson, specimens of Spence's metal; J. H. Baldock, deposit in milk; K. McKean, Planorbis nautilus; E. Lovett, scales of haddock, showing pigment cells; W. L. Sarjeant, Carchesium polypinum; E. B. Sturge, new form of ivory mounting cell; A. Warner, spinarets of spider, section of cat's lip, showing sensitive hairs, double stained.

Ordinary Meeting, April 21st, 1880.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The PRESIDENT announced in feeling terms the death of Mr. John Drummond and Mr. Walter Walters, both members of the Club, which had occurred since the last meeting, and the hon. secretary was requested to convey to the families of those gentlemen the sincere sympathy of the members, in the loss which they had sustained.

Mr. Herbert J. Barnes and Mr. Henry Thomas Smith were balloted for, and elected.

The PRESIDENT further announced the receipt from Dr. Gulliver, of a copy of his Hunterian Oration of 1873; and from Mr. Mawley, of a pamphlet "On the weather of 1879;" and called particular attention to the valuable and varied information which this pamphlet contained.

Mr. E. LOVETT read a paper, a few practical suggestions "On the preparation of objects for the microscope." *(See p. 61).*

The following objects were exhibited:—Mr. E. Wormald, stuffed birds, viz., a pair of hybrids, bred by him at Woodcote Hall, being a cross between a golden spangled Hamburgh fowl and a cock Pheasant, and a cross between a black fowl and a cock Pheasant, a pair of Cirl Buntings (E. cirlus), caught at Woodcote last winter, a Hen Pheasant assuming male plumage, and a Bohemian Pheasant shot at Newdigate, Surrey; Mr. J. Flower, pair of Toucans and Bell Bird from Brazil, Pomatorhine Skua, purchased in Leadenhall Market; Mr. J. C. Swaine, Bohemian Pheasant, shot in Wiltshire; Mr. E. Straker, Brassia barbata; Mr. E. B. Sturge, curious variety of Bladder Wrack, from New Passage, river Severn; J. H. Baldock, young Silkworm; P. Crowley, vegetable sections, double stained; E. Lovett, piece of London clay, containing diatoms; also new graduating object glass varying from three to six inches; W. L. Sarjeant, Melicerta ringens; A. D. Taylor, leaf of Pelargonium lobatum, showing scent ducts; A. Warner, section of kitten's jaw, showing permanent tooth displacing milk tooth.

Ordinary Meeting, May 19th, 1880.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. Shadforth Morton was balloted for and elected.

A paper was read by the PRESIDENT "On the structure and Geological History of the Weald, and of the catchment basin of the river Wandle" *(see p. 64)*, which was followed by a discussion on many of the points referred to in the paper, in which Dr. Carpenter, Mr. A. Taylor, Mr. J. Chisholm, Mr. Turner, and others, took part.

The following objects were exhibited:—Mr. John Berney, pellet of owl, found at North End; Mr. Berney, jun., nest and eggs of a bunting, found at Worms Heath; Mr. E. Lovett, wood from submerged forest, Hastings, Sepia officinalis, fossils from Wealden formations, ova of Xantho Florida; Mr. H. R. Owen, fibre of asbestos; Mr. A. Warner, platino cyanide of magnesium (opaque); and sections stained two colours; Mr. P. Crowley, flowers of Aristolochia ornithocephala.

EXCURSION WITH THE MEMBERS OF THE GEOLOGISTS' ASSOCIATION, SATURDAY, JUNE 19TH, 1880.

A considerable number of the members of the Club accepted the invitation of the Geologists' Association to join this excursion, which was under the direction of J. Logan Lobley, Esq., F.G.S. The party started from the East Croydon station, and passing through the station yard, proceeded to the extensive gravel-pits in the Fairfield. The fine sections of drift gravel, with its overlying bed of brick earth which are here exposed, were inspected, and the chief features of interest were pointed out and described by Mr. Lobley and John Flower, Esq., M.A., F.Z.S. Attention was particularly called to the presence in this gravel of a considerable number of rounded pebbles, which must have been derived from the Oldhaven beds, and to occasional pieces of very hard sandstone, containing a large quantity of iron, which were mixed with the flints, and which could only have been brought there from the Weald. It was also explained by Mr. Flower that this gravel, which was part of a bed of considerable extent, upon which the town of Croydon was almost entirely built, was probably brought down and deposited by an ancient stream, which flowed out of the Weald, and through the valley which runs from Merstham to Croydon. The structure of this valley, between the Fairfield and Duppas Hill, was explained, and the process by which, in all probability, this bed of gravel was at first deposited, and was then left high and dry by the stream, was briefly sketched. It was also explained that this bed of gravel rested on sand, which had a very uneven surface, and seemed to be deposited over the outcrop of the Tertiary beds which lie immediately over the chalk; the sand on the south side of the pit being Thanet sand, and that on the north side part of the Woolwich and Reading series. No mammalian remains have been found in the pit.

The party next proceeded by the footpath to the grounds of Park Hill House, where the springs which supply the ornamental water were examined and described. From Park Hill House the party proceeded across the fields to the Water Tower, which was ascended, and from its summit the distant objects to be seen, and the chief physical features of the district, including the eastern and western water sheds of the Wandle basin, were pointed out and described. Attention was particularly called to the direction and curved shape of the valley from Merstham, immediately to the south of Croydon, and this was contrasted with the direction taken by the valley of the Wandle to the north and north west of Croydon.

The chalk pit in Coombe Lane, with its bed of Thanet sand, situated on the extreme southern edge of the London basin, having been examined, and described by Mr. Lobley, the party went on to Croham Hurst. Here the position and structure of this hill, as an outlier of the Oldhaven beds, was described by Mr. Lobley, and the various places and objects of interest to be seen from the summit of the hill were pointed out.

The next place visited was the chalk pit in the Brighton-road, near Purley, well known to geologists as the pit in which was found the granite boulder, apparently of Scandinavian origin, and supposed to have been dropped into the ancient chalk sea, from a floating glacier, during the cretaceous period. The party then proceeded by Riddlesdown along the edge of the Caterham valley, excavated in the chalk, and well known as the valley in which, in wet seasons, the Bourne stream flows. The excavations along the hill side, and the fine chalk pit near the Rose and Crown having been examined and described, refreshments were obtained at the Rose and Crown Inn, and the party returned home, by train, from Kenley station.

Ordinary Meeting, Sept. 15th, 1880.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. Alfred Tylor, F.G.S., &c., Mr. Alfred William Rich, and Mr. Albert Bartrum, were balloted for, and elected.

The PRESIDENT announced that Mr. Thomas Cushing had kindly presented the Club with six volumes of Professor Symons' work on "British Rainfall" (from 1865 to 1870.) The thanks of the Club were awarded to Mr. Cushing for his useful present.

It was further announced that the annual soiree would be held on November 24th.

A letter was read from a gentleman at Pardubitz, in Bohemia, who asked to be supplied with the report of the Club's proceedings for 1879.

The PRESIDENT exhibited and described a flint, which he had picked off a heap of gravel dug out on the Friends' School estate in Park Lane, Croydon, and which, at first sight, looked very much like a flint implement. He explained that it was really nothing more than a natural flint, but was interesting, because, by comparing it with genuine flint implements, the points in which worked flints invariably differed from natural flints could be easily seen. A number of flint implements, much resembling in shape the natural flint, were also exhibited and described, and the characteristics of these were pointed out and explained. The President also pointed out how impossible it was that these characteristics could ever be imparted to a flint by natural causes.

The PRESIDENT also exhibited a number of cocoons of the Common Puss Moth (Dicranura vinula) with specimens of the moth, and called particular attention to the solidity and hardness of the cocoons, which were also opaque, admitting little or no light. He further explained that, hard as they were, they were composed of nothing but small chips of wood, or particles of earth, mixed with a secretion from the caterpillar, and the way in which the cocoon was formed was explained. The difficulty which many naturalists felt in explaining how it was that so very soft a creature as the Puss Moth was able to work its way out of such a very hard envelope was removed on a careful examination of the cocoons. In every one of them there was one small part where the shell of the cocoon was thin and semi-transparent, and through that thin portion which seemed invariably to be left immediately over the face of the moth, the insect made its escape. So strong was the instinct which impelled the insect to get out in this way, that from one of the cocoons, which was exhibited, the moth had still eaten its way out through the thin portion, although a large part of the cocoon had previously been cut away and destroyed, and the moth, which came out in broad daylight, could, apparently, easily have got out of the cocoon without having to eat its way out at all.

Mr. E. LOVETT mentioned the case of a caterpillar of the

Puss Moth which had made its cocoon in a tin box. The caterpillar having no foreign substance to make use of, the cocoon was entirely transparent.

The Rev. E. M. Geldart exhibited and described a specimen of the Common Blue Butterfly (Polyommatus alexis), captured by him at Alum Bay, Isle of Wight, which seemed, from its markings, to be hermaphrodite; and a specimen of the Lulworth Skipper (Pamphila actæon) from Lulworth Cove, Dorsetshire. He also exhibited and described a specimen of Erebia medusa, from the Hasenberg, Stuttgart, which had many of the characteristic markings of an English species (E. blandina), and a specimen of the Dark Crimson Underwing (C. sponsa) from Brockenhurst, in the New Forest; also a specimen of the Poplar Kitten (D. bifida) taken on a fence in Fairfield Road, on April 23rd last. He further remarked that after the severe winter we had experienced, it would have been expected that insects would have appeared later than usual; but the contrary had been the case, for hibernating insects had been earlier, and the Poplar Kitten was at least a month earlier than usual. It might be accounted for by the fact that the cold set in early and was continuous. When frost was intermittent, and varied by warm weather, the insects were enticed out, and were destroyed by the frost which succeeded.

The President mentioned, with reference to Park Hill and Fairfield Road, that the large number of poplar trees which had been planted there a few years ago had made a marked difference in the insects, and many, such as the Poplar Kitten, and others which he enumerated, were now tolerably common, which before were scarce or unknown about Park Hill.

Mr. J. S. Johnson stated the result of his examination of the pemmican which had been handed to him to report upon.

The following objects were exhibited:—*Microscopes:* Mr. H. M. Klaassen, pond life; Mr. E. Lovett, ova of Spiny Lobster; Mr. W. Low, Alcyonilla fungosa; Plumatella repens; Mr. K. McKean, section of black coral (Antipathes virgata); Mr. S. Palmer, leg of garden spider; Mr. E. B. Sturge, section-stem of Perilla nankinensis; Mr. A. Warner, section through bud of lily.—*General Objects:* Mr. J. S. Johnson, drawings illustrating the anatomy of the Crayfish; Mr. A. Warner, new model student's microscope; Mr. H. M. Klaassen, Tenby beetlestone; Mr. E. Lovett, 92 species of moths taken this summer between Addiscombe and Shirley; also nest of Meadow Pipit, with egg of cuckoo, from Shirley.

Ordinary Meeting, 20th October, 1880.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The PRESIDENT announced that the Soirée of the Greenwich Microscopical and Natural History Society was fixed for Wednesday, 8th December.

He further announced that Mr. William Drummond had very kindly offered, through Dr. Carpenter, to present to the Club twelve vols. of the Archœologia of the Society of Antiquaries, and Catalogue of Broadsides, which had belonged to his late brother, Mr. John Drummond, and that the Committee proposed to accept this very handsome gift on behalf of the Club.

Dr. CARPENTER called attention to an iron cannon ball, about four inches in diameter, which he exhibited, and which was dug up in High Street by a man excavating for a sewer. It was found at a depth of about a foot and-a-half below the surface of the ground. The ball had been roughly cast, with a thick rim in relief all round it, and on one side was a deep indent produced probably by the ball having been discharged from a cannon. He further stated that he had never heard that there had been any battle or engagement in Croydon since the introduction of gunpowder, and he was therefore unable to account for this cannon ball being found where it was.

Dr. CARPENTER also exhibited and described some teeth which had been obtained from the beds of drift gravel in and near Croydon. The first of these consisted of eight teeth, which were found in the early part of the year in cutting a sewer down Scarbrook Hill. They were found in two different places in the gravel, and were embedded in a portion of the bone of the jaws of the animals to which the teeth belonged. He did not see the bones as they were thrown away by the workmen who found them. He also exhibited and described another tooth which he had found about eight years ago in the gravel pit in Fairfield; and two more which had been found in gravel by the side of the Brighton Road, one near Caterham Junction, and the other nearer to Croydon. All were teeth of ruminants, perfectly fossilised, and some quite unworn, but the single specimens appeared to have been rolled and to be slightly waterworn. The teeth were, in some respects, like those of the rhinoceros, but differed somewhat from them, as they also did from those of the horse; they were too large for the latter.

Dr. CARPENTER further exhibited a small bough of a Sumach *(Rhus Elegans)* now growing in a garden adjoining his own at Duppas Hill. This bough had a remarkable tumour upon it which was described by Dr. Carpenter. He also expressed a hope that if any member of the Club met with a similar tumour on a tree he would send him the specimen. Tumours of this description on plants were in many respects similar to tumours which were well known to medical men as diseases in animals, and as he believed that a good deal of valuable information might be obtained by comparing these tumours in plants with similar morbid growths in animals, he was very desirous of taking up this subject and investigating it.

Dr. Carpenter also exhibited several birds' nests, taken from his own garden during the past summer. He said that his chief reason for calling attention to these was that they seemed to show that there were what one might call fools amongst birds as well as amongst human beings. This was very well shown by the way in which certain birds build their nests. Four years ago, when he went to his present residence, there was on the lawn an arbor vitæ tree, and in that tree a thrush built its nest, but built it in a very insecure position. In the very middle of the nest the bird had woven a bit of white paper, and anyone going along must see that paper as well as the nest. The nest was a badly built one, and was not constructed as thrushes generally build their nests, but was simply perched in a single cleft between two branches. As soon as the young birds were hatched and began to grow the nest toppled over, and they tumbled out. In the following season a similar nest was built precisely in a similar way in the same arbor vitæ tree, and a gust of wind blew it out before the eggs were hatched. Each succeeding year there had been an increasing number of these kind of insecure nests built in these trees by thrushes and blackbirds. The arbor vitæ being chosen, exposed places and insecure position being taken in preference. He expressed an opinion that nest building had its origin in a reasoning power, and was not due to instinct alone, as instinct was neither progressive nor retrograde, but was always the same, being independent of education or experience. It was quite certain that birds differed in their capacities, and he believed that if we could see the brains of the birds whose building powers he had commented upon they would be found defective in some part of their organization. In a neighbouring garden he found a thrush's nest, also with a piece of white paper woven into it. Why it should be so he could not conceive, unless on the principle that the reasoning powers of these birds were defective, and that a brood had been hatched which were propagating a class of foolish birds.

Dr. Carpenter next described a large glacial moraine which he had examined last autumn in the cliff near the village of

St. Bees in Cumberland, and he exhibited and described numerous specimens of the various rocks which he had obtained from it.

The President added some remarks upon the subjects which Dr. Carpenter had brought before the meeting.

With regard to the cannon ball, he suggested that this might be a relic of one of the skirmishes which were known to have taken place at Croydon during some of the old Civil Wars. Other indications of these existed. There were at Lambeth Palace several letters which were written to Archbishop Whitgift by the then Vicar of Croydon, during the building of the Whitgift Hospital, and in these it was mentioned, that in making the new road on the south side of the Hospital, which is the modern George Street, a number of human skeletons were found, and that in consequence of this the works were stopped for a time. These were believed to be the remains of some of the men who fell during the Civil Wars. Quite recently another human skeleton was discovered in excavating for the new sewer in George Street.

With regard to the teeth to which Dr. Carpenter had referred, these were of peculiar interest, as very few mammalian remains had been found in the Croydon gravels. He also added that he had himself a fine molar tooth of an elephant, and some pieces of bone, probably from the same animal, which had been found in the gravel at Thornton Heath, and he understood from Mr. Baldwin Latham that bones of elephants and of extinct deer had lately been discovered in similar gravel at Mitcham. There was no reason why these remains should not occur about Croydon, as similar remains had been found in many places in drift gravels in the valley of the Thames.

Referring to the nests which had been exhibited, Mr. Flower dissented from the views expressed by Dr. Carpenter. He believed that no line of demarcation could be drawn between instinct and reason. A habit was formed under the influence of reason, and if that habit became fixed and was inherited it became an instinct. But even after its formation an instinct was always capable of a very large amount of modification, and might even disappear altogether by altered circumstances. A very good instance of this was shewn in the fear which most birds and wild animals had of man. That fear, where it existed, was undoubtedly now due, to a great extent, to instinct. But the fear was purely an acquired fear, and did not exist in places like uninhabited islands, where birds had not been subjected to persecution and ill-treatment from men. Even in Scotland the same thing might be seen. In the higher hills in the deer forests, where the Ptarmigan are not molested, they have no more fear of man than they have of sheep or deer, but where they are much shot at and disturbed they are almost as wild and as wary as Grouse. For these reasons he thought it much more probable that the failure of the birds to which Dr. Carpenter had referred was due to the fact that they had, for some reason, been driven to make their nests in the arbor vitœ trees, which were only lately introduced, and were in many respects very different from our native trees and shrubs, and that the birds had not yet learnt to adapt the building of their nests to their peculiarities. Referring to the use of pieces of paper by birds as materials for nesting, Mr. Flower mentioned some curious instances of the use of this material by blackbirds and thrushes, which had come under his own observation.

Mr. Turner thought there was a great deal in Dr. Carpenter's theory that the birds were deficient in the intelligence which usually belonged to their species, the members of which generally selected safe places to build their nests in. He had no doubt it was the same bird that built the second and third nests, or the children of the first parents, who, no doubt, exhibited the deficiency of their parents, perhaps, in a more exaggerated form.

Mr. Lovett, Mr. Fuller, and Mr. Sarjeant also spoke with reference to some of the subjects which had been brought before the meeting by Dr. Carpenter.

The following objects were also exhibited:—Mr. H. M. Klaassen, photographs of terminal moraines and of glaciers; Mr. H. R. Owen, coralline; Mr. E. Lovett, ova of shore crab, *mactra glauca* striated boulder from river Wansbeck; Mr. W. L. Sarjeant, quill of porcupine stained, skeleton larva under polarised light; Mr. A. D. Taylor, section of cactus, shewing spines.

Ordinary Meeting, Nov. 17th, 1880.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The following gentlemen were balloted for and elected:— Mr. Francis Thompson, jun., Mr. Nathaniel Bogle-French, Mr. W. F. Footit, Mr. W. Topley, F.G.S., and Mr. Charles Price Turner.

The President announced that Mr. P. Crowley had presented to the Club a copy of Professor Bell's new edition of Gilbert White's Natural History of Selborne, also three volumes (for 1867, 1868 and 1873) of Professor Symons' work on "British Rainfall," and the thanks of the meeting were accorded to Mr. Crowley for these gifts.

Mr. E. Lovett exhibited and described a *female* of the Drinker Moth *(O potatoria)* which he had bred from a caterpillar, and which had all the distinctive colouring of the *male* of that species. He also exhibited and described male and female specimens of the same moth, with the normal colouring peculiar to the sexes.

Mr. Alfred Tylor, F.G.S., read a paper on "Colourization in Animals," illustrated by a number of skins of various animals, and by numerous diagrams. After calling particular attention to the details and peculiarities of the skins exhibited, he contended that their colours were regulated chiefly by certain laws of "Emphasis" and "Symbolism," and that it was only in a secondary degree that they were made subservient to the purposes of protection or sexual excitement.

Mr. Alfred Russel Wallace, in commenting upon the views expressed by Mr. Tylor, said the subject which he had introduced was so vast that it would require an entire evening to go into it fully. It happened that he had a theory of his own, which did not agree with Mr. Tylor's, and he could not very well express his views without referring to this theory. In order to explain the great varieties of colour which are to be seen in nature, it is necessary, in the first place, to consider the physical nature and origin of colour, for that is the foundation of the whole matter. It is now generally held that the colour of natural objects is a subjective phenomenon. The objects themselves are devoid of colour, but they each absorb some of the different coloured rays of which white light is composed, and reflect the other rays, and the object appears to be of the colour of the rays or mixture of rays which it reflects. Thus green objects absorb the red rays and reflect the yellow and the blue, whilst purple objects absorb the yellow and reflect the red and the blue. The rays which each particular object will absorb and reflect will depend upon the nature and constitution and size of the molecules of which it is made up; and any alteration in these, from any cause, will probably produce a corresponding alteration in the colour.

As there is every conceivable variety in the molecular structure of different bodies in nature, there is, necessarily, every variety of colour. Some colours, or groups of colours, are much more abundant than others, but, as a rule, in the animal world, obscure colours predominate.

Mr. Wallace stated that the conclusion at which he had arrived was, that, primarily, there is no reason why any animal should be of any particular colour. It may be of any colour, and as a matter of fact, every possible variety of colour does exist in nature. But the particular colour which any particular animal possesses, is the result of an infinite variety of secondary causes which render certain colours useful and other colours hurtful to the animal. In birds, and in some other animals, the brilliant colouring of the males is usually most intense in the breeding season, when the animal is in the fullest vigour. But the one thing of all others which most affects the development of colour is the need of protection or concealment. Almost all animals need concealment because they have enemies, and those which are too powerful to fear any enemies still need concealment to enable them to catch their prey. If there were no need for protection and concealment, the beautiful colours of tropical birds, instead of being exceptional, would probably be the rule, and there would be brilliant colours throughout nature. The large Felidœ afford good instances of the advantages to animals of particular colouring. The Ounce for instance, which passes much of its time in trees, is spotted, and for this reason cannot be easily seen amongst the foliage of trees. The Tiger, on the other hand, which lives mostly in jungle and tall grass, and is never seen in trees, is striped, and so nearly resembles the grass and jungle in colour, that in it it is quite invisible at a short distance. In a similar way animals that frequent trees of different kinds do not acquire the colour of any tree in particular, whilst animals that frequent only one kind of tree, as a rule, acquire the colour of the tree which they frequent. The same law of concealment applies to birds. The bright colours of birds are principally on the breast, where they would not be seen when the birds are sitting on their nests or perched on trees, except from underneath. The reason why tropical birds have so much colour is that the vegetation is abundant and the forests dense, and hence there is less need for concealment. It is supposed by a good many people that brilliancy of colour is due to the intensity of the sun, but that is a mistake, because in the desert, where the sun is strongest, animals, as a rule, are of the colour of the sand. Mr. Wallace further disputed the theory that brilliancy of colour depends on rapidity of motion, remarking that wings of birds have generally little brilliancy of colour in them.

Dr. Henry Woodward, F.R.S., supported the views expressed by Mr. Wallace, and fully concurred in his opinion that the colour of animals was mainly determined by the necessity for concealment. In connection with this subject he mentioned that in Sir Thomas Fowell Buxton's coverts in Norfolk, white varieties of the common Pheasant were encouraged, and were, in consequence, rather numerous. The gamekeepers, however, did not like them, because, from their conspicuous colouring, they attracted all the "vermin" in the neighbourhood, and the gamekeepers had great difficulty in preserving them from the attacks of Weasels and Stoats, and Birds of Prey.

Referring to what Mr. Wallace had said as to the colours of male animals being often brightest when they were most vigorous, he mentioned that at his own house he had an aquarium which contained a number of Sticklebacks which were preparing for spawning. The males were brilliantly coloured, but, being very pugnacious, were constantly fighting, and, as each of these was beaten his bright colours faded or disappeared. One of the larger males for a long time held his own against the others, but at last he was beaten, and then his colours also faded.

The PRESIDENT added some remarks as to the object of the gorgeous plumage of the males of some species of birds at the breeding season, and described the way in which the males make use of their brilliant colours at this season, which seemed to prove that the real object of the colours is to enable the male to attract and to excite the female. He also referred to a subject which he thought had not received the attention which it seemed to deserve. In some of the species of Gallinaceous birds, such as the Common Pheasant, the female occasionally assumes the brilliant plumage of the male. Sometimes this assumption is complete, and the female becomes exactly like the male, except perhaps that its colours are not quite so bright; whilst in others only a very slight amount of the male colouring is taken. Between these two extremes, it would be possible, he believed, to find every intermediate grade. This seems to show that the plumage of the male is not, as might be supposed, a dress essentially distinct in its nature from the plumage of the female; but that they are both, in all essentials, the same, and that the gorgeous colours of the male may be produced by a gradual modification of the more sober colours of the female. Mr. Flower also mentioned and described some very remarkable instances of protective colouring in birds.

Mr. TYLOR, in reply, whilst fully admitting the importance and advantage to animals of protective colouring, pointed out that this did not in any way affect the theory which he had advanced, that the external markings of animals corresponded with their internal structure, nor did it explain why the colouring was almost invariably regular and symmetrical.

The following objects were exhibited:—J. Berney, small moth; W. J. Fuller, head of horse fly in fluid; H. M. Klaassen, pigment cells in skin of fish; E. Lovett, exuviated skin of chameleon; also sand tubes of Pectinaria belgica, from The

Nore; W. Low-Serjeant, pond life; also nail embedded in oak; A. D. Taylor, gold tail moth—Porthesia auriflua; A. Warner, pediculus pubis about to cast its skin; E. Straker, dried specimens of thirty-seven species of plants in flower gathered in the present month.

Eleventh Annual Soiree.

Held on Wednesday, November 24th, 1880.

This was held, as in past years, in the Large and Small Public Halls. 146 members and 675 visitors were present, making a total of 821. 163 microscopes were exhibited.

The stage was again beautifully decorated with a choice collection of plants from the conservatories of Mr. Philip Crowley, and the walls of the large hall were hung with a series of valuable drawings from the collection of Mr. Geo. Butterworth. The music performed during the evening was under the direction of Mr. Geo. Webb.

Among the nnmerous objects exhibited were a large and varied collection of shells which were sent by the President, and a large and very fine collection of Humming Birds exhibited by Mr. W. F. Footit. The latter, which occupied nearly the whole of one side of the small Hall, from the great brilliancy of their colours, deservedly attracted a great deal of attention.

In the Old School of Art Room a set of Crookes' Radiant Matter Tubes, kindly lent by Mr. L. P. Casella, of London, were exhibited by Mr. T. Cushing, and were very ably described by him from time to time during the evening.

Mr. E. Lovett exhibited about 250 specimens of British Stalk Eyed Crustacea, obtained and prepared by himself, and the Rev. E. W. Field an interesting collection of seals and brasses. Mr. H. M. Klaassen exhibited a chameleon, sent by Mr. John H. Ley; also, a collection of mosses, ferns, and lichens under a large graphoscope, and specimens of Alpine plants, with English plants of the same genus. Mr. A. F. Sealy, of Cambridge, exhibited a complete collection of British Butterflies; and collections of Lepidoptera were also shewn by Mr. J. Berney, the Rev. E. M. Geldart, and Mr. H. A. Auld. Mr. A. D. Taylor exhibited a micro-aquarium; Mr. Alfred Russel Wallace a number of interesting objects of Malay manufacture; Mr. E. W. Foss, a number of objects from Japan; Mr. A. Barker, Zulu weapons, dresses, and ornaments. Mr. A. H. Hinton sent a collection of chalk fossils; Mr. John Drage, a case of birds obtained at the Lizard Point, Cornwall; Dr. Morton, a collection of shells; and Mr. T. D. Russell, a collection of minerals. Dr. Strong exhibited some bones which had been found in drift gravel, at depths varying from 10 to 16 feet, at Mitcham; also, an instrument for detecting a peculiar defect in the eye, known to medical men as "Astigmatism;" Mr. C. R. Holt, model of Cingalese canoe; and Mr. E. Mawley, sunshine recorder, cards, and diagrams.

Microscopes and objects of interests were exhibited by the following members and visitors :—

Croydon Club.—J. H. Baldock, W. H. Beeby, J. Berney, Theo. Bindley, Wm. Cheshire, J. Corry, P. Crowley, Thos. Cushing, Jno. Drage, A. W. Drummond, H. S. Eaton, Jno. Flower, W. F. Footit, W. J. Fuller, Rev. E. M. Geldart, Wm. Ingrams, J. S. Johnson, E. F. Jones, H. M. Klaassen, Wm. Lee, H. Lee, H. Linton, T. M. Loftus, H. Long, E. Lovett, K. McKean, Geo. Manners, Chas. Manners, E. Mawley, Dr. Morton, E. R. Moules, H. Moules, J. C. Oswald, S. Overton, H. R. Owen, S. Palmer, W. J. Russell, W. L. Sarjeant, W. F. Stanley, E. Straker, Dr. Strong, E. B. Sturge, A. D. Taylor, F. Thompson, J. Toms, H. Turner, C. P. Turner, A. R. Wallace, F. West, E. Williams.

Royal Microscopical Society.—A. C. Cole, M. J. Cole, J. W. Fairey, J. W. Goodinge, J. R. Williams.

Quekett Club.—W. Adkins, F. W. Andrew, J. W. Bailey, W. J. Brown, G. D. Colsell, A. L. Corbett, Rev. H. M. Clifford, A. Fieldwick, A. C. Goodinge, H. R. Gregory, J. H. Hadland, G. Hind, F. H. P. Hind, J. J. Hunter, Dr. Matthews, G. A. Messenger, J. Nelson, J. W. Reed, F. Reeve, T. D. Russell, J. E. Simmonds, A. Smith, A. J. Winney, Dr. Charters White.

South London—J. G. Brewer, E. Dadswell, T. D. Ersser, F. W. Hembrey, R. G. Hovenden, W. J. Parks, J. Saffery, Wm. Short, D. G. Simpson, C. W. Stidstone, W. T. Suffolk, Jno. Terry, W. West, R. West, J. W. Worster.

Sydenham and Forest Hill.—J. E. Arch, H. Blanch, C. W. Burt, R. E. Crossland, E. George, E. L. Hardy, C. J. Soltan.

New Cross.—F. Alexander, A. Bliss, M. Burgess, Jno. Burgess, G. F. Collingwood, H. T. J. Hart, E. A. Lewes, W. F. Manger, J. Ramage, Rev. S. Thackrah, Geo. Wilcocks.

Hackney.—T. K. Crossfield, M. Fairservice, O. Goldthwaite, A. H. Hinton, R. J. Larking.

Tower Hill.—Jno. Alstone, Jno. Puddy, R. Sedgewick, W. C. Vernon.

Greenwich.—C. E. Blomfield, Geo. Dannatt, W. Trickett, W. S. Scarr.

Makers and Private.—H. A. Auld, Dr. Bossey, A. Barker, R. and I. Beck, Dr. Beeby, C. Baker, J. Carpenter, F. R. Cheeswright, H. Crouch, Dring & Fage, Rev. E. W. Field, E.

W. Foss, C. R. Holt, J. How & Co., J. W. Justican, Col. R. D. Knight, Le Grand & Sutcliff, A. Lightwood, W. Moginie, Geo. Payne, H. B. Pim, J. H. Pepler, G. Rodman, Jas. Rymer, G. Yuill, E. S. Whealler.

Ordinary Meeting, December 15th, 1880.

John Flower, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

The following gentlemen were balloted for and elected :—Mr. W. T. Malleson, Mr. A. Morris, Mr. John Frith, Mr. John George Bracher Brewer, Mr. John George Marks, Mr. George Newberry, Mr. Frederick Cheeswright, and Mr. Matthew Mawson.

The President announced that the twelve volumes of the Archœologia, and the Catalogue of Broadsides which were mentioned at the last meeting, had been received from Mr. William Drummond; also that Professor Rupert Jones had sent a box of fossils for distribution among the members of the Club; and that a box of zoophytes had been received from Mr. Henry Lee for distribution. Letters from Professor Rupert Jones and Mr. Lee, which accompanied the boxes, were also read.

Mr. H. M. Klaassen and Mr. E. Lovett were appointed to audit the accounts for the current year.

Mr. E. Lovett read a paper on "Preparing and Mounting for exhibition Crustacea and similar objects" *(see p. 78)*, being a description of the way in which the specimens which he exhibited at the last Soiree were prepared and preserved.

Mr. E. Straker laid before the meeting a "Table of the Girths, Positions, and Estimated Ages of Churchyard Yew Trees in the eastern half of the County of Surrey." *(See p. 80.)*

The President called attention to a peculiarity which he had noticed in the claw of the middle toe in birds. *(See p. 82).*

The following objects were also exhibited :—Mr. J. Berney, Star Fish; Mr. W. J. Fuller, Acarus sacharina (sugar mite from moist sugar); Mr. H. M. Klaassen, rocksalt crystals from Cheshire mines; Mr. E. Lovett, specimens of British stalk-eyed Crustacea, preserved so as to retain their natural colour, Pisa Gibsii, Palœmonidæ in a young state; Mr. W. L. Sarjeant, cocoanut three-quarters of an inch in diameter, group of Vorticellæ; Mr. E. B. Sturge, glass and pith slides for use with opaque objects.

Annual Meeting, January 19th, 1881.

JOHN FLOWER, M.A., F.Z.S., President, in the Chair.

The minutes of the last meeting were read and confirmed.

Mr. E. S. Whealler, Mr. James A. Carter, Mr. James Phillips, Mr. Percy Budd, Mr. Willie James Epps, and Mr. James Rymer were balloted for and elected.

The PRESIDENT read a letter from the Hon. Sec. of the Hackney Microscopical and Natural History Society, announcing that the first Soiree of that Society would be held at the Morley Hall, Triangle, Hackney, on February 24th. A letter was read from Mr. Edward Mawley, sent with four numbers of the Rosarian's Year Book which he presented to the Club.

The Hon. Sec. having been prevented by indisposition from attending the meeting, the PRESIDENT, in his absence, read the report of the Committee and their balance-sheet for the year 1880 as follows :—

REPORT.

The Committee have again the pleasure of submitting to the members of the Club their annual report.

During the year 1880 thirty new members have been elected, twenty-two members (most of whom have removed from the neighbourhood of Croydon) have resigned. The Committee regret to add that five members, Mr. John Drummond, Mr. Walter Walters, Mr. J. W. Baillie, Dr. Williams, and Mr. George Cooper have died.

The total number of members on 31st December was two hundred and forty-one ordinary, and five honorary members.

The following papers have been read :—

February 18th.—Mr. E. R. PEARCE, "On the History and Uses of British Medicinal Plants."

March 17th.—Mr. A. RUSSEL WALLACE, F.L.S., &c., "On the Peculiar Species of the British Fauna and Flora."

April 21st.—Mr. E. LOVETT, "Practical Suggestions on Mounting Objects for the Microscope."

May 19th.—The PRESIDENT (Mr. Jno. Flower, M.A.) "On the Structure and Geological History of the Weald, and of the Catchment Basin of the river Wandle."

September 15th.—The PRESIDENT, "On some Cocoons of the common Puss Moth, and Mr. J. S. JOHNSON, M.R.C.S., "On some Specimens of Pemmican."

October 20th.—Dr. ALFRED CARPENTER, "On Birds' Nests at Duppas House," "On Fossil Teeth from the Gravel at Scarbrook Hill," "On Specimens of Rocks found near St. Bees Head, Cumberland."

November 17th.—Mr. ALFRED TYLOR, F.G.S., &c., "On Colorization in Animals."

December 15th.—Mr. E. LOVETT, "On Preparing and Mounting for Exhibition Crustacea and similar objects," and an interesting table showing the girths, positions, and estimated ages of Churchyard

Yew Trees in the eastern half of the county of Surrey, prepared by Mr. E. Straker.

In addition to the papers above mentioned, numerous objects of interest, many of them connected with the Natural History of the district, have been brought before the members, and have been discussed at the various meetings.

An excursion was made on 12th June to Caterham, White Hill, and Godstone, in conjunction with the members of the Quekett and South London Microscopical Clubs, and on Saturday, 19th June, the members, by invitation from the Geologists' Association of London, joined the members of that society in a geological examination of the district between Croydon and Riddlesdown.

Mr. F. J. Horniman, of Forest Hill, having kindly given the members a second invitation to visit his museum, a party of twenty-one attended on 18th December, and were exceedingly interested in the inspection of the collection.

The eleventh annual soiree was held at the Public Hall, on Wednesday, 24th November, and was attended by Fellows of the Royal Microscopical Society, and members of the Quekett, South London, Sydenham, New Cross, Hackney, Greenwich, and Tower Hill Clubs, also by private exhibitors, by whom and by members of the Club one hundred and sixty-three microscopes were exhibited, together with many interesting works of art and antiquities, and numerous objects connected with Natural History and Microscopy. The attendance was as follows:—One hundred and forty-six members, ninety-four exhibitors (non-members), and five hundred and eighty-one visitors. Total, eight hundred and twenty-one, as against eight hundred and fifteen in 1879.

Members of the Club have also attended the soirees of the New Cross and Greenwich Clubs, and have also given exhibitions of microscopical objects at the Church of England Young Men's Society's meetings at North End, and at the Public Hall, besides assisting at exhibitions for the Mitcham Working Men's Institute, and the South Norwood Orphanage.

The Journals and Reports of the Royal Microscopical Society, the Quekett, Watford, New Cross, Hackney, East Kent, South London, Eastbourne, Brighton and Sussex, and Belgian Clubs and Societies, have been received.

The following donations were made to the Club:—

"The Hunterian Oration" for February, 1863, second section, 1880, by Dr. Gulliver, F.R.S., from the author; "Notes on the weather of 1879," by Mr. Edward Mawley, F.M.S., by the author; Six vols. "British Rainfall," by G. T. Symons, for the years 1865, 1866, 1867, 1868, 1869, 1870; by Mr. Thomas Cushing, F.R.A.S., ten vols.—35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45. Part 1, vol. 46, and one Catalogue of Broadsides of the "Archæologia," published by the Society of Antiquaries of London, by Mr. William Drummond, as a memento of his brother, Mr. John Drummond, deceased; Professor Bell's edition of Gilbert White's "Natural History of Selborne," 2 vols; and 3 vols. "British Rainfall," by Mr. Philip Crowley, F.Z.S.; Report of Excursion of Geologists' Association to Camberley, Surrey, by Professor T. Rupert Jones; "Science Gossip," monthly, from the Publisher, Mr. D. Bogue; Duplicate copies of the Quekett Club

Journal, by Mr. A. Warner; a Box of Fossils, by Professor T. Rupert Jones; a quantity of Butterfly Wings, by Mr. F. J. Horniman; a box of Zoophytes, by Mr. H. Lee, F.G.S., &c.

The attendance at the meetings has been slightly in excess of last year.

In conclusion, the Committee consider that notwithstanding the small nett increase in the number of members, the interest in the Club continues undiminished, the continual changes taking place in a large population like that of Croydon fully accounting for the somewhat numerous withdrawals from membership.

The thanks of the Club are again due to the Local Press for the reports of the various meetings which have appeared in the columns of the *Croydon Advertiser*, *Croydon Chronicle*, and *Croydon Guardian*.

Signed on behalf of the Committee,

JOHN FLOWER, *President*.

Croydon, January 19th, 1881.

BALANCE SHEET FOR THE YEAR ENDING 31st DECEMBER, 1880.

RECEIPTS.

	£	s.	d.
To Balance in hand, 1st January	47	4	4
,, Subscriptions	117	10	0
,, Sale of Lectures	1	14	4
,, Sale of Soirée Tickets	29	15	0
	£196	3	8
To Balance brought down	89	16	4

EXPENDITURE.

	£	s.	d.	£	s.	d.
By Hire of Rooms				6	5	0
,, Printing and Advertising				16	11	4
,, Stationery				1	10	0
,, Postages				4	5	10
,, Collecting Subscriptions				6	9	0
,, Attendance at Hall and care of Lamps				1	8	2
,, Gratuities				1	8	6
,, Insurance				0	7	6
,, Sundries				0	13	0
,, Books and Binding				1	1	6
SOIREE ACCOUNT.						
,, Hire of Rooms	8	7	0			
,, Printing and Advertising	10	17	8			
,, Tables	11	10	0			
,, Postages	4	10	6			
,, Police and Attendants	0	17	6			
,, Music	6	2	6			
,, Decorating Platform	1	10	0			
,, Refreshments	17	4	7			
,, Lamps	2	15	0			
,, Roofing Passage	2	0	0			
,, Sundries	0	12	9			
				66	7	6
Balance forward				89	16	4
				£196	3	8

PHILIP CROWLEY, TREASURER.

We, the undersigned, having examined the above accounts, and the vouchers relating thereto, hereby certify that they are correct according to the Vouchers and the Bankers' Pass-book.

5th January 1881.

H. M. KLAASSEN, }
EDWD. LOVETT, } AUDITORS.

The PRESIDENT, in moving the adoption of the Report, expressed his great satisfaction at the continued prosperity of the Club, and that the last two years, the term of his Presidency, had been years of uninterrupted progress and success. Referring to the Report, it showed that the number of new members elected in 1880 was rather above the average. As in 1879 they had lost more members than usual by resignation, but it was satisfactory to know that nearly all the members who had resigned had done so in consequence of their removal from Croydon. With regard to the papers which had been read, and the various matters which had been brought before and discussed by the members of the Club, the President further remarked that they certainly showed no falling off, either in number, or variety, or importance, and congratulated the members that so large a proportion of the papers and matters which had been brought before them had been connected with the natural history of the district, or were the results of the personal observations and work of members of the Club. They could never hope to rival the large London Societies, nor was it desirable that they should make the attempt. Their province was rather to make themselves masters of their own district, to see that it was properly and systematically examined, and that every fact of value was carefully investigated and accurately recorded. He appealed to the members not to assume, as too many people did, that every thing which they saw was unimportant, or that it must necessarily have been observed before. That was very far from being the case, and if they would bring before the Club more often the objects which they met with in their walks and excursions, and any fact of interest which they had observed, it would tend much to the success and usefulness of their meetings, and would materially help forward the objects for which the Club was founded. Seeing that all the members of the Club were learners, there was really no fact, nor any subject, which any member should hesitate to bring forward if he thought it to be of interest, and particularly if it was connected with the natural history of the district.

Another cause for satisfaction was the number of other societies and clubs with which they were in correspondence, and with which they exchanged reports, and the President expressed a hope that the time was not far distant when something like co-operation would be established among the various clubs and societies in the south of England, so that they might all work upon a common plan, and for a common object. After remarking upon the last soirée, which was one of the most interesting, if not the best, that the Club had ever had, and the local societies which they had been able to help, and referring to the donations to the Club during the past year, and particularly to the very handsome donation of Mr. Wm. Drummond, the President took the opportunity of thanking the Committee, Officers, and Members of the Club for their invariable courtesy to himself, and for the support which they had always accorded to him, and moved " That the Report and Accounts, as read to the Meeting, be received and adopted, and that they be printed and circulated among the Members."

Mr. Manners having seconded the motion, it was carried unanimously.

Before the motion was put, Mr. H. T. Mennell referred to the small number of the field meetings of the Club, and the small attendance at them, which he was unable to account for. He attached great importance to these meetings, and thought that if they were well planned, and well led, they were among the most valuable of the Club's proceedings. Probably a great deal might be done to improve these meetings, if people, who were not members of the Club, but who resided in and were acquainted with the localities which were visited, were associated with the members of the Club, and suggested that the country clergy might give valuable aid.

Mr. Turner supported the views expressed by Mr. Mennell, and suggested that two of the causes which prevented the field meetings from being successful were, that they started too late and went too far from home.

The Rev. E. M. Geldart agreed with Mr. Turner, except that he did not consider that they went far enough for their excursions.

Mr. H. M. Klaassen pointed out that the late hour at which they started for their excursions was unavoidable, as most of the members had business engagements which prevented their starting earlier, and he urged the desirability of joining with other clubs, and so increasing the numbers joining in the excursions.

The President cordially supported the views which had been expressed as to the importance of the field meetings, and expressed the opinion that the chief reason why theirs had not been successful was that they had not been properly organised. He thought that every excursion should be made to a particular place for definite objects, which should be fully announced before hand, and that some one of the members, whose name should be duly announced, should be responsible for the expedition, and should see that the objects of interest were properly pointed out and explained. If this were done he had little doubt that the meetings would be well attended, and would be of great value to the members.

The President next moved the appointment of Mr. Philip

Crowley as President of the Club for the ensuing year. Mr. Long having seconded the motion, it was carried unanimously, and Mr. Crowley expressed his thanks to the members for the compliment which they had paid him.

Dr. Thompson proposed that Mr. John Flower be elected to the office of Treasurer, vacated by Mr. Crowley.

This proposal was seconded by Mr. Chisholm, and carried.

The President next announced the resignation by Mr. E. B. Sturge of the office of Honorary Secretary of the Club, and in doing so regretted that Mr. Sturge was prevented by indisposition from being present at that meeting. Mr. Sturge had acted for five years as Honorary Secretary of the Club, and during that time had discharged the onerous duties of the office most admirably and conscientiously. He had now resigned because he felt that he should not be able, in the year to come, to devote sufficient time to enable him properly to discharge the duties of Secretary.

Upon the motion of Mr. Manners, seconded by Dr. Thompson, Mr. K. McKean was elected Honorary Secretary in the place of Mr. Sturge.

The President read a letter from Mr. Henry Lee, announcing his wish, in consequence of his removal from Croydon, to retire from the Committee, but expressing his unabated interest in all that related to the Club. He also pointed out that as Mr. K. McKean had been elected Honorary Secretary there were thus two vacancies on the Committee.

It was proposed by Mr. H. M. Klaassen, and seconded by Mr. Long, and carried unanimously, that Dr. Carpenter, Mr. J. Chisholm, Mr. T. Cushing, Mr. J. S. Johnson, Mr. G. Manners, Mr. A. D. Taylor, and Mr. H. Turner (members of the old Committee), and Mr. H. T. Mennell and Mr. E. Lovett be appointed the Committee for the ensuing year.

Cordial votes of thanks were accorded to the retiring President and Honorary Secretary, and on the motion of the President, a vote of thanks was also accorded to the Local Press for their reports of the proceedings of the Club.

Mr. John Drage exhibited a white variety of the common Thrush (Turdus musicus) which was shot near the Lizard Point, Cornwall, in the autumn of 1880, and a specimen of the purple Sand-piper (Tringa striata) shot in the winter of 1880, in the same locality. The thrush was a remarkably white specimen, having only a few very faintly coloured feathers on the head and on the left wing.

TRANSACTIONS

OF THE

Croydon Microscopical and Natural History Club.

I. — On the Natural History of Hard Water, and on its Softening by Clark's Process.

By Alfred Carpenter, Esq., M.D., President.

[*Read October 16th*, 1878.]

Dr. Carpenter first produced three samples of pure rain water, also some water as supplied from the Board's well in the town, and he poured three portions of each into test bottles. He explained that the rain which descended on to the chalk hills round Croydon, which hills were the source from which the Croydon water supply was derived, necessarily passed through the chalk, and in so doing dissolved certain of its ingredients which had an attraction for water. There were very few things in nature that water would not dissolve, but it had its preferences, and some of the things it preferred most were to be found in the water which we drank. Dr. Carpenter then poured into one phial of rain water some nitrate of silver; into a second some oxalate of ammonia; and into the third some chloride of barium. None of these re-agents or tests appeared to have any effect in the rain water, but on pouring them, in the same order, into the phials containing the Board's water it was found that, in the one containing nitrate of silver, the presence of chlorides was detected in the water; in that containing oxalate of ammonia the presence of lime was indicated; and in the sample to which the chloride of barium had been added it was shown that the sulphates were present. He further explained that the tests also showed the presence of carbonates. When the rain water descended on to the hills and then passed deep into the ground, it absorbed carbonate of lime out of the chalk. Two grains only of carbonate of lime were taken up by each gallon of water, but as the rain water descended it carried with it carbonic acid, which was always present in the air, and this carbonic acid enabled the water to take up a much larger quantity of lime, as a bicarbonate, which was much more soluble than the carbonate. The ordinary constituents of chalk water in this district were 22 grains of bi-carbonate of lime to a gallon. Sometimes this quantity was exceeded—28 grains were not unusual in some places, and in others even a greater proportion. The water having thus absorbed this carbonate and bi-carbonate, also became charged with a certain amount of sulphate of lime, which was more soluble even than bi-carbonate of lime. Cold water would take up 150 grains of it per gallon. In the chalk there was also salt in small quantities, and hence the presence of chlorides in the water. In the water supplied to this town there was always found, when it was pure, two grains of common salt (which was a chloride of sodium) to the gallon, but if that quantity was exceeded by say eight, ten, or twelve grains to the gallon, it was quite certain that the water had been rendered impure by the admixture of sewage. Bi-carbonate of lime existed in water while it was cold, but if the water was boiled much of the carbonic acid was driven off from the lime, and passed again into the air from whence it came, whilst the lime was set free as a carbonate and was deposited. It was from this effect of boiling chalk water that a quantity of carbonate of lime was found in our kettles, boilers, hot water pipes, &c. Dr. Carpenter exhibited specimens of pipes, the apertures of which had been almost completely closed by the lime deposits. He then explained at some length how carbonate of lime forms a large part of the solid strata of which the globe is made up, and exhibited on the table a large number of specimens of minerals of which lime formed part. Sometimes the lime is obtained in transparent crystals, but it is generally mixed with other earths, with metals, &c., and in these various states it is known by the names of chalk, limestone, stalactites, marble, calcite, aragonite, &c. Dr. Carpenter then went on to say that the presence of lime in our water enabled us to have it in a pure state for drinking purposes. Water, in all parts of the world seemed to have a preference for lime, and wherever it trickled through ground containing lime, it dissolved the lime in considerable quantities. This was one of the means adopted by Providence to provide us with pure water. If we had water too pure, it would more easily absorb metals of a poisonous nature, but the presence of lime in water prevented the easy admission of much poisonous material. Our housekeepers found that boiling water was a much better solvent than cold water, because, in the process of boiling, about 20 grains of lime were thrown out, leaving only two grains, more or less, in the liquid. It had been proposed to separate lime from water, and thus have a purer beverage for drinking purposes, which was considered by some to be a more satisfactory article to drink than water which was charged with large quantities of lime. When water was boiled it became comparatively pure; the only disadvantage was the destruction of the boilers and the stoppage of the pipes. Some years ago, Dr. Clark, of Aberdeen, propounded a plan for softening chalk water; that system was improved by Mr. Porter, and the process is now known as Clark and Porter's. For those who wished to prevent incrustation in boilers and pipes, Clark's process was simple. First, they must provide themselves with a cistern or reservoir capable of containing 540 gallons. Mix 9-ozs. of caustic lime with 40 gallons of water, which will make a milk of lime, then pour it into the cistern, containing 500 gallons of water. By this process the water will become pure. Two pounds of lime will sink to the bottom, and the boilers and pipes will no longer be furred up. Dr. Carpenter proceeded to explain that he would not argue that water from which the chalk had been removed was better to drink; he preferred the water as they got it from the well. It was known that when carbonic acid was prevalent in the atmosphere, fungus germs developed in a most remarkable manner, and when the carbonic acid was washed by the rain into the soil, it would give rise to conditions in the atmosphere of the soil which would promote the spread of epidemic diseases, unless it was absorbed by the chalk. But, so long as there were only 22 grains of bi-carbonate of lime in our water, it would be impossible for it to retain carbonic acid, and consequently it would be impossible for these germs to be developed which existed in a carbonic acid atmosphere, or for any injurious element to be introduced into the water, for the water is not supersaturated with lime and a carbonic acid atmosphere cannot exist. Dr. Carpenter then referred to the wonderful changes that had taken place in the structure of the earth, more especially with regard to the mineral kingdom. An immense mass of matter had been removed from our chalk hills, and they were gradually being lowered by the rain water which flowed over them. Water, in the shape of rain, rivers, or waves of the sea, denuded stone down, even more quickly than simple exposure to the air; hence there was no rocky mountain which was not constantly getting lower or less, by the disintegrating cause; but this law was balanced by the elevating cause, which seemed to depend upon the working of fire under the crust of the earth. By it the rocks at the bottom of the sea were raised, either by sudden convulsions, or gradually, above the level of the sea, so that they became dry land, and this was the reason why sea shells were found in the chalk hills in this neighbourhood far above the present level of the sea. When new land was thus thrown up, it immediately became liable to be worn away again by air and water, and carried back into the sea ; so that nature might be said to keep up a constant system of change on the face of the globe. The main object, however, of his paper was to point out that nature did not leave man unprotected from his own acts. He might foul his supply of drinking water, but Providence turned the ammonia compounds into nitrates and nitrides, and prevented a carbonic acid atmosphere in the underground air by providing an abundance of lime. The underground air is purified by it in those places in which vegetation does not take up the carbonic acid, and thus the spread of such diseases as typhoid by drinking water is limited, Dr. Carpenter contending that typhoid germs cannot vegetate in the absence of carbonic acid.

2.—On a Portion of the Trunk of a Horse-Chestnut Tree in which an Iron Chain has become Imbedded.

By John Flower, M.A., F.Z.S.

[*Read Nov. 20th,* 1878.]

When I first went to live at Park Hill, in April, 1844, there were two large horse-chestnut trees, a few yards apart, growing close to the house. One is still growing there; but the other (from which this piece was taken) was cut down in the spring of the present year. Previous to 1844, an iron chain had been put round this tree, some twenty feet, or perhaps rather more, from the ground, and to this chain another iron chain was attached, and passed round a bough of the tree which is now standing, with the object, apparently, of preventing that bough from breaking off and falling on some farm buildings over which it hung. I can quite well remember seeing this chain between the two trees, but many years ago it broke in two places, and nearly the whole of it fell down; and from that time little more was thought about it. About 1854, but it may have been a little earlier, it was noticed that the upper part of the tree from which this piece was cut was weak. The leaves were much smaller on that part of it, and there was an evident want of vigour about it. This was the subject of constant remark in the summer, but no one knew exactly what was the cause of it. Later on several large and vigorous boughs began to show themselves about fifteen feet from the ground, and below the place where the chain had been put round the tree. These continued to grow very freely up to the time when the tree was cut down, but the upper part never recovered itself. It seemed to get rather stronger for some years before the tree was cut down, but it was never really strong, and the leaves on it continued to the last to be unusually small. For some years past I have had but little doubt in my own mind that the iron chain had become embedded in the trunk, and that that was the cause of the tree's singular behaviour. After it was cut down a careful examination proved beyond doubt that this was the case, and so interesting did it appear to me to be that I had an entire section of the trunk cut out, from about eight inches above the chain to below the point from which the large and vigorous boughs previously mentioned took their origin. That section, 34 inches in height, is now in the Small Hall, where it can be inspected by any one who chooses to examine it, but it is too big to move upstairs. I ought, perhaps, here to explain, for the benefit of those who have not studied botany, how it is that trees like the horse-chestnut grow and are nourished. The materials by which the tree is nourished are contained in the sap, which may be termed the blood of the tree, and which passes up, from the root to the branches, through the sap vessels, which lie immediately under the outside bark, and between that and the solid wood of the tree. The solid wood, again, is increased in diameter every year, by the addition of a layer of wood, which is formed by the sap vessels, and in this way the tree increases annually in bulk. If we bear these facts in mind, we shall have no difficulty in seeing exactly what has happened in the tree which we are considering. The chain having been placed round it, all went well until, by the growth of the tree, the chain began to get tight; then it began to press hard upon the bark and, as a necessary consequence, upon the sap-vessels under it. This stopped the free circulation of the sap to the upper boughs, and the result was that the upper part of the tree got weak and shabby, it being in fact, half starved. If the chain had pressed equally on all parts of the trunk at the same time, as a broad iron band would have done, in all probability the upper part of the tree would have died outright; but, having a rough outline, the chain was not able to stop the flow of the sap altogether, and so some portion of it managed to get past the chain and kept the upper boughs alive. The trunk, therefore, continued to grow, whilst, on the other hand, the chain remained stationary, and so, by degrees, the solid wood was formed completely over the chain, and then, the full supply of sap having been restored, the upper part of the tree was gradually recovering itself when it was cut down. I have cut a hole in the wood where the chain is nearest to the surface, and through that hole the chain can be seen. The position which it occupies can be seen very well in two ways—horizontally by the scar made in the bark when it grew over the chain, and by the different colour of the wood of the trunk, as seen from above; the dark part of the wood corresponding to the part which is enclosed within the chain, and the brighter part to that which is outside of it. At the nearest point it is about an inch from the edge of the wood, but in one place it must be embedded to a depth of four or five inches. The vigorous boughs which sprung out of the trunk a short distance below the chain were formed because the sap was compelled, by its nature, to employ itself in the formation of new wood, and, being unable to get up to the top of the tree, it expended its energy in throwing out these boughs as close as possible to the point where the free flow of the sap was obstructed by the chain. These, therefore, took to themselves more than their proper share of the sap, increased rapidly in size, and, by thus drawing off the strength of the tree, helped to keep back the healing process which was going on over the chain, and to starve the upper boughs. It is remarkable that these boughs did not spring from the side which was nearest to the other tree, nor from the side which was furthest from it, but from the other sides. As regards the dimensions of the tree, when the chain was first put round it it must have been about 40 inches in circumference. Its circumference is now, taken about eight inches above the chain, 67 inches; but, taken about 26 inches below the chain, it is 96 inches. It would be possible, I think, to ascertain from the rings in the tree, approximately, the number of years which were occupied in effecting the changes which I have pointed out. I hope to be able to find time to do this, and lay the result before the members of the club on a future occasion. The number of rings appearing at the bottom of the trunk would give the entire age of the tree. On the other hand, the rings in the centre of the upper part of the trunk, would represent the years which elapsed before the chain began to strangle the tree; then comes a number of confused rings, very close together, which represent the years of the tree's struggle with the chain, and when the free flow of the sap upwards was obstructed; and then come a number of broader and more distinct rings, which represent the years which have past since, the chain having become embedded by the steady growth of the tree, the free flow of the sap was once more restored. It is a very interesting fact that the part of the chain which was put round the tree which is still standing has also become embedded in the bough which it was intended to support, and can no longer be seen; but a piece of the chain which was attached to the part which is embedded is still to be seen hanging from it. The part of this bough which is above the chain is very weak and shabby, and, on the other hand, two boughs, which spring just below the chain, have abnormally increased in size.

NOTE.—The piece of the tree which was the subject of the above paper is now in the Museum of the Royal Gardens at Kew. It has been admirably photographed by Mr. Mason, the well-known photographer, of George Street, Croydon, who will supply copies to any one who may wish to have them.—J. F.

3.—First Report of the Botanical Sub-Committee.

[*Read Dec. 18th,* 1878.]

It will be within the recollection of most of you that at our usual monthly meeting, on Dec. 19th, 1877, the hon. secretary laid before the members of the Club a list of the wild plants found in the immediate neighbourhood of Croydon, which had been prepared and forwarded to him by one of our members, Mr. W. F. Miller. That list extends only to the tract of country which lies within a radius of about eight miles from Croydon, and the number of species which Mr. Miller had found within that district is about 400. These, however, did not comprise any of the members of those numerous and important families—the rushes, the sedges, and the grasses. Mr. Miller did not put forward this list as being by any means a complete one, but, on the contrary, he gave it only as the result of his own observation, and he communicated it to the Club in the hope that others of our members might be induced to co-operate with him, and help to complete the list which he had begun.

Mr. Miller was not, however, the only member of the Club who had been at work in this field. Mr. Beeby, Mr. Bennett, and Mr. Flower, had, for some years past, spent a considerable amount of time in investigating the botany of the district, and had compiled a large number of notes as to our local wild flowers, and, before Dec. 19th, 1877, had had under consideration the best way of working, systematically, the wild plants of our neighbourhood. As it was felt that Mr. Miller's object was one which well deserved support, and one, moreover, which came peculiarly with the province of our Club, at the meeting on Dec. 19th, 1877, Mr. Miller, Mr. Beeby, Mr. Bennett, and Mr. Flower were formed into a Sub-Committee, to investigate the botany of our district, and to prepare a complete list of its plants. In this way the Botanical Sub-Committee came into existence. They now submit their report of this their first year's work.

The first thing which the Sub-Committee had to consider was the district to be investigated, and after full consideration, the following was adopted, as being on the whole, the most convenient, and for botanical purposes, the most complete. The northern boundary of the district selected is the river Thames, from the mouth of the river Darenth, near Dartford, in Kent, to the mouth of the river Mole, near East Moulsey, in Surrey. The eastern boundary is the river Darenth, and the western is the river Mole. The southern boundary is the northern edge of the Gault. The chief reasons which induced the Sub-Committee to adopt this district are as follows:—In the first place it is a tolerably large area (it comprises about 500 square miles of land), it is also very compact, and is very well defined by natural boundaries. In the next place Croydon, as you will see from the one-inch Ordnance geological map, lies, as nearly as possible, in the very centre of this district. To the north, our town is distant from the Thames eight miles to Battersea, and ten miles to London Bridge, while from the edge of the Gault to the south it is also distant eight miles. It is also sixteen miles from the bend in the Darenth, which forms the extreme eastern boundary, and sixteen miles from the bend in the Mole, which is our extreme western limit. But above all, this district is very complete geologically, and therefore, necessarily, very complete for botanical purposes, plants being of course, dependent for their existence, to a great extent, upon particular soils.

The strata which exist in the district are six in number, and when in their natural position, they occur in the following order:—

Tertiary. (Lower eocene).	Bagshot Beds. London Clay. Lower London Tertiaries.
Secondary. (Upper Cretaceous).	Chalk. Upper Greensand. Gault.

Above these, and scattered about in no regular order, come the alluvial soil, which is, of course, at the top, and numerous surface beds of gravel, sand, and brick earth. As Professor Morris has very fully described the geological history of these strata in his lecture, it will not be necessary now to describe them more fully.

The most important of them for our present purpose is undoubtedly the chalk. The strata which overlie it having been removed the chalk has become exposed over a large part of the district, that is, over that part of it which is uncoloured on the map, and which lies immediately to the S. S.E. and S.W. of Croydon. In the same way the Lower London Tertiaries, which are made up for the most part of gravels, sands, and clays lie exposed to the N.E., and they also form a line along the N. boundary of the chalk. The London clay lies exposed immediately to the N. and N.W., and one piece of Bagshot sand is found to the extreme W. Along the southern boundary of the district the Upper Greensand extends over a very small and narrow area, and below that, to the south, comes the Gault, which is a very stiff blue clay.

Speaking roughly, therefore, about one half of the district is Chalk, of the other half about one fourth is London clay, and the remaining one fourth is made up of sands, clays, and gravels.

The Sub-Committee have been thus particular as to the reasons which induced them to select this particular district, because, some little time after they had chosen it, they learnt that the South London Microscopical and Natural History Club had adopted one which seems to be almost identical with it, and it appears from the map, with Mr. Jackson's description annexed, which was laid before the Club at the meeting on Oct. 16th, that the district which they have selected is exactly the same as our own, except towards the south. We make our southern boundary, as we have seen, the northern edge of the Gault, whilst their boundary is the northern edge of the Upper Greensand. As the Upper Greensand seems to go naturally with the chalk, whilst the gault, on the other hand, differs much from both these strata, there seems no sufficient reason for excluding the Upper Greensand.

The Sub-Committee first heard that the South London Club had selected this district in this way. Directly after they were appointed they made overtures for help and co-operation to some of the members of the various Natural History Clubs which had been established in the neighbourhood of Croydon, and amongst others, to some of the members of the South London Club. They, however, expressed themselves as unable to co-operate with us, as they were themselves working the same district. It is not, of course, intended to question the right of the South London or any other Club to work any district which in their opinion is the most convenient and most desirable for them, but the Sub-Committee cannot but feel that the result which both Clubs desire would have been better attained if the South London Club had communicated with us before they selected for themselves a district which lies so immediately around our town, and made arrangements for an independent investigation of it.

With regard to that part of the district which lies in the county of Kent, the Sub-Committee have thought it better not to deal with that in this report. A Flora of Kent is now being prepared by Mr. F. J. Hanbury, and when that is completed it will probably prove a complete and exhaustive Flora of the county. In addition to this the Sub-Committee feel that the Surrey part of the district will require all the time which they can bestow upon it, and therefore, that, for the present, at all events, it will be better to confine their work to our own county.

Having thus settled the area of ground to be worked the

Sub-Committee proceeded to compile a complete list of all the plants which they had themselves observed in that district; to look up and examine fresh localities; and to make a complete record of all the places in which they have found the rarer species; and the result has been that a large mass of information as to our local wild flowers has been accumulated.

Annexed to this report is a complete list of all the species of Phanerogamic, or flowering plants, and of the Filices, Lycopodiaceæ, Marsileaceæ, Equisetaceæ, and Characeæ, of the Cryptogamic plants which have been thus observed, and their total number is 754. These do not, however, include a considerable number of species like the Spruce Fir, Lime, and Sycamore, which, although they are common enough in parks, woods, and plantations, cannot properly be considered to be wild.

Of the 754 species nearly 700 are to be found within four miles of the place where we are now assembled. This list is of course as yet but a very incomplete one. The district will require a great deal more attention than it has yet received, before it will be possible to compile a complete catalogue of its plants. In Mr. Brewer's Flora of Surrey—which is anything but an exhaustive Flora of the country round Croydon—and in other works, a number of additional species are recorded as occurring at various places in our district; but as the Sub-Committee have not yet been able to ascertain whether these species are still to be found in the localities given they have, for the present, omitted them from the list. Still the results which have been obtained thus far are satisfactory, considering the short time during which the Sub-Committee have been at work. Now that attention has been called to this subject, and the matter has been taken up systematically, there can be little doubt that a large number of fresh species will be added to this list, and when this has been done the Croydon district will be shown to possess a Flora, which, for the number and variety of its species, will compare favourably with that of other districts of the same size, and which affords very ample materials for the study of English Botany.

In the seventh, which is the last edition of "The London Catalogue of British Plants" (published in 1874), and which standard authority has been followed in all matters of classification and scientific nomenclature, the total number of species of flowering plants and of the five families of Cryptogamic plants, above mentioned, which are found wild in the British Islands, is stated to be 1680. It will be seen, therefore, that the plants already observed by the Sub-Committee in our district comprise nearly one half of the total number of species in the London Catalogue. Further than this, the 754 species above mentioned are of a very varied character, for they are representatives of no less than 83 out of the 94 Natural Orders into which the 1680 species which are comprised in the London Catalogue are divided.

The families which are not known to occur wild in our district, excluding the limes (Tiliaceæ) are 11 in number :—

1. Frankeniaceæ, which contains but one species (F. lœvis), the Sea Heath.

2. Tamariscaceæ, which also contains but one species (T. Anglica), the Tamarisc.

3. Elatinaceæ, which has two species, the Waterpeppers.

4. Polemoniaceæ, which has but one species (P. cæruleum), the Jacob's Ladder.

5. Pinguiculaceæ, which has eight species, the Butterworts and Bladderworts.

6. Plumbaginaceæ, which contains six species, the Sea Lavenders and Thrifts.

7. Elæagnaceæ, which has but one species (H. rhamnoides), the Sea Buckthorn.

8. Asaraceæ, in which are two species, the Asarabacca and the Common Birthwort.

9. Empetraceæ, with a single species (E. nigrum), the Crowberry.

10. Eriocaulonaceæ, which also has but one species, (E. septangulare), the Pipewort, and

11. Marsileaceæ, also containing one species (P. globulifera), the Creeping Pillwort.

The last-named species was formerly found on Esher Common, and may still grow there, but there is but little chance of any of the other excepted families being represented in our Flora, except, possibly, the Elatinaceæ and Pinguiculaceæ. The two species which are comprised in the first of these two families are both found in our county; and of the Pinguiculaceæ one species of Butterwort occurs in the south east of England, and two species of Bladderwort are included in the Flora of Surrey.

On the other hand the Frankeniaceæ, Tamariscaceæ, and Elœagnaceæ are confined to the sea coast; and the same remark applies to the Plumbaginaceæ, except as to one species of Thrift which is found on the top of some of the Scotch mountains. The Jacob's Ladder, again, is hardly a wild flower at all. Wherever it is found it has probably escaped from cultivation. Both the species of Asaraceæ are also considered by many to be introduced plants, the Birthwort being confined to the south and south-east of England, and being found only near old ruins. This is to be explained by the fact that this plant was much cultivated in gardens in olden times, on account of its supposed medical properties, which were believed to be very great. The old herbalists had a belief that every plant was given to man by his Creator for some special purpose, and that that purpose—on what was called the doctrine of signatures—was indicated by the external appearance of the plant: and, accordingly, the shape of the corolla of this species was supposed to show that it was good for women at the time of childbirth. It was also believed to be good for snake bites, and for "plague, small-pox, measles, and such like malign and contagious diseases."

Of the two remaining of the eleven excepted families the Crowberry is not now found in the South of England, and the Pipewort is found only in the Isle of Skye, and in one or two of the adjoining islands, and on the west coast of Ireland. It is a North American species, which has contrived to find its way, as only plants seem to be able to do, to our western shores, and it is found in no other part of Europe.

With regard to the localities in which the rarer species have been found, the Sub-Committee have thought it better, for the present at all events, to withhold these altogether, because experience has shown that to disclose these localities too often leads to the extermination of many of these plants, and every plant thus exterminated is a loss, which cannot be repaired, to all those who study wild flowers in the only place in which they can be properly studied—their native woods and fields. The members of the Sub-Committee, however, will always be ready to give any assistance in their power to anyone who is really interested in wild flowers, or is desirous of studying botany, either by communicating to them the places where they can find any particular plants which they may require, or in any other way, and if, as it is hoped will be the case, a new edition should be published of Mr. Brewer's "Flora of Surrey," all the knowledge of our local wild flowers which the Sub-Committee have acquired will be freely placed at the disposal of the editor.

It now only remains to appeal to the members of the Club generally to assist in completing the task which has been commenced. Those who are botanists can assist greatly if they will by communicating to any member of the Sub-Committee the localities where any of the rarer species have been found; and to those who are not botanists, even a slight acquaintance with the subject will be sufficient to prove to them that botany is not a hard dull science, as many believe it to be, but that it is a science which is full of interest to all, and one which will amply repay any time and labour which may be devoted to it.

List of Phanerogamic Plants, and of Filices, Lycopodiaceæ, Marsileaceæ, Equisetaceæ, and Characeæ, of Cryptogamic Plants, observed in the Croydon District.

1. Ranunculaceæ.

Clematis.
1 Vitalba, Linn.

Anemone.
8 nemorosa, Linn.
9 apennina, Linn.

Myosurus.
11 minimus, Linn.

Ranunculus.
12 circinatus, Sibth.
14 peltatus, Fries.
var. truncatus.
var. floribundus.
var. elongatus.
15 diversifolius, Gilib.
var. radians.
16 Drouetii, Schultz.
21 hederaceus, Linn.
22 sceleratus, Linn.
24 Flammula, Linn.
var. pseudo-reptans.
27 auricomus, Linn.
28 acris, Linn.
29 repens, Linn.
30 bulbosus, Linn.
33 parviflorus, Linn.
34 arvensis, Linn.
35 Ficaria, Linn.

Caltha.
36 palustris, Linn.
var. Guerangerii.

Helleborus.
41 fœtidus, Linn.

Aquilegia.
42 vulgaris, Linn.

Delphinium.
43 Ajacis, Reich.

2. Berberaceæ.

Berberis.
46 vulgaris, Linn.

3. Nymphæaceæ.

Nuphar.
48 lutea, Sm.

4. Papaveraceæ.

Papaver.
50 somniferum, Linn.
var. hispidum.
51 Rhœas, Linn.
var. strigosum.
52 dubium, Linn.
var. Lamottei.
53 Argemone, Linn.
54 hybridum, Linn.

Chelidonium.
57 majus, Linn.

4*. Fumariaceæ.

Corydalis.
58 lutea, DC.

Fumaria.
60 pallidiflora, Jord.
var. Boræi.
63 densiflora, DC.
64 officinalis, Linn.
66 parviflora, Lam.

5. Cruciferæ.

Raphanus.
69 Raphanistrum, Linn.

Sinapis.
71 arvensis, Linn.
72 alba, Linn.
73 nigra, Linn.

Diplotaxis.
81 tenuifolia, DC.
82 muralis, DC.

Sisymbrium.
83 officinale, Scop.
86 Alliaria, Scop.

Erysimum.
87 cheiranthoides, Linn.

Cardamine.
94 pratensis, Linn.
95 hirsuta, Linn.
96 sylvatica, Link.

Arabis.
98 thaliana, Linn.
102 hirsuta, Brown.

Barbarea.
105 vulgaris, Brown.
107 stricta, Andrz.

Nasturtium.
110 officinale, Brown.
111 sylvestre, Brown.
112 palustre, DC.
113 amphibium, Brown

Draba.
118 verna, Linn.
var. brachycarpa

Alyssum.
124 calycinum, Linn.

Camelina.
126 sativa, Crantz.

Thlaspi.
128 arvense, Linn.

Capsella.
134 Bursa-pastoris, Mœnch.

Lepidium.
137 sativum, Linn.
138 campestre, Brown.
139 Smithii, Hook.
140 Draba, Linn.

Senebiera.
142 Coronopus, Poir.

6. Resedaceæ.

Reseda.
144 lutea, Linn.
145 Luteola, Linn.

7. Cistaceæ.

Helianthemum.
149 vulgare, Gaert.

8. Violaceæ.

Viola.
151 palustris, Linn.
152 odorata, Linn.
var. alba.
153 permixta, Jord.
var. sepincolá.
154 hirta, Linn.
var. calcarea
155 sylvatica, Fries.
var. Riviniana.
var. Reichenbachiana.
157 canina, Auct.
var. flavicornis, Sm.
160 tricolor, Linn.
var. arvensis.

9. Droseraceæ.

Drosera.
163 rotundifolia, Linn.
165 intermedia, Hayne.

10. Polygalaceæ.

Polygala.
166 vulgaris, Linn.
168 depressa, Wender.
169 calcarea, Schultz.

11. Frankeniaceæ.

---

12. Caryophyllaceæ.

Dianthus.
172 Armeria.—Linn.
173 deltoides, Linn.
var. glaucus.

Saponaria.
177 officinalis, Linn.

Silene.
178 inflata, Sm.
var. puberula.

Lychnis.
188 vespertina, Sibth.
189 diurna, Sibth.
190 Flos-cuculi, Linn.
193 Githago, Lam.

Mœnchia,
195 erecta, Sm.

Cerastium.
198 semidecandrum, Linn.
199 glomeratum, Thuil.
200 triviale, Link.
203 arvense, Linn.

Stellaria.
205 aquatica, Scop.
207 media, With.
208 Holostea, Linn.
210 graminea, Linn.
211 uliginosa, Murr.

Arenaria.
212 trinervis. Linn.
213 serpyllifolia, Linn.
var. leptoclados.
220 tenuifolia, Crantz.

Sagina.
223 apetala, Linn.
224 ciliata, Fries.
225 procumbens, Linn.
229 nodosa, Meyer.

Spergula.
230 arvensis, Linn.

Spergularia.
231 rubra, Fenzl.

12*. ILLECEBRACEÆ.

Scleranthus.
240 annuus, Linn.
var. biennis.

13. PORTULACACEÆ.

Montia.
242 fontana, Linn.

14. TAMARISCACEÆ.

---

15. ELATINACEÆ.

---

16. HYPERICACEÆ.

Hypericum.
248 Androsæmum, Linn.
249 calycinum, Linn.
250 perforatum, Linn.
252 tetrapterum, Fries.
254 humifusum, Linn.
256 pulchrum, Linn.
257 hirsutum, Linn.
258 montanum, Linn.
259 eleodes, Linn.

17. MALVACEÆ.

Malva.
262 moschata, Linn.
263 sylvestris, Linn.
264 rotundifolia, Linn.

18. TILIACEÆ.

---

19. LINACEÆ.

Radiola.
268 millegrana, Sm.

Linum.
269 catharticum, Linn.
272 usitatissimum, Linn.

20. GERANIACEÆ.

Geranium.
274 phœum, Linn.
277 pyrenaicum, Linn.
278 molle, Linn.
279 pusillum, Linn.
281 dissectum, Linn.
282 columbinum, Linn.
284 Robertianum, Linn.

Erodium.
285 cicutarium, Herit.

Oxalis.
288 Acetosella, Linn.
290 stricta, Linn.

21. ILICACEÆ.

Ilex.
294 Aquifolium, Linn.

22. CELASTRACEÆ.

Euonymus.
295 europæus, Linn.

23. RHAMNACEÆ.

Rhamnus.
296 catharticus, Linn.
297 Frangula, Linn.

24. SAPINDACEÆ.

Acer.
299 campestre, Linn.

25. LEGUMINIFERÆ.

Ulex.
300 europæus, Linn.
302 nanus, Forster.

Genista.
303 anglica, Linn.
305 tinctoria, Linn.

Sarothamnus.
306 scoparius, Koch.

Ononis.
307 spinosa, Linn.
308 arvensis, Auct.

Anthyllis.
310 vulneraria, Linn.

Medicago.
311 sativa, Linn.
314 lupulina, Linn.
316 Maculata, Sibth.

Melilotus.
318 officinalis, Willd.
319 alba, Lam.
320 arvensis, Wallr.

Trifolium.
322 subterraneum, Linn.
323 pratense, Linn.
var. sylvestre.
324 medium, Linn.
327 incarnatum, Linn.
329 arvense, Linn.
331 striatum, Linn.

Trifolium.
332 scabrum, Linn.
333 glomeratum, Linn.
336 hybridum, Linn.
337 repens, Linn.
338 fragiferum, Linn.
339 procumbens, Linn.
340 minus, Relban.
341 filiforme, Linn.

Lotus.
342 corniculatus, Linn.
344 major, Scop.

Astragalus.
351 glycyphyllus, Linn.

Ornithopus.
352 perpusillus, Linn.

Hippocrepis.
354 comosa, Linn.

Onobrychis.
355 sativa, Lam.

Vicia.
356 hirsuta, Koch.
357 tetrasperma, Moench.
359 Cracca, Linn.
362 sepium, Linn.
364 sativa, Linn.
365 augustifolia, Roth.
var. Bobartii.

Lathyrus.
369 Nissolia, Linn.
370 hirsutus, Linn.
371 pratensis, Linn.
373 sylvestris, Linn.

Orobus.
376 tuberosus, Linn.
var. tenuifolius.

26. Rosaceæ.

Prunus.
378 spinosa, Linn.
379 insititia, Linn.
381 Avium, Linn.
382 Cerasus, Linn.

Spiræa.
385 Ulmaria, Linn.
386 Filipendula, Linn.

Agrimonia.
387 Eupatoria, Linn.

Poterium.
390 Sanguisorba, Linn.
391 muricatum, Spach.

Alchemilla.
392 arvensis, Scop.

Potentilla.
397 Fragariastrum, Ehrh.
400 Tormentilla, Schenk.
402 reptans, Linn.
403 anserina, Linn.
405 argentea, Linn.

Fragaria.
408 vesca, Linn.

Rubus.
410 Idæus, Linn.
413 plicatus, W. & N.
420 discolor, W. & N.
451 cæsius, Linn.
var. umbrosus.

Geum.
454 urbanum, Linn.

Rosa.
464 Tomentosa, Sm.
465 rubiginosa, Linn.
466 micrantha, Sm.
468 canina, Linn.
var. lutetiana.
470 arvensis, Huds.

Cratægus.
473 Oxyacantha, Linn.
var. monogyna.

Pyrus.
475 Aria, Hooker.
480 Aucuparia, Gaert.
481 communis, Linn.
var. Achras.
482 Malus, Linn.
var. acerba.
var. mitis.

27. Lythraceæ.

Lythrum.
483 Salicaria, Linn.

Peplis.
485 Portula, Linn.

28. Onagraceæ.

Epilobium.
486 angustifolium, Linn.
487 hirsutum, Linn.
488 parviflorum, Schreb.
489 montanum, Linn.
490 lanceolatum, S. & M.
491 roseum, Schreb.
492 tetragonum, Linn.
493 obscurum, Schreb.
494 palustre, Linn.

Circæa.
501 lutetiana, Linn.

28*. HALORAGIACEÆ.

Myriophyllum.
504 spicatum, Linn.
505 alterniflorum, DC.

Callitriche.
508 obtusangula, Le Gal.
509 stagnalis, Scop.
var. platycarpa.
510 hamulata, Kirtz.
var. pedunculata.

29. CUCURBITACEÆ.

Bryonia.
513 dioica, Linn.

30. GROSSULARIACEÆ.

Ribes.
514 Grossularia.
517 nigrum, Linn.

31. CRASSULACEÆ.

Sedum.
520 Telephium, Linn.
var. purpurascens.
525 acre, Linn.
527 reflexum, Linn.

Sempervivum.
530 tectorum, Linn.

32. SAXIFRAGACEÆ.

Saxifraga.
540 tridactylites, Linn.
543 granulata, Linn.

33. UMBELLIFERÆ.

Hydrocotyle.
552 vulgaris, Linn.

Sanicula.
554 europæa, Linn.

Helosciadium.
559 nodiflorum, Koch.
560 inundatum, Koch.

Petroselinum.
562 segetum, Koch.

Sison.
563 Amomum, Linn.

Ægopodium.
565 Podagraria, Linn.

Bunium.
569 flexuosum, With.

Pimpinella.
570 Saxifraga, Linn.
571 magna, Linn.

Sium.
573 angustifolium, Linn.

Œnanthe.
578 fistulosa, Linn.
581 Lachenalii, Gmel.

Fœniculum.
586 vulgare, Gaert.

Silaus.
589 pratensis, Bess.

Angelica.
592 sylvestris, Linn.

Pastinaca.
596 sativa, Linn.

Heracleum.
597 Sphondylium, Linn.

Daucus.
599 Carota, Linn.

Caucalis.
600 daucoides, Linn.

Torilis.
601 infesta, Spreng.
602 Anthriscus, Gaert.
603 nodosa, Gaert.

Chærophyllum.
604 Anthriscus, Lam.
605 sativum, Lam.
606 sylvestre, Linn.
607 temulum, Linn.

Scandix.
609 Pecten-Veneris, Linn.

Conium.
610 maculatum, Linn.

34. ARALIACEÆ.

Hedera.
614 Helix, Linn.

35. CORNACEÆ.

Cornus.
616 sanguinea, Linn.

36. LORANTHACEÆ.

Viscum.
617 album, Linn.

37. CAPRIFOLIACEÆ.

Adoxa.
618 Moschatellina, Linn.

Sambucus.
619 nigra, Linn.
620 Ebulus, Linn.

Viburnum.
621 Opulus, Linn.
622 Lantana, Linn.

Lonicera.
624 Periclymenum, Linn.

38. RUBIACEÆ.

Galium.
629 cruciatum, With.
630 verum, Linn.
631 erectum, Huds.
632 Mollugo, Linn.
var. elatum.
var. insubricum.
633 saxatile, Linn.
635 palustre, Linn.
639 Aparine, Linn.
640 tricorne, With.

Asperula.
641 odorata, Linn.
642 cynanchica, Linn.

Sherardia.
643 arvensis, Linn.

39. VALERIANACEÆ.

Centranthus.
644 ruber, DC.

Valeriana.
646 officinalis, Linn.
var. Mikanii.
var. sambucifolia.

Valerianella.
648 olitoria, Moench.
651 dentata, Koch.
var. mixta.

40. DIPSACEÆ.

Dipsacus.
652 sylvestris, Linn.
653 pilosus, Linn.

Scabiosa.
654 succisa, Linn.
655 columbaria, Linn.
656 arvensis, Linn.

41. COMPOSITÆ.

A. Cynarocephalœ.

Onopordum.
657 Acanthium, Linn.

Silybum.
658 Marianum, Gaert.

Carduus.
660 nutans, Linn.
661 crispus, Linn.
var. litigiosus.
662 lanceolatus, Linn.
664 palustris, Linn.
668 acaulis, Linn.
669 arvensis, Curt.
var. setosus.

Carlina.
671 vulgaris, Linn.

Arctium.
672 majus, Schkuhr.
673 minus, Schkuhr.
674 intermedium, Lange.

Serratula.
677 tinctoria, Linn.

Centaurea.
678 nigra, Linn.
679 Scabiosa, Linn.
680 Cyanus, Linn.

B. Corymbiferœ.

Chrysanthemum.
684 segetum, Linn.
685 Leucanthemum, Linn.

Matricaria.
686 Parthenium, Linn.
687 inodora, Linn.
688 Chamomilla, Linn.

Tanacetum.
689 vulgare, Linn.

Anthemis.
690 Cotula, Linn.
691 arvensis, Linn.
692 nobilis, Linn.

Achillea.
694 Millefolium, Linn.
695 Ptarmica, Linn.

Artemisia.
697 vulgaris, Linn.

Filago.
700 germanica, Linn.
702 spathulata, Presl.
703 minima, Fries.

Gnaphalium.
705 uliginosum, Linn.
707 sylvaticum, Linn.

Senecio.
712 vulgaris, Linn.
713 sylvaticus, Linn.
716 erucifolius, Linn.
717 Jacobæa, Linn.
718 aquaticus, Huds.

Bidens.
725 cernua, Linn.
726 tripartita, Linn.

Galinsoga.
727 parviflora, Cav.

Inula.
729 Conyza, DC.
732 dysenterica, Linn.

Bellis.
734 perennis, Linn.

Erigeron.
735 canadensis, Linn.
736 acris, Linn.

Solidago.
740 Virga-aurea, Linn.

Tussilago.
741 Farfara, Linn.

Petasites.
742 vulgaris, Desf.

Eupatorium.
743 cannabinum, Linn.

C. Liguliflorœ.

Cichorium.
744 Intybus, Linn.

Lapsana.
745 communis, Linn.

Hypochœris.
748 radicata, Linn.

Leontodon.
750 hirtus, Linn.
751 hispidus, Linn.
752 autumnalis, Linn.

Picris.
753 hieracioides, Linn.

Helminthia.
754 echioides, Gaert.

Tragopogon.
755 pratensis, Linn.
var. minor.
var. grandiflorus.
756 porrifolius Linn.

Taraxacum.
757 officinale, Wigg.
var. Dens-leonis.
var. erythrospermum.

Lactuca.
760 saligna, Linn.
761 muralis, Fresen.

Sonchus.
763 oleraceus, Linn.
764 asper, Hoffm.
765 arvensis, Linn.

Crepis.
768 taraxacifolia, Thuil.
769 setosa, Hall. fil.
770 virens, Linn.

Hieracium.
774 Pilosella, Linn.
795 Murorum, Linn, pt.
799 vulgatum, Fries.
802 tridentatum, Fries.
805 umbellatum, Linn.
808 boreale, Fries.

42. Campanulaceæ.

Jasione.
811 montana, Linn.

Phyteuma.
812 orbiculare, Linn.

Campanula.
814 glomerata, Linn.
815 Trachelium, Linn.
816 latifolia, Linn.
818 rotundifolia, Linn.

Specularia.
822 hybrida, A.DC.

43. Ericaceæ.

Vaccinium.
827 Myrtillus, Linn.

Erica.
836 Tetralix, Linn.
837 cinerea, Linn.

Calluna.
840 vulgaris, Salisb.

Monotropa.
846 Hypopitys, Linn.

44. Jasminaceæ.

Fraxinus.
847 excelsior, Linn.

Ligustrum.
848 vulgare, Linn.

45. Apocynaceæ.

Vinca.
849 major, Linn.
850 minor, Linn.

46. Gentianaceæ.

Erythræa.
853 Centaurium, Pers.
854 pulchella, Fries.

Chlora.
857 perfoliata, Linn.

Gentiana.
861 Amarella, Linn.

Menyanthes.
863 trifoliata, Linn.

Limnanthemum.
864 nymphæoides, Link.

47. POLEMONIACEÆ.

---

48. CONVOLVULACEÆ.

Convolvulus.
866 arvensis, Linn.
867 sepium, Linn.

Cuscuta.
870 europæa, Murr.
871 Epithymum, Murr.
872 Trifolii, Bab.

49. SOLANACEÆ.

Solanum.
873 Dulcamara, Linn.
874 nigrum, Linn.

Atropa.
875 Belladonna, Linn.

Hyoscyamus.
876 niger, Linn.

50. SCROPHULARIACEÆ.

Verbascum.
877 Thapsus, Linn.
879 Lychnitis, Linn.
880 nigrum, Linn.
881 virgatum, With.
882 Blattaria, Linn.
883 Hybrida.
4 Nigro-Lychnitis.

Scrophularia.
884 Balbisii, Hornem.
886 nodosa, Linn.

Digitalis.
889 purpurea, Linn.

Antirrhinum.
890 majus, Linn.
891 Orontium, Linn.

Linaria.
892 Cymbalaria, Mill.
893 Elatine, Mill.
894 spuria, Mill.
897 vulgaris, Mill.
898 minor, Desf.

Veronica.
902 hederifolia, Linn.
903 polita, Fries.
904 agrestis, Linn.
905 Buxbaumii, Ten.
908 arvensis, Linn.
909 serpyllifolia, Linn.
915 officinalis, Linn.
916 Chamædrys, Linn.
917 montana, Linn.
918 scutellata, Linn.
919 Anagallis, Linn.
920 Beccabunga, Linn.

Euphrasia.
921 officinalis, Linn.

Bartsia.
922 Odontites, Huds.
var. verna.
var. serotina.

Pedicularis.
925 palustris, Linn.
926 sylvatica, Linn.

Rhinanthus.
927 Crista-galli, Linn.

Melampryum.
930 pratense, Linn.

51. OROBANCHACEÆ.

Lathræa.
932 squamaria, Linn.

Orobanche.
935 major, Linn.
938 elatior, Sutton.
941 minor, Linn.

52. VERBENACEÆ.

Verbena.
942 officinalis, Linn.

53. LABIATÆ.

Lycopus.
943 europæus, Linn.

Mentha.
946 sylvestris, Linn.
var. nemorosa.
948 Piperita, Huds.
var. officinalis.
951 hirsuta, Linn.
var. subglabra.
953 rubra, Sm.
957 arvensis, Linn.
var. præcox.
958 Pulegium, Linn.

Thymus.
959 Serpyllum, Fries.
960 Chamædrys, Fries.

Origanum.
961 vulgare, Linn.

Calamintha.
962 Clinopodium, Spenn.
963 Acinos, Clairv.
965 menthifolia, Host.

Mellissa.
967 officinalis, Linn.

Nepeta.
968 Cataria, Linn.
969 Glechoma, Benth.

Salvia.
970 Verbenaca, Linn.

Prunella.
972 vulgaris, Linn.

Scutellaria.
973 galericulata, Linn.
974 minor, Linn.

Marrubium.
976 vulgare, Linn.

Ballota.
977 nigra, Linn.
var. fœtida.

Stachys.
978 Betonica, Bent.
980 palustris, Linn.
982 sylvatica, Linn.
983 arvensis, Linn.

Galeopsis.
984 Ladanum, Linn.
987 Tetrahit, Linn.

Lamium.
989 amplexicaule, Linn.
991 incisum, Willd.
992 purpureum, Linn.
var. decipiens.
993 maculatum, Linn.
994 album, Linn.
995 Galeobdolon, Crantz.

Ajuga.
996 reptans, Linn.
998 Chamæpitys, Schreb.

Teucrium.
999 Botrys, Linn.
1002 Scorodonia, Linn.

54. Boraginaceæ.

Echium.
1003 vulgare, Linn.

Lithospermum.
1009 officinale, Linn.
1010 arvense, Linn.

Myosotis.
1011 cæspitosa, Schultz.
1012 palustris, With.
1015 sylvatica, Ehrh.
1016 arvensis, Hoffm.
var. umbrosa.
1017 collina, Reich.
1018 versicolor, Reich.

Anchusa.
1019 arvensis, Bieb.

Symphytum.
1023 officinale, Linn.

Cynoglossum.
1025 officinale, Linn.

Asperugo.
1027 Procumbens, Linn.

55. Pinguiculaceæ.

---

56. Primulaceæ.

Primula.
1037 vulgaris, Huds.
var. caulescens.
1038 officinalis, Linn.

Lysimachia.
1045 vulgaris, Linn.
1047 Nummularia, Linn.
1048 nemorum, Linn.

Anagallis.
1049 arvensis, Linn.
1050 cærulea, Sm.
1051 tenella, Linn.

57. Plumbaginaceæ.

---

58. Plantaginaceæ.

Plantago.
1061 major, Linn.
1062 media, Linn.
1063 lanceolata, Linn.
var. Timbali.
1065 coronopus, Linn.

59. Illecebraceæ.
(Removed to Order 12*.)

---

61. Chenopodiaceæ.

Chenopodium.
1073 polyspermum, Linn.
var. spicatum.
var. cymosum.
1075 album, Linn.
var. candicans.
var. viride.
var. paganum.
1076 ficifolium, Sm.
1077 murale, Linn.
1079 urbicum, Linn.
var. intermedium.
1080 rubrum, Linn.
1083 B. Henricus, Linn.

Atriplex.
1085 angustifolia, Sm.
1086 erecta, Huds.
var. erecta (Bab Man.)
1087 deltoidea, Bab.
1088 Smithii, Syme.

62. Polygonaceæ.

Rumex.
1094 conglomeratus, Murr.
1095 nemorosus, Schrad.
var. viridis.
1097 palustris, Sm.
1098 pulcher, Linn.
1099 obtusifolius, Auct.
var. Friesii.
var. sylvestris.
1100 pratensis, M. & K.
1102 crispus, Linn.
1104 Hydrolapathum, Huds.
1107 Acetosa, Linn.
1108 Acetosella, Linn.

Polygonum.
1110 Fagopyrum, Linn.
1111 Convolvulus, Linn.
1113 aviculare, Linn.
var. agrestinum.
var. vulgatum.
var. arenastrum.
var. microspermum.
var. rurivagum.
1116 Hydropiper, Linn.
1118 mite, Schrank.
1119 Persicaria, Linn.
1120 lapathifolium, Linn.
1122 amphibium, Linn.

63. Elæagnaceæ.

———

64. Thymeleaceæ.

Daphne.
1127 Laureola, Linn.

65. Santalaceæ.

Thesium.
1128 humifusum, DC.

66. Asaraceæ.

———

67. Empetraceæ.

———

68. Euphorbiaceæ.

Buxus.
1132 sempervirens, Linn.

Euphorbia.
1134 Helioscopia, Linn.
1138 amygdaloides, Linn.
1143 Peplus, Linn.
1144 exigua, Linn.

Mercurialis.
1146 perennis, Linn.

69. Callitrichaceæ.

(See Order 28.*)

———

70. Ceratophyllaceæ.

Ceratophyllum.
1148 aquaticum, E. B. 3.
var. demersum.

71. Urticaceæ.

Parietaria.
1149 diffusa, Koch.

Urtica.
1150 dioica, Linn.
1152 urens, Linn.

Humulus.
1153 Lupulus, Linn.

Ulmus.
1154 suberosa, Ehrh.

72. Amentiferæ.

Quercus.
1156 Robur, Linn.
var. pedunculata.
var. sessiliflora.

Castanea.
1157 vulgaris, Linn.

Fagus.
1158 sylvatica, Linn.

Corylus.
1159 Avellana, Linn.

Carpinus.
1160 Betulus, Linn.

Alnus.
1161 glutinosa, Linn.

Betula.
1162 alba, Linn.

Salix.
1170 fragilis, Linn.
1172 alba, Linn.
1173 undulata, Ehrh.
1178 viminalis, Linn.
1183 cinerea, Linn.
var. aquatica.
var. oleifolia.
1184 aurita, Linn.
var. minor.
1185 caprea, Linn.
1190 repens. Linn.
var. genuina.

73. Coniferæ.

Pinus.
1199 sylvestris, Linn.

Juniperus.
1201 communis, Linn.

Taxus.
1203 baccata, Linn.

74. Typhaceæ.

Typha.
1204 latifolia, Linn.
1205 angustifolia, Linn.

Sparganium.
1206 ramosum, Huds.
1207 simplex, Huds.

75. Araceæ.

Acorus.
1210 Calamus, Linn.

Arum.
1211 maculatum, Linn.

76. Lemnaceæ.

Lemna.
1213 trisulca, Linn.
1214 minor, Linn.
1215 gibba, Linn.
1216 polyrhiza, Linn.

77. Naiadaceæ.

Potamogeton.
1218 natans, Linn.
1219 polygonifolius, Pour.
1230 perfoliatus, Linn.
1231 crispus, Linn.
1232 densus, Linn.
1237 pusillus, Linn.
1239 pectinatus, Linn.

Zannichellia.
1241 palustris, Linn.

78. Alismaceæ.

Triglochin.
1249 palustre, Linn.

Sagittaria.
1252 sagittifolia, Linn.

Alisma.
1253 Plantago, Linn.
var. lanceolatum.
1254 ranunculoides, Linn.

Actinocarpus.
1256 Damasonium, Hook.

Butomus.
1257 umbellatus, Linn.

79. Hydrocharidaceæ.

Hydrocharis.
1258 Morsus-ranæ, Linn.

Elodia.
1260 canadensis, Mich.

80. Orchidaceæ.

Aceras.
1261 anthropophora, Brown.

Orchis.
1263 pyramidalis, Linn.
1264 ustulata, Linn.
1268 Morio, Linn.
1269 mascula, Linn.
1273 maculata, Linn.

Gymnadenia.
1274 conopsea, Brown.

Habenaria.
1277 bifolia, Bab. Man.
1278 chlorantha, Bab.

Herminium.
1280 Monorchis, Brown.

Ophrys.
1281 apifera, Huds.
1283 muscifera, Huds.

Spiranthes.
1284 autumnalis, Rich.

Listera.
1289 ovata, Brown.

Neottia.
1290 Nidus-avis, Rich.

Epipactis.
1291 latifolia, Auct.
1293 violacea, D. Dug.

Cephalanthera.
1297 grandiflora, Bab.

81. IRIDACEÆ.

Iris.
1307 Pseudacorus, Linn.

82. AMARYLLIDACEÆ.

Narcissus.
1311 Pseudo-narcissus, Linn.

Galanthus.
1316 nivalis, Linn.

83. DIOSCOREACEÆ.

Tamus.
1317 communis, Linn.

83*. TRILLIACEÆ.

Paris.
1318 quadrifolia, Linn.

84. LILIACEÆ.

Convallaria.
1323 majalis, Linn.

Ruscus.
1325 aculeatus, Linn.

Lilium.
1326 Martagon, Linn.

Ornithogalum.
1331 nutans, Linn.
1332 umbellatum, Linn.

Scilla.
1336 nutans, Sm.

Allium.
1341 vineale, Linn.
var. bulbiferum.
var. compactum.
1342 oleraceum, Linn.

Narthecium.
1348 ossifragum, Huds.

85. ERIOCAULONACEÆ.

---

86. JUNCACEÆ.

Luzula.
1352 Forsteri, DC.
1353 pilosa, Willd.
1355 campestris, DC.
1356 multiflora, Koch.
var. congesta.

Juncus.
1365 conglomeratus, Linn.
1366 effusus, Linn.
1368 glaucus, Sibth.
1371 obtusiflorus, Ehrh.
1372 acutiflorus, Ehrh.
1373 lamprocarpus, Ehrh.
1374 supinus, Moench.
1377 bufonius, Linn.
1380 squarrosus, Linn.

87. CYPERACEÆ.

Blysmus.
1387 compressus, Panz.

Scirpus.
1389 acicularis, Linn.
1390 palustris, Linn.
1392 multicaulis, Sm.
1394 cæspitosus, Linn.
1396 fluitans, Linn.
1398 setaceus, Linn.
1400 lacustris, Linn.
1401 Tabernæmontani, Gmel.
1402 carinatus, Sm.
1403 triqueter, Linn.
1405 maritimus, Linn.

Eriophorum.
1409 angustifolium, Roth.

Carex.
1414 pulicaris, Linn.
1423 paniculata, Linn.
1424 vulpina, Linn.
1425 muricata, Linn.
var. pseudo-divulsa.
1426 divulsa, Good.
1427 stellulata, Good.
1428 remota, Linn.
1429 axillaris, Good.
1434 ovalis, Good.
var. bracteata.
1439 acuta, Linn.
1442 vulgaris, Fries.
1443 glauca, Scop.
1450 pilulifera, Linn.
1452 præcox, Jacq.
1455 panicea, Linn.
1459 pendula, Huds.
1462 sylvatica, Huds.
1464 binervis, Sm.

Carex.
1469 flava, Linn.
var. lepidocarpa.
1472 hirta, Linn.
1473 Pseudo-cyperus, Linn.
1474 paludosa, Good.
1475 riparia, Curtis.

88. GRAMINA.

Setaria.
1486 viridis, Beauv.

Anthoxanthum.
1488 odoratum, Linn.

Digraphis.
1489 arundinacea, Trin.

Phalaris.
1490 canariensis, Linn.

Alopecurus.
1491 agrestis, Linn.
1493 geniculatus, Linn.
1495 pratensis, Linn.

Phleum.
1498 pratense, Linn.

Agrostis.
1506 Spica-venti, Linn.
1509 canina, Linn.
1510 alba, Linn.
1511 vulgaris, With.

Phragmites.
1517 communis, Trin.

Milium.
1518 effusum, Linn.

Aira.
1520 cæspitosa, Linn.
1523 flexuosa, Linn.
1524 caryophyllea, Linn.
1525 præcox, Linn.

Avena.
1526 flavescens, Linn.
1527 pubescens, Linn.
1528 pratensis, Linn.
1530 fatua, Linn.
1531 elatior, Linn.
var. nodosum.

Holcus.
1532 mollis, Linn.
1533 lanatus, Linn.

Triodia.
1534 decumbens, Beauv.

Koeleria.
1535 cristata, Pers.

Molinia.
1536 cærulea, Moench.

Melica.
1538 uniflora, Retz.

Catabrosa.
1539 aquatica, Beauv.

Glyceria.
1540 fluitans, Brown.
1541 plicata, Fries.
1542 aquatica, Sm.

Sclerochloa.
1547 rigida, Link.

Poa.
1549 annua, Linn.
1556 nemoralis, Linn.
1557 compressa, Linn.
1558 pratensis, Linn.
1559 trivialis, Linn.

Briza.
1560 media, Linn.
1561 minor, Linn.

Cynosurus.
1562 cristatus, Linn.

Dactylis.
1564 glomerata, Linn.

Festuca.
1567 Pseudo-myurus, Soyer.
1568 sciuroides, Roth.
1569 ovina. Linn.
var. tenuifolia.
1570 rubra, Linn.
var. duriuscula.
1573 pratensis, Huds.

Bromus.
1574 giganteus, Linn.
1575 asper, Murr.
var. serotinus.
1576 erectus, Huds.
1579 sterilis, Linn.
1580 secalinus, Linn.
1582 commutatus, Schrad.
1583 mollis, Linn.

Brachypodium.
1385 sylvaticum, R. & S.
1586 pinnatum, Beauv.

Triticum.
1588 repens, Linn.

Lolium.
1592 perenne, Linn.
1593 italicum, Braun.
1594 temulentum, Linn.

Hordeum.
1598 pratense, Huds.
1599 murinum, Linn.

Nardus.
1601 stricta, Linn.

89. FILICES.

Pteris.
1606 aquilina, Linn.

Lomaria.
1608 spicant, Desv.

Asplenium.
1609 Ruta-muraria, Linn.

Athyrium.
1617 Filix-fœmina, Bernh.

Nephrodium.
1629 Filix-mas, Rich.
1634 dilatatum, Desv.

Polypodium.
1638 vulgare, Linn.

Ophioglossum.
1645 vulgatum, Linn.

90. LYCOPODIACEÆ.

Lycopodium.
1651 inundatum, Linn.

91. MARSILEACEÆ.

---

92. EQUISETACEÆ.

Equisetum.
1660 maximum, Lam.
1662 palustre, Linn.
1663 Limosum, Linn.

93. CHARACEÆ.

Chara. (Ex Bab. Man.)
1667 syncarpa, Thuil.
1668 translucens, Pers.
1676 fœtida, Braun.

4.—Notes and Remarks as to a few of the More Remarkable and Interesting of the Plants mentioned in the Botanical Sub-Committee's First Report.

[*Read, with the Report, December 18th, 1878.*]

42. *Common Columbine* (A. vulgaris). — This well-known garden species is tolerably common near Croydon, and is of peculiar interest, because Surrey is one of the very few English counties in which it is found in a truly wild state. When growing freely, and in full bloom, it forms a very beautiful object in many of our woods and copses.

163. *Common Sun Dew* (D. rotundifolia).—This exceedingly interesting plant is found in one place only near Croydon. Its singular carnivorous habits, and general history, have been most ably and minutely described by Mr. Darwin, in his late work on "Insectivorous Plants." Those who care to do so can easily procure plants for themselves, and observe their habits, with the aid of Mr. Darwin's book.

The family *Geraniaceæ* is very fairly represented, as we have seven out of the 12 British species of geraniums.

The family *Crassulaceæ*, which comprises the Stone Crops, is not well represented in the district. Out of its 14 species five only occur, and these, with the exception of the Biting Stone Crop (S. acre), only very sparingly. 520—The *Orpine Sedum* (S. telephium) has been found only in one place, on the side of a hill, by the edge of a wood, when the Thanet sand comes to the surface. This plant, like many others, has a curious superstition attached to it. Brande, in his "Popular Antiquities" says, that it is a habit with girls on Midsummer Eve to set up two plants of it, one for the girl, another for her lover, upon a slate or trencher, and if the lover's plant lives and turns to the girl's, it is held to be a proof that he will be faithful.

The *Saxifrages* are another badly represented family. Out of its 20 species only 2 occur. 543—The *Meadow Saxifrage* (S. granulata) occurs in great abundance in the meadows at and about Park Hill, and, 540—the *Rue-leaved Saxifrage* (S. tridactylites) is found on walls at and about Mitcham.

658. *Milk Thistle* (S. Marianum).—This handsome species, with glossy green leaves with milk-white veins, grew wild at Smitham Bottom before it was enclosed, but I doubt whether it is now to be found in the district, except here and there, as a stray plant escaped from a garden. It is interesting on account of its name, which it acquired in a very singular way. The Greeks had a myth, that Jupiter, to make his son, the

infant Hercules, immortal, put him to the breast of Juno while she was asleep, and that the milk which was spilt, as the child withdrew from her, formed the Milky Way in the heavens, and gave rise to the white lily upon earth, which, consequently, went by the name of Juno's Rose. This myth found its way naturally into the old herbals, and came in that way to be known generally in connection with the plant. The monks seem to have turned this myth to account, in the interest of their church, and to get rid of the old myth, which was Pagan, they substituted a new one, and hence arose the myth, that the veins of the leaves of this thistle were rendered white by the milk of the Virgin Mary, which fell upon it while she was nursing the infant Jesus. The plant in this way acquired the names of the Milk Thistle, the Holy Thistle, and Our Lady's Thistle. The transfer, to the Roman Catholic mythology, of a Pagan myth in connection with aflower is not uncommon; there are many similar instances.

744. *Chicory* (C. intybus).—This plant is found in many of our hedge banks, and edges of fields. It is best known as being extensively used to adulterate coffee; it has also some medical properties. The name is an English form of the Greek name, "kichora," which was derived from ancient Egypt.

875. *Deadly Nightshade* (A. belladonna).—This species, one of the family Solanaceæ, has been found in two places within four miles of Croydon, and at Coulsdon. In the Flora of Surrey it is also stated to occur near Chipstead, and along the entire range of the chalk hills. The medical and poisonous properties of the berries of this plant are well known, and a preparation made from them is also largely used as a cosmetic. There are but three other British members of the family, viz., the two Nightshades, which are both, to some extent, poisonous, and the Common Henbane, which is very poisonous. All these are to be found in the immediate neighbourhood of Croydon; the Henbane being cultivated at Mitcham for medical purposes. It is a very remarkable thing that a family which contains many poisonous plants as the Solanaceæ does, should also contain two such harmless and wholesome vegetables as the Potato and Tomato. The Tobacco, Petunia, Stramonium, Mandrake, Winter Cherry, and Cayenne Pepper, are also members of this family.

942. *Common vervain* (V. officinalis).—This plant is to be met with on many of our sunny banks and dry chalky pastures, and common-place and uninteresting as it is in appearance, there are few plants which have such a remarkable history. By the Druids it was venerated almost as much as the Mistletoe, and it was dedicated by them to the service of the altar and the decoration of their priesthood. In its honour one of their

great annual festivals, the Verbenalia, was named after it. In later times it was regarded as a powerful charm against witchcraft and sorcery, and as a cure for the plague and many other diseases. Volumes have been written as to its virtues. In Germany, and in many parts of France, it was gathered. with many unintelligible cabalistic ejaculations, during certain phases of the moon, and was believed to work miracles of a very surprising kind. In Greek and in Latin literature it is mentioned constantly as used, on various occasions, by priests, ambassadors, sorcerers, and heralds. The plant however, like a great many more, is a sad impostor. In itself it has no efficacy or medical value whatever.

999. *Cut-leaved Germander* (T. botrys).—The discovery in the neighbourhood of Croydon of this rare and peculiarly Surrey species was communicated to the club at the meeting on December 19th, 1877. This summer the plant has been very abundant in the field where it was first found in 1875. There has been, apparently, no crop except grass in the field this season, and the weeds have not therefore been cleaned off it. The plants have this year been more numerous, but smaller in size, than in 1875.

Of the family, *Plantaginaceæ* we have four out of the six known species, all of which are common. One of these, the *Common Ribwort Plaintain* (P. Lanceolata), is the plant which produces the long flower stalks which children are so fond of playing with, fighting them one against another. The origin of this game is, fortunately, recorded for us in one of the local names of the plant. In the northern counties the flower stalks of this species go by the name of "Kemps," a word believed to be derived from the Danish "kœmp," a warrior, and as the same game is still commonly played by children in Sweden, where flower stalks are called "kampar," there can be no reasonable doubt that it is of considerable antiquity, and was learnt from the Danes, being, in fact, a relic of their invasions, which were not uncommon before the Norman conquest.

Another very remarkable survival of an ancient word is found in the name of, 1185,--The *Common Sallow* (Salix Caprea). This plant belongs to a group in which the sexes are distinct, there being male trees and female trees. It is very common in our neighbourhood, and the male tree, which in spring has yellow flowers, which come out before the leaves, is commonly called a "Palm." The word Sallow is said to be the same as the Greek "elix," and the Latin "salix;" and a corresponding word is found in a considerable number of the languages in the Aryan group. In all of them it implies a shrub or tree which is fit for withes, from which are made hurdles or wattles. Now this word seems to take us back into the far past, to the early infancy of the human race, when our very remote ancestors dwelt, as a pastoral people, probably in Central Asia, and lived, rich and poor, in wattled huts, made of wicker work, which would naturally be named from the material of which they were composed. The old word which signified the withes with which the huts were made still survives, as we have seen, in a large number of languages, and retains its old meaning; but most remarkably the word is still used, also, to signify a house or hall, which is only a developed form and a modern representative of the huts of our ancestors. It is seen in the German word, "saal," a house, and in the French, "salle," a hall or room, from which comes our English word, "saloon," and the Greek, "aule," a court, hall, or dwelling, and the Latin, "aula," a court, hall, palace, or castle, may possibly have the same origin.

The family *Orchidaceæ*, which, from the singular shape and great beauty of the flowers of many of the species, is perhaps, the most generally interesting of all the natural orders, is very well represented in our district. Our chalk soil suits them well, and they are consequently abundant. Within four miles of Croydon are found 13 species, viz., the man orchis, pyramidal orchis, green-winged meadow orchis, early purple orchis, spotted orchis, fragrant orchis, lesser butterfly orchis, bee orchis, fly orchis, tway blade, bird's nest orchis, broad-leaved helleborine, and white helleborine, whilst in the district are five more species, viz., the dwarf dark-winged orchis, greater butterfly orchis, musk orchis, ladies' tresses, and the narrow-leaved helleborine.

1318. *Herb Paris* (P. quadrifolia).—This plant, the "herba paris" (that is herb of a pair, or betrothed couple) of the old herbals, is not common in Surrey. It seems to be rather plentiful near Reigate, Merstham and Gatton, but it is found only in one place, in one wood near Croydon. Its four leaves, set on the stalk like a true lover's knot, were held to be emblematical of an engagement, hence the name of the plant.

If time permitted, it would be easy enough to extend these few remarks and to call your attention to many matters of interest connected with other species which are included in the list. It may be confidently said that there is nothing about a plant which is not interesting. The structure of the various parts of plants, the functions which these parts perform, and their endless modifications to suit the requirements of each particular species, are all matters of deep interest; whilst on the other hand, the ideas and superstitions connected with plants, and even the names which they bear, when properly investigated, throw a good deal of light, not only upon our national history, and the manners and customs and family life of our more immediate ancestors, but even upon the early history of the human race.

5.—Copy of a Letter from Mr. George Corden to the "Croydon Advertiser" as to the Storm at Croydon on Sunday, June 23rd, 1878.

[*Read February 26th*, 1879.]

Sir,—As the thunder storm of Sunday last, June 23rd, was of such an extraordinary nature, and of such unprecedented violence in this town, I venture to give your readers a few of the results of my observations during its progress.

In the first place, it appeared to me to be a succession of storms, four in number, three of which broke immediately over this town, and the fourth raged furiously to the S.E. of this place from 3.45 to 4.30 p.m.

The clouds appeared to me to come up, in each of the three first instances, from the W.S.W., and pass over to the E.N.E., and in the case of the fourth to travel from N.E. to S.E. without passing over here.

The lower stratum of air, directly after the first storm commenced, changed suddenly from S.W. to N., then N.E., and at the period of the fourth storm to S.E., eventually passing to South later on.

The barometer scarcely indicated that any change was in progress; at 10 a.m. it stood at 30.16; just before the storm commenced it fell to 30.14; it again rose to 30.16 as the storm progressed, and fell again to 30.14 after it was over; it then fell to 30.13 by night, and the next day it gradually rose.

The temperature of the air in the shade (thermometer on a board with its back to a wall facing north,) was 81° at 12 o'clock a.m.; it then fell two or three degrees before the storm commenced, and at 4.45, after all was over, it had fallen to 65°, or a difference of 16°; it then rose to 68°, where it remained most part of the evening.

The first part of the storm raged from 1.30 to 2 p.m. during which time, though the lightning was more vivid and the claps of thunder more deafening perhaps than at any other time during the storm, the rainfall only amounted to 0.15 of an inch. A lull here occurred giving me an opportunity to empty the gauge.

At 2.5 the storm re-commenced, and at 2.20 a lull enabled me to measure again, this time 0·31 of an inch in 15 minutes.

At 2.20 hail stones commenced falling, and as I thought at the time, of an unusual size (½ an inch in diameter), and of peculiar shapes. I took the opportunity to roughly sketch the most striking forms, and there were some pear shaped, some bowl shaped, and some formed like stars. The rainfall for this part of the storm was measured at 2.35, and represented 0·41 of an inch in 15 minutes.

From 2.35 to 2.50 only 0·06 of an inch (rain and hail) was measured, and no rain fell from 2.50 to 3.5; but at 3.5 commenced the most extraordinary feature in the whole storm, in the shape of a fall of hail stones 1-inch in diameter; the noise they made in falling resembling the sound of workmen hammering on the roof.

These stones fell widely apart, I should say a foot, and very few, if any, entered the rain gauges, and as they bounced up two or three feet when they reached the ground they looked very much like dancing eggs. I sketched one of the most perfect of them, and it was somewhat of a white granular appearance, like frozen snow, and a small portion clear ice.

The fall of 1-inch hailstones soon gave place to a perfect deluge of smaller hail and rain. In a few minutes the roads were rushing rivers; the hilly streets became like mountain torrents, the beds of which were torn up and deposited on the level ground at the bottom, a notable instance being seen in Coombe-street, where the surface of the road was totally destroyed and converted into a series of deep trenches and hillocks of sand and stones.

At 3.45, or 40 minutes after this portion of the storm commenced, I emptied the gauge again, and found that there had fallen in that time 0·89 of an inch.

After this I only measured 0·02, which fell in the form of slight rain, while the fourth and last part of the storm exerted its fury in the S.E.

The total fall of rain in the $2\frac{1}{4}$ hours from 1.30 to 3.45 p.m. was 1·82 inches, and 0·02 from 3.45 to 4.45 made a total of 1·84.

$2\frac{1}{4}$ hours 1·82 inches	1.30 to 2.0 p.m.	= 0·15 in. ...	1st storm.
	2.5 „ 2.35 „	= 0·72 „ ...	2nd „
	2.35 „ 2.50 „	= 0·06 „ ...	„ „
	3.5 „ 3.45 „	= 0·89 „ ...	3rd „
	3.45 „ 4.45 „	= 0·02 „ ...	4th in S.E.
	Total ...	... 1·84 inches.	

The fall from 2.5 to 3.45 p.m., a space of 1 hour and 40 minutes, was 1·67 inches.

I find that at Waddon House (P. Crowley, Esq.), 2·15 was registered; at Tanfield Lodge, Southbridge (J. Weston, Esq.), 1·90; and at Addiscombe only 1·41, or a difference between Waddon and Addiscombe of 0·74 of an inch.

The tremendous force of such an enormous weight of water falling in so short a space of time will be best realised by comparing it with the heavy fall on the 10th and 11th of April last, when a great deal of flooding was caused by a fall of 1·95 inches in 19 hours. On this occasion we have had nearly as much in two hours and a quarter.

On the 30th of July, 1872, there fell 1·14 inches during a storm which lasted half-an-hour; on the 23rd of the same month 0·55 fell in 20 minutes, and on the 11th of the same month 0·46 in 20 minutes.

On the 24th of September, 1875, there fell in $1\frac{1}{2}$ hour during a thunderstorm 1·13 inches.

On the 25th and 26th of July, 1867, in 24 hours there fell 2·58 inches.

On the 11th and 12th July, 1868, in 24 hours there fell 2·03 inches.

On the 23rd of September, 1871, there fell in the night 1·55 inches.

During the whole of this remarkable storm the horizon to the south of Croydon appeared to be almost clear, and I understand that at Caterham Junction, two miles to the south, no rain fell.

At Camden Town, N.W. of London, full three inches of rain fell in the three hours.

I remain, sir, your obedient servant,

GEORGE CORDEN.

16, Wandle Road, Croydon,
June 25th, 1878.

At Nantwich House (Park Hill Rise) the fall was only 1·28, whilst that at the Filter Works at Brimstone Barn, to the west of the town, was 2·22 or a difference of nearly an inch.

6.—Ornithological Notes.

By the President, John Flower, M.A., F.Z.S.

[*Read March 19th, 1879.*]

Sterile Grey Hen (T. tetrix) partly in male plumage.—This bird, which has been preserved by Burton, of Wardour Street, I bought in Leadenhall Market, on September 21st last. It came up, with a number of other game birds, from Girvan, in Ayrshire. Sterile Grey Hens, in this sort of plumage, are not uncommon. Some of them are said to be old birds which have ceased to lay, whilst others appear to be young, but, whether old or young, this abnormal plumage seems to be always due to one cause, viz., a diseased state of the ovaries. It is a most remarkable thing that this cause should produce such a change in the plumage, but that it does do so, not only in this species, but in pheasants, and other allied birds, is now thoroughly well established. Sterility seems, further, to have had the effect, in this case, of considerably increasing the size of the bird. A very large Grey Hen will weigh about 2-lbs., but this bird, which was not in particularly good condition, weighed 2-lb. 4½-oz. The bones, too, which are on the table, are considerably larger than those of an ordinary Grey Hen, they are also somewhat softer in texture, and the processes are not so well developed. These peculiarities all seem to indicate that the defective constitutional condition which produced the sterility was developed at an early period, and before the bird was fully grown, and it seems probable, therefore, that this hen never was anything but sterile. Birds are not the only animals in which this singular phenomenon occurs, of the female assuming male characteristics. In the deer tribe, with the exception of the reindeer, the females have no horns. But a few cases are on record of the does of fallow deer, and, I believe, also of the hinds of red deer, developing horns, and these cases have also been proved to be due to a diseased state of the ovaries. Like all departures from the ordinary course of nature, these abnormal growths are of great interest physiologically. They show, what probably few people would suspect without some such proof, that many of what we are accustomed to regard as essential characteristics of the male and female sexes, are really, comparatively speaking, superficial, and that they are connected by the mysterious laws of correlation of growth, with the generative organs. If the testes of the young male be removed, many of the most prominent characteristics of the male sex are not developed, and, on the other hand, a diseased state of the ovaries of the female (which correspond physiologically with the testes) which is sufficient to produce sterility, will often cause the female, as in this case, to assume some of the characteristics of the male.

Cirl Bunting (E. cirlus L.)—I have here a nest and eggs of this species, which I found in a plantation at Woodcote, near Croydon, on July 15th last. The nest was about two feet from the ground, and was placed between the trunk of a small tree and the boughs of some ivy which was climbing up it. I have also a single egg which I took from a nest in a thorn bush in Gatton Park, on July 20th, 1873. There was another egg in this nest, which, unfortunately, was broken. All these eggs, notwithstanding the late date at which they were found, were fresh laid. The Cirl Bunting is not by any means a common bird. Like its near connection, the common Yellow Bunting, it is resident, but its breeding area is restricted and peculiar. It is said never to have bred in Kent, in any of the eastern counties, or in Wales. It is most abundant in the counties, other than Kent, which extend along our south coast; and it has also been known to breed in most of the counties which lie to the north of these, up to, and including Warwickshire. Surrey, for some reason or other, seems to be rather a favourite county with this species.

Stock Dove (Columba œnas).—There can, I think, be no doubt, that this species has of late years increased in numbers in our county. Like the closely-allied species, the common Ring Dove, or Wood Pigeon (C. palumbus), the Stock Dove not unfrequently selects for its breeding place a tree which is quite close to human habitations, whereas, at any other season of the year both species are very shy, and difficult to approach. A pair of Stock Doves have bred regularly for many years in the yew tree which stands close to the front door at Pendell Court, near Bletchingley, and last year I was greatly interested in watching a pair of these birds, which nested so close to our town as the grounds attached to Park Hill House. They first appeared in the middle of March, 1877, and took possession of a hollow and decayed bough of an elm tree not thirty yards from the house. They remained about the place for some days, and no doubt would have bred there, but they were eventually driven away by a pair of Jackdaws, which took possession of the hole, and reared a brood in it. In the middle of February, 1878, both the Doves and the Jackdaws reappeared, but I shot one of the Jackdaws, and the Doves were then left in possession of the hole. They reared two broods in it: On May 19th I found one of the old birds sitting on two eggs, and on July 21st I found two young birds, about half grown, in the nest. This year, I am glad to say, they have returned, and no doubt they will breed again in the same hollow bough. The two nests above mentioned were unusually late, as the Stock Dove is an early breeder. I have a pair of the eggs of this species here this evening, which I took from a fine old yew tree in Challock churchyard, near Ashford, Kent, on April 17th, 1876, and these had been incubated for some days when I took them. I found another, much smaller egg, and what appeared to be the remains of an abandoned nest, lower down in the same bough. I have reason to believe that the above is not the only instance of the breeding of this species near Croydon. For some years a pair has frequented some large elm trees still nearer to the town, and I have no doubt have bred in one of them, though I have never actually seen the nest. I have seen them constantly for the last three weeks on the same bough of the same tree. When once they have selected a breeding place they seem to remain as firmly attached to it as our tame pigeons do to their dovecot. Though it may be seen occasionally, the stock dove is anything but a common bird in our neighbourhood, probably because we have not any large number of the old and hollow trees which these birds require, and in which they breed. In parts of Norfolk and Suffolk, where there are few trees, Stock Doves breed in considerable numbers in the warrens, in deserted rabbit holes, and even on the ground, in the rabbit runs, under thick furze bushes. The breeding range of this species is peculiar, and is very much more restricted than that of the common Wood Pigeon. This common species is abundant in all parts of the British islands, and at all seasons of the year. The Stock Dove, on the other hand, has been known, on one occasion, to breed as far north as Northumberland, but in the British islands it very rarely breeds beyond lat. 54, or further west than long. 3 W. It has never occurred in Ireland, nor, with one doubtful exception, in Scotland. It is most abundant in some of the midland and eastern counties, and it occurs but sparingly in most of our southern counties, including Surrey.

Foot of Cock Pheasant (Ph. colchicus L.) with an extra toe. —This, which is the right foot of a bird which was shot near Edenbridge, in Kent, by Mr. A. Eastty, one of our members, is like the foot of an ordinary pheasant from the tarsal joint downwards. But above the tarsal joint, and growing, apparently, from the inner side of the tibia, is an additional toe, growing in an upward direction. This seems to spring from the tibia, about an inch and a-half above the tarsal joint, and the scaly skin of the tarsus is continued up to it. Without taking the leg to pieces, or at least soaking and softening the parts, it is impossible to say, confidently, how this departure from the ordinary form is to be explained. It will probably turn out that this is a somewhat parallel case to the extra toe which we see in Dorking fowls, though why the toe has grown as it has, instead of in its proper place, below the tarsal joint, is difficult to explain.

7.—Notes on a Collection of Nests of British Birds, which have been selected by the common Cuckoo (Cuculus Canorus) for the Deposit of its Eggs.

Exhibited by Philip Crowley, Esq.

[*Read April 16th*, 1879.]

This remarkable and interesting collection was exhibited at our last meeting, but as Mr. Crowley did not announce beforehand that he intended to exhibit it, it was not done full justice to. At my suggestion, he has brought the collection again for inspection by the members of the Club, and as in the interval which has elapsed since the last meeting, Mr. Crowley has very kindly given me the opportunity of more carefully examining the nests and the eggs, I am enabled to lay before you the following particulars as to them.

The collection is made up of 47 nests, belonging to 15 different species, viz.:—

Red Backed Shrike (Lanius collurio)	1
Spotted Flycatcher (Musicapa grisola)	1
Hedge Sparrow (Accentor modularis)	2
Redbreast (Erithacus rubecula)	6
Reed Warbler (Acrocephalus streperus)	1
Dartford Warbler (Melizophilus undatus)	2
Blackcap (Sylvia atricapilla)	1
Pied Wagtail (Motacilla lugubris)	3
Yellow Wagtail (M. raii)	1
Tree Pipit (Anthus trivialis)	9
Meadow Pipit (A. pratensis)	11
Skylark (Alauda arvensis)	1
Yellow Bunting (Emberiza citrinella)	2
Greenfinch (Ligurinus chloris)	3
Linnet (Linaria cannabina)	3
Total	47

In addition to these, Mr. Crowley has also brought several Cuckoo's eggs, which are not with the nests in which they were found. The 47 nests above mentioned all contain eggs of the Cuckoo, except in one instance, one of the nests of the tree pipit, which contains a young bird. This last mentioned nest is the only one which was found by Mr. Crowley himself. All the others were procured by various persons whom he employed to collect eggs for him, and who resided chiefly in the neighbourhood of Frensham, which is in the extreme western part of the county of Surrey; but the names of the persons who sent the various nests, and the dates when they were sent, have been recorded. It would no doubt have been more satisfactory, in some respects, if we could have had here this evening the persons who actually found these nests, but these persons had nothing to gain by deceiving Mr. Crowley, and there seems no reason at all to doubt that the nests were found, with the eggs of the Cuckoo in them, as they were stated to have been.

As regards the breeding habits of the Common Cuckoo, the bird is entirely parasite. It never, under any circumstances, builds a nest for itself, but deposits its egg in the nest of some other bird, generally of a Wagtail, Hedge Sparrow, or Pipit, and leaves that bird to hatch the egg and bring up the young cuckoo. The propensity of this little monster to eject from the nest all the eggs and the other young birds which the nest may contain, and thus to secure for itself the undivided attention of its foster parents is well known.

The nests which the cuckoo has been known to select for the deposit of its eggs are of a very varied character. Mr. H. E. Dresser, in Nos. 69 and 70 of his well known work "A History ot the birds of Europe" (which number was issued as recently as August, 1878) has an exhaustive article on the Cuckoo, and in it he gives a list of all the species of birds to which the female cuckoo has been known to entrust her eggs. These are 92 in number, and all of them, except four, belong to the order Passeres, or perching birds. The four exceptions are a species of Turtle Dove, the common Wood Pigeon, the Stock Dove, and last, not the least remarkable, the Little Grebe. Mr. Dresser's list also comprises, amongst others, the Magpie and the Jay.

Mr. Crowley's collection of nests all belong to birds of the Passerine order, but some of them are of great interest. His two nests of the Dartford Warbler are the only nests of this rare species, in which the Cuckoo's egg has been found. With the exception of Middlesex, the Dartford warbler does not breed, except as a rare straggler, in any county north of the Thames. Its great stronghold is that large series of commons which lie in the extreme west of Surrey, and the extreme east of Hampshire, and it is just from that district that Mr. Crowley has received nearly all the nests which he has exhibited this evening. He has received from there, from time to time, no less than 84 nests of the Dartford Warbler; the two which contain the Cuckoos' eggs was sent to him by a man named Smithers, who lived at Churt; one was sent in the summer of 1860, and the other in the summer of 1869. The three Greenfinches' nests again, are the only instances on record of the Cuckoo having used the nest of this species in the British Isles. These were also found and sent by Smithers, one in 1862, another in 1864, and the third in 1865. It appears also from Mr. Dressers' list that there is only one other recorded instance of the use by the cuckoo of the nest of the Blackcap, Yellow Wagtail, or Linnet; all these nests were found by Smithers, the Blackcap's in 1860, the Yellow Wagtails' in 1860, and the Linnets' in 1863, 1866, and 1869. The nest of the Yellow Bunting is one which is very rarely used by the Cuckoo, the two nests of this species which are in Mr. Crowley's collection, were both found by Smithers in the summer of 1864.

As will be seen from the specimens here this evening, the eggs of the Cuckoo differ very much in color, and in the number and character of their markings, as well as in size. As far as is known, however, it would appear that all the eggs laid by any particular female are alike. Some females have even been known to lay blue eggs. It will be seen, too, that the eggs of the species of birds to which the cuckoo entrusts its eggs also differ very widely. Strange as it may appear, it has been proved, in many instances, that the egg of the Cuckoo bears a remarkable general resemblance to the eggs of the bird in whose nest it is placed; and it would appear from this, that the Cuckoo does not deposit its egg at random in the first nest that comes, but that, as a rule, each female selects a nest the eggs in which resemble its own. Some very remarkable instances are on record of this resemblance, the best of which perhaps is in the case of the Redstart (R. phœnicurus). The eggs of this species are blue, and in several instances, blue Cuckoo's eggs have been found in the nest of the redstart. How far this resemblance goes is a matter of controversy. Some authors maintain that it is the rule for the eggs of the Cuckoo to resemble the eggs of the bird to which it is entrusted, whilst others maintain that this is exceptional. This difference of opinion may, perhaps, to some extent, be due to the fact that the authors would not, in all probability, agree as to what constitutes a resemblance. The object of this assimilation in color must be to render the egg of the cuckoo less easily recognized as a substituted one by the foster parents, and for this and other reasons it would seem probable that it is the rule for the eggs to agree in colour, and not the exception. Certainly this collection seems to favour this view, for, of the 46 nests, in twenty-nine cases the eggs agree fairly well in colour and markings, and in seventeen cases they differ. The seventeen exceptions are Red Backed Shrike, one; Hedge Sparrow, two; Redbreast, three; Dartford Warbler, two; Tree Pipit, one; Meadow Pipit, two; Yellow Bunting, one; Greenfinch, two; and Linnet, three.

In one or two instances the resemblance between the two eggs is very striking, as, for instance, in the nest of the Yellow

Wagtail; but, on the other hand, and as if to caution us against forming a hasty judgment, there is a Cuckoo's egg very similar to that in the Yellow Wagtail's nest, in the nest of one of the Dartford Warblers, whose eggs it does not at all resemble. These two cuckoos' eggs are quite unlike any of the others in the collection, but, as they bear a strong family resemblance to each other, and were found in the same district, and in the same month, (May, 1860) they were, in all probability, laid by the same bird.

There is a similar and very remarkable family likeness between the Cuckoos' eggs in two of the Robins' nests, and i the Flycatchers' nest, and one of the separate eggs. These four eggs all came from the neighbourhood of Frensham in May, 1860, and no doubt were laid by the same bird.

In one of the Wagtail's nests is a Cuckoo's egg which is marked something like the egg of a Yellow Bunting.

The peculiarity in the size of the egg of the Cuckoo is well seen in this collection. It is in almost every case rather larger than the eggs of the species in whose nest it is placed, but it is, nevertheless, very small for the size of the Cuckoo. This, no doubt, is due to the very small ovaries of the bird. The Cuckoo is rather a large bird, rather larger than a Missel Thrush, but its ovaries are only as large as those of the Common Brown Wren, and its eggs are not larger than those of the Common House Sparrow. The object of this peculiarity in the size of the eggs of the Cuckoo can of course only be to assimilate them to the eggs of the birds in whose nests they are laid.

It is now well established that the Cuckoo does not always lay its egg in the nest which it selects in the ordinary way, but that it often lays its egg on the ground, and then deposits it in the nest with its beak. Judging from the places which are usually selected by the species whose nests are before us, and the character of their nests, there can, I think, be little doubt that, in some of them, the Cuckoo's egg was placed with the beak, as above described, but as we have no particulars as to how and where these nests were placed, it is, of course, not possible to say, with certainty, in what way the cuckoo's eggs were deposited in them.

8.—On a Peculiarity, hitherto undescribed, in the Breast-Bone of the Gannet (Sula bassana).

By the President, John Flower, M.A., F.Z.S.

[*Read April 16th*, 1879.]

When at Stornaway, in the Outer Hebrides, in August, 1876, I had an opportunity, for the first time, of seeing Gannets fishing, and a very remarkable and astonishing performance it seemed to me to be. This bird flies over the sea at a considerable distance from the water and as soon as it discovers a fish it turns in the air, sometimes first mounting a short distance higher, and then giving one or two powerful strokes with its wings, it flies straight downwards, closes its wings, and drops into the water like a stone, and with great velocity. It seems very rarely to miss its aim, for it almost invariably reappears in about 15 seconds with the fish in its mouth. The height from which the plunge is taken is said to vary according to the depth at which the fish happens to be in the water, the deeper the fish the greater being the height to which the bird ascends before turning to commence its plunge, the object of the increased height being, of course, to take the bird deeper into the water. The whole proceeding is a very striking one, as the Gannet is a large and heavy bird. The length of a full-grown one is about 3-ft. 2-in., and its weight is about 7-lbs., and yet it enters the water with hardly any splash. Whilst watching the Gannets at Stornaway it struck me that there must be some very remarkable provision in their structure to enable them to take these tremendous plunges with impunity especially in rough weather. In the following December the body of a Gannet was sent to me, and it was while dissecting that that I first became aware of the curious and beautiful arrangement which I am about to describe to you, but I was not aware till a few months ago that this arrangement has never yet been described; it seems, strangely enough, to have been entirely overlooked. During the plunge the neck of the bird is stretched straight out from the body. The long, strong, and wedge-shaped beak first enters the water, and makes a hole through which passes the head and neck, and, as the neck gradually increases in thickness as it approaches the body, and finally passes into the body much in the same way as the neck of a hock bottle passes into the body of the bottle, it is obvious that there would be nothing to offer any great amount of resistance to the water if it were not for the wings of the bird. These are necessarily large to sustain so heavy a bird, and they measure over six feet from tip to tip. When folded they project somewhat from the sides, and during the plunge they are forced by the pressure of the water tightly against the body, and backwards towards the tail. Nearly the whole of the strain which is thus caused, and which must often be very considerable, especially when the Gannet is fishing in rough weather, is necessarily thrown upon the shoulder joint, and but for the arrangement next to be described it would probably often be sufficient to disable the bird. From the front part of the body of the sternum is developed a very large and powerful wedge of bone, and on the sides of this wedge the coracoids are articulated, not, as in nearly all other birds, at right angles, or nearly at right angles with the axis of the sternum, but in a direction nearly parallel with the axis. When, therefore, the strain begins to be felt at the shoulder joint the coracoids slide slowly backwards down the sides of the wedge of bone and ease the strain. This allows the wings to perform a similar movement along the sides of the body, the front part of which forms a flattened cone, round the sides of which the wings are wrapped. By this exceedingly simple and yet beautiful mechanical contrivance of a wedge within a cone the pressure of the water is gradually eased off and reduced to nothing, and this without any undue or dangerous strain being placed upon a single muscle or ligament. The very strong clavicles and the thick coating of feathers which lies between the wing and the body must both play an important part in easing off the effect of the blow caused by the bird striking the water. The clavicles, being fused to the end of the ridge of the sternum, would act as a spring, much in the same way as the top joint of a salmon rod, whilst the feathers would act as padding and help to prevent any jar. The breastbone of the Gannet which I have here is the one which I took out of the Gannet which I dissected in December, 1876. I gave this to Dr. Rolleston for the University Museum at Oxford, and he has very kindly lent it to me for exhibition this evening.

9.—Notes as to the Flow of Sap from the Cut Branch of a Birch Tree (B. alba).

By Philip Crowley.

[*Read April 16th*, 1879.]

At 7 a.m. on the morning of Saturday, March 29th last, a small branch about one inch in diameter was cut off a birch tree in my garden by my gardener. The tree from which it was cut was about six inches in diameter at a height of five feet from the ground. About 9.30 I noticed that the tree was bleeding freely from the cut branch, and in the afternoon I showed the tree to our President, Mr. Flower. At 10.40 a.m. on March 30th I placed a vessel to catch the sap that dripped from the bough. Between 10.40 a.m. and 1.40 p.m. 10 ozs. had flowed into the vessel, and by 9.40 p.m. $16\frac{1}{2}$ ozs. more. I recorded daily the quantity of sap which flowed from the tree up to the morning of April 6th, when the flow was much lessened, and rain prevented my measuring it correctly. Even now, more than 18 days after the branch was cut off, there is some drip from it, but not much. The following is my record of the quantity of sap :—

March 30	...	10.40 a.m. to 9.40 p.m.	...	$26\frac{1}{2}$ ozs.
" 31	...	" 6. 0 p.m.	...	$53\frac{1}{2}$ "
April 1	...	" 6. 0 p.m.	...	56 "
" 2	...	" 6. 0 p.m.	...	58 "
" 3	...	" 6. 0 p.m.	...	55 "
" 4	...	" 6. 0 p.m.	...	48 "
" 5	...	" 6. 0 p.m.	...	45 "
" 6	...	" 10. 0 a.m.	...	31 "
Add from the period from 7 a.m. on March 29th, when the bough was cut, to 10.40 a.m. on March 30th, when I first began to measure the sap ...		...	...	60 "
Total ...		...	...	433 "

—Taking 20 ozs. to a pint, this would be equal to 21 $\frac{13}{20}$ pints, or from $2\frac{1}{2}$ to 3 pints every 24 hours. On April 7th, in three hours of fine weather, the flow of sap was 4 ozs. On April 8th and 9th it was only about 15 ozs. in the 24 hours.

10.—Diatomaceæ.

By William Ingrams.

[*Read May 21st*, 1879.]

Patience, I have heard more than once, is a virtue which few women are possessed of and no men. Whether this be so or not is a matter that can be settled by each individual for himself. The subject for this evening is one that requires great patience, and I could not write a paper on it without much consideration as to the method of treating it. It is a subject that has engaged the attention of the finest minds; volumes have been written on it; and from these volumes, in which the subject is discussed in a most able manner, one might have put together a paper which would have been thought a tolerably fair exposition of the subject. Such a course, however, would, I am satisfied, have caused disappointment to some; and hereafter, perhaps, expressions manifesting the absence of the great virtue from others.

Gentlemen, be good enough to read the books in which the subject is discussed. You can do this at your leisure. In the short time I have at my disposal, I prefer rather for the sake of the younger members of the Club, to give you such a paper as will, I trust, result in an enthusiastic and persevering course of systematic study of—not books merely, but of the great book which an omniscient Creator has left open for the perusal of all who have eyes to see.

Some years since my attention was arrested by the marvellous beauty of some of the diatomaceous forms. This was followed by a desire to know something of the nature of such remarkable organisms, and, if possible, to have slides of my own which would serve to indicate the part which such exceedingly minute forms played in the great cosmical laboratory. My first efforts were presumptuous. I began with guano. Some slides were mounted containing many varieties; others—specimens picked out according to books with a bristle from the shaving brush. All were beautiful; but I was sometimes not a little mortified that I could not, to my own satisfaction, in answer to the oft-repeated question, "What are they?" say more than, "Well, some say they are the solid parts of very small plants, and others the solid parts of very small animals. They were obtained from guano. Guano is the excrement of sea birds, deposited on the mountains of the western coast of America." As a rule, these answers were satisfactory to all but myself. One had read of the philosophical reasonings of Owen on other skeletons, but these diatomaceous skeletons—what of them, their envelopes, their contained parts? How could one supply them so as to be able to form an adequate conception of the perfect forms? The guano supplied, and will supply all who will take the trouble to clean them, large numbers of beautiful forms; and also a great quantity of silica. Where did that come from? I had seen some certainly in the gizzards of birds, where it formed a good substitute for teeth, but of what earthly use could be such flinty particles as were contained in my residuum of guano, after washing in water for weeks, and boiling in hydrochloric and nitric acids? What could they have to do with crushing the food of sea birds? Hundreds of them, thousands, could have passed at one time through the eye of a needle, and millions had to be elutriated before one could get the coveted prize—a good slide of the smaller diatoms.

These forms were, of course, all marine; and as a systematic study of them, before passing through the intestines of the sea bird, was out of the question, one was naturally led to investigate the nature of the diatoms of our own waters. In these you can find all that is necessary to enable you to form an adequate conception of these deeply interesting and remarkable organisms; and of the part they take in the system which keeps the earth as it is—a beautiful whole. I do not say there are no difficulties. There are many great ones; and so there are in everything that is worth doing, but I do say that, in our local waters, we have great facilities for successfully prosecuting our study of the diatom, its habitat, nature, development, mode of increase, and preservation.

First, as to its habitat. It is found in all rivers, ponds, pools, and ditches, and sometimes manifests its presence in a manner not altogether agreeable to the nasal organs. This, however, is owing not to anything offensive in itself, but to the negligence or the want of forethought in man. Diatoms, for the most part young ones, together with rising generations of plants of a confervoid character, may be nowhere seen to such advantage as on the Waddon mill pond. At certain seasons the surface of the pond is clear; at others, a thin whitish film, showing the direction of the current towards the mill, and another film, from the mill to the outlet to the backwater, may be seen forming a curve from one side of the pond to the other. The gentle current carries it slowly and surely to a bridge contrived to stop circulation. Here it is stopped, and other portions of the film, which sometimes covers half the surface of the pond, are brought in succession to the same spot; and, finding no mode of exit at the time, form by pressure a corrugated mass assuming many colours, and evolving the odour peculiar to obstructions. Such films may also occasionally be seen in all ditches with a gentle current, where a temporary obstruction impedes circulation ; on water-cress beds, and even on water with a rapid current when water weeds rise to the surface.

The nature of such films can, of course, only be seen by the aid of the microscope. They are so delicate, so gossamer-like, that they cannot be handled without altogether altering the form. The substance breaks up easily, and this no doubt was the origin of the term diatoms, which in times past were called brittleworts or brittleweeds. The film may be collected in a bottle in the usual way, but sometimes one will be observed when the necessary apparatus is at home. The best plan then is to walk in, if the water be not too deep, carry it home on the end of the stick or umbrella, and allow a very small quantity of water to wash it from the stick into a small glass. It will in a short time be found on the surface ready for examination, and will be found to consist of diatoms of various sizes, confervæ and infusoria, the last revelling in the rich banquet which nature has provided them. I have mounted roughly a slide or two at numbers 1 and 2. They are not very beautiful, but they are very interesting. You will find, growing together, young diatoms and confervæ—the diatoms, in many cases, attached to a confer.

Passing now from what presents itself on the surface and from what is sometimes unpleasant — from surface growth to undergrowth—you cannot fail to observe two things, the extraordinary beauty of the subaqueous scenery, and the apparently repulsive appearance which a portion of it presents when removed from the water. This beautiful miniature scenery is, in a great measure, due to the presence of the diatom. I may indeed venture to say that, but for the diatom, much that excites admiration would disappear, and nothing be left but bare stone. Remove any of these undergrowths—the velvety cushion from the stone, or the long lines of freely flowing "silkweed of the country" from the water, how different they appear! Many a person has turned from them in disgust, but this must not be the case with the student. He must take them home, put them into a glass, add water, stir them, allow the heavier particles to subside, take a small quantity with a tube, place it on a slide, and then he will find that he has robbed the water of some of its treasures. In some of these experiments some diatoms will be found quite free ; others united end to end, so as to form a filament ; while others will be seen firmly attached to confervæ. Specimens of various kinds may be seen at 3, 4, 5, in their natural state. At 6, 7, 8, you have the part coveted by the microscopist, after all have been cleaned and mounted in the usual way. I have dealt somewhat at length on this part of the subject. One would have liked to have said a little more, but, perhaps, enough has been said to help our younger members to find the diatom.

The nature of the diatom and a few particulars respecting it will be the next division of our subject. It has at different times, as observers have discovered or have fancied they have discovered, certain peculiarities, been frequently handed over, at one time to the animal, at another to the vegetable kingdom. It is scarcely worth while to go over the same ground again now. What remains to be said appears to be conclusive evidence that its proper place is the vegetable kingdom. One point, a most important one, is that sunlight causes it to evolve oxygen, which may be seen in bubbles like so many pins' heads on a velvet cushion, and these may help you in your search for some of the more beautiful forms. The free forms have powers of motion which render it difficult to believe that they are not animals, but all are due to vital processes and the nature of the element in which they live. Some of these motions may be seen at 9. The varieties are numerous, varying in size from the seventieth to about the twelve hundredth part of an inch. Many, of these dimensions, may be seen on nearly all the slides.

In its natural state, fixed or free, the diatom consists of two parts—the solid and the liquid—the cell—for such it is—and the cell contents. The contents are two, one coloured called endochrome; the other, colourless. The latter is sometimes called the protoplasm, and by slightly touching the end of one of the larger forms with a fine-pointed needle, it is possible to discharge both. The colouring particles will diffuse themselves over a considerable space under the microscope, and form minute raised granules which infusoria tell me are very nice, and the protoplasm will form a globule having much the same consistence as oil.

It is very difficult to find out what becomes of these contents. When confined in the cell, they assume different forms at different seasons, but in what must be called the final stage the free forms, laden with their precious freight of granules and globules, move hither and thither as if in quest of a spot suitable for their deposition. Unfortunately for the microscopist, in diatomaceous gatherings, too many of these are to be found on the surface of the drop under examination. They suit the diatoms nevertheless, and many may be observed relieved of their granular contents. Many an hour's patient watching, at different times, will not, perhaps, be rewarded by a glimpse of what takes places; but by great good fortune, I have seen this phenomenon more than once, and it led to a further examination of some fine scum—not Waddon scum, there is too much there for the purpose, but scum from undergrowths placed in glasses of water—and it also led to the discovery of two kinds of cells. These were carefully tended and watched; and, in a short time, two other bodies appeared in considerable numbers, one kind having the appearance of spores, beautifully bright, with a faint tinge of green; the other, by far the most numerous, rapidly moving animalcule-like creatures, colourless, and so exceedingly minute that with a $\frac{1}{4}$-power and number 2 eyepiece, nothing could be made of them. They swarmed in large numbers round the cells and ultimately disappeared. The whole phenomenon was analogous to what takes place in the germ frond of the fern. The germ frond of a fern is produced by a spore, and the what I take to be spores or zööspores in question, in a very short time settled down, and formed around them in a plane, a coherent, nearly transparent mucous frond, in which could be seen the new forms like in all respects their parents, the diatoms.

Now, as regards these cells. Are they both produced from the same granular particle as in the fern, or does the fertiliser reside in a different looking plant as in some other vegetable forms? Permit me to call your attention to a matter of singular interest. I said that the diatom might be found on all water plants. There is an exception, and a most remarkable one it is. I don't remember to have seen a single gathering that did not contain specimens of some members of the Oscillatoriaceœ, and not one of them has had a diatom. These consist of tubular filaments which have movements analogous to those of the diatom. They are always associated with the diatom, and without the diatom appear to be very busy in the manufacture of flint. With the diatom, although some nodules are produced, the plants flourish; without it, they become weaker and weaker. I commend this part of the subject to your consideration; one pair of eyes is hardly sufficient for it.

The silicious covering of the cell, however, is the chief object of interest to microscopists. Nothing is more beautiful. I shall say nothing whatever as to its perfection of form or the beauty of its striae and dots. You will find these all fully described in such excellent works as Carpenter's, Smith's, and others; but it is necessary to dwell for a few moments on its structure. It is composed of silica secreted from the water. The contents of this box forty years ago were in the chalk hills. Water percolated from the chalk through an artificial obstruction, where evaporation was going on to a great extent, and the obstruction became enamelled with what we have here,—flint deposited from the water. This stone, found in the neighbourhood, in our underground circulation contains many pebbles, and also, owing to an obstruction, a great quantity of the same material which has cemented into a consolidated matrix the whole of what were centuries since free pebbles. This will be quite sufficient to show that water which has percolated through the earth contains silex in solution. The water issues from springs perfectly clear and pure, and from it the diatom secretes what is held in invisible solution—the silex which forms the epiderm of the cell. The silex secreted consists of two parts called valves, separated by a line. The valves at times separate, and what appears to be a line becomes a band or hoop, wider and wider, till at length it is, in some cases, cast off, leaving two separate individual cells. This process is called *binary sub-division*. It is not peculiar to the diatom, but exists also in confervoid and other growths. This may be called a system by which the species is increased by *gemmination* in contradistinction to that above described by germination.

There is yet another peculiarity by which the species is distinguished. Two individual cells in contact open, and the whole contents of each flow out, become amalgamated, and form a cell twice the size of the parent cells. This process is called *conjugation*. It is very remarkable, and if it were the ordinary mode of increase would lead to the production of a giant race. Time would fail to go into this part of the subject. It is fascinating certainly, but it does not account for the presence of the infant diatoms.

One word more as to the provision for the preservation of the species. At certain seasons, none better than April and May, the microscopist will be watching with curious eyes the movements in his drop of water of the naviculoid forms and their cargoes, and it may be also the vibrations of *Gomphonema* or *Synedra splendens*, and will be much disappointed when, just as he is about, he thinks, to see what he has so long watched for take place, the discharge of endochromous granular particles, to find his drop of water has evaporated. He should, just before this takes place, when what little water remains is drawn by attraction to the diatoms and surrounds them, so that he cannot see them distinctly, do one of two things, and each with a different object in view. He should, if he would see his pets a little longer, with a delicate touch, allow a small drop of water to issue from a very fine-pointed dipping tube to the circular space occupied by the first drop ; or notice, with thrilling interest, the provision made for the preservation of the species. Slowly but surely, the anxiously-expected, long-looked-for granules and bubbles of protoplasm will retreat, if the species be straight and tubular, as in *Synedra splendens*, and attached to a kind of cushion, as it very frequently is—not to the highest point by the cushion, but to the lowest, the part in contact with the slide, which is for the time the bed of its pond or ditch, leaving its upper part a perfectly transparent skeleton with all its markings visible, and having at its lower part all its granules closely packed in the oily protoplasmic contents. If the species be naviculoid, the contents will go half to one end, and half to the other, and be packed in a similar manner. Tribes of men and animals become extinct, but so long as the present circulation of water between earth and air continues, so long the diatom will continue to exist, to store up, and to secrete the matter which the intelligent traveller who has climbed nature's fairest peaks knows once formed an integral portion of the mighty masses on which he has gazed with admiration and awe, but which has by this circulation found its way into all our rivers, ponds, and ditches.

I feel I have already taxed too much your powers of endurance, but will, if you wish it, say a few words on the mounting and preservation of the diatoms when collected. This branch of the subject assumes different proportions, according to the object in view. If the skeleton only be wanted, the collection should be placed in a small glass of water and stirred. Weighty particles will soon subside, and the water should be poured into a large glass. This process may be repeated till the larger glass be full. Allow it to stand three or four hours or more. Pour off the liquid and you will have what you want at the bottom. Refill the vessel with water and allow a second settlement of the same duration. One or more washings might also be made, but when you have poured off nearly all the water from the last, return the gathering to the smaller glass, and allow it to subside in the same way. Pour off the water and add slowly a small quantity of hydrochloric acid. There will, in all probability, be effervescence, and the contained matter will rise to the surface. When the action has nearly ceased, add a little more acid. Let it remain in a safe place till the whole has subsided. You may then—it will take some time—place the glass over the flame of a spirit lamp till you see that all action has ceased. Allow time to subside, pour off the acid, and repeat the process with nitric acid, testing occasionally by taking, with a small tube, a small quantity for observation under the microscope. This is the most troublesome part of the whole business, and requires great care. It should be performed in some outhouse, and the operator should remember that these acids, employed to destroy vegetable and other matter, will also destroy cloth. If the outhouse be supplied with gas, so much the better. The glass containing all can be placed on wire gauze, at a safe distance from the flame, and the process watched. Fumes will soon rise, and the operator will have to retreat unless he has some contrivance over the glass to allow them to escape. When satisfied by testing that the skeletons are clean, pour off the acid after a proper time has elapsed, and wash with distilled water, if you can, four or five times, taking care not to be in too much of a hurry in pouring off the liquid.

The next step is the separation of the flinty particles from the diatoms. This is rather a tedious business, but the end is near. Have five or six glasses, each about four times the size of the small glass, in which the diatoms have been boiled. Have about four washings, at intervals of half-an-hour, pouring off into one of your vessels each washing. This gets rid of a multitude of the smaller particles. Repeat the process at different intervals till all the glasses are filled, testing as you go on. It is quite possible to have diatoms ready for mounting before all the glasses are full. When quite ready, a small quantity should be placed on a slide with the tube. The slide should be put away for a time out of the dust, to allow the water to evaporate. Do not dry it too quickly. The thin film on the surface should then be mounted, either dry or in balsam.

This is a brief sketch of the process for skeletons; that for the parasitic form is simpler. The chief difficulty being getting the plant, the object, into position. The lesson should be learnt at the riverside. All I can say now is that a small portion of the conferva, which is known to have the diatom, should be placed on the slide, and retained in position with the thumb nail. A small quantity of water should be allowed to run from a tap to the first joint of the thumb. It will diffuse itself over the slide, and the fibres of the confer will separate. The water should then be turned off, and the slide examined. If the fibres be well separated and the specimen worth preserving, it should be kept free from dust till the water has evaporated, and then mounted either in the dry state or in some preservative liquid. Both methods are very easy. I shall therefore say nothing more about them, but will answer questions that may be put respecting either.

I thank you very sincerely for your attention, and the next time I hear the uncharitable observation respecting patience, I shall invite the individual who makes it to attend a meeting of the Croydon Microscopical and Natural History Club.

11.—WINTER TEMPERATURES
OBSERVED AT
16, WANDLE ROAD, CROYDON,
BY GEO. CORDEN.

[*Read May 21st*, 1879.]

Winters.	November. Extremes Max.	Min.	November. Mean daily. Max.	Min.	Mean.	December. Extremes Max.	Min.	December. Mean daily. Max.	Min.	Mean.
1866—67	62	22	51·8	36·6	44·2	55	23	48·0	36·4	42·2
1867—68	63	22	48·3	32·2	40·3	54	15	42·2	30·4	36·3
1868—69	57	23	46·3	35·4	40·8	56	21	50·0	39·0	44·5
1869—70	59	27	49·5	38·9	44·2	55	20	42·0	36·0	39·0
1870—71	54	29	47·7	36·1	41·9	55	9	38·0	28·5	33·2
1871—72	52	21	44·0	33·1	38·5	50	18	42·4	34·3	38·4
1872—73	61	33	50·5	41·9	46·2	55	26	47·6	40·0	43·8
1873—74	57	28	49·8	39·4	44·6	56	20	45·4	36·4	40·9
1874—75	59	26	47·8	37·1	42·4	53	15	37·8	28·4	33·1
1875—76	59	29	47·3	39·8	43·5	55	20	42·8	35·4	39·1
1876—77	60	26	48·9	40·3	44·6	56	30	47·7	41·7	44·7
1877—78	58	32	51·2	41.1	46·1	53	28	45·9	36·3	41·1
12 years. Max.	63	33	51·8	41·9	46.2	56	30	50·0	41·7	44·7
12 years. Min.	52	21	44·0	32·2	38·5	50	9	37·8	28·4	33·1
12 years. Mean	58·4	26·5	48·6	37·7	43.1	54·4	20·4	44·2	35·2	39·7
1878—79	53	29	44·1	36·0	40·0	54	14	37·8	30·6	34·2
Diff. from mean	5·4*b*	2·5*a*	4·5*b*	1·7*b*	3·1*b*	0·4*b*	6·4*b*	6·4*b*	4·6*b*	5·5*b*

a Above the mean. *b* Below the mean.

WINTER TEMPERATURES

(continued).

Winters.	January.					February.				
	Extremes		Mean daily.			Extremes		Mean daily.		
	Max.	Min.	Max.	Min.	Mean.	Max.	Min.	Max.	Min.	Mean.
1866—67	55	0	39·8	26.6	33·2	57	25	50·1	38·0	44·0
1867—68	51	22	41·1	31·9	36·5	60	23	49·6	36·1	42·8
1868—69	54	26	46·2	36·0	41·1	58	29	50·5	40·2	45·3
1869—70	50	21	42·6	35·3	38·9	54	20	40·6	33·6	37·1
1870—71	45	19	37·5	30·3	33·9	55	26	49·6	38·8	44·2
1871—72	52	29	46·8	38·2	42·3	55	33	50·8	41·4	46·1
1872—73	54	27	46·7	38·5	42·6	49	26	39·7	31·5	35·6
1873—74	54	28	47·5	37·2	42·3	53	22	44·5	34·1	39·3
1874—75	53	30	48·4	40.3	44·3	50	25	41·0	32·0	36·5
1875—76	54	14	42·7	32·7	37·5	58	22	46·8	37·7	42·2
1876—77	55	30	47·6	38·2	42·9	58	24	49·1	39·5	44·3
1877—78	56	27	44·8	36·8	40·8	57	25	47·0	39·4	43·2
12 years. Max.	56	30	48·4	40·3	42·9	60	33	50·8	41·4	46·1
12 years. Min.	45	0	37·5	26·6	33·2	49	20	39·7	31·5	35·6
12 years. Mean	52·8	22·8	44·3	35·2	39·7	55·3	25·0	46·6	36·9	41·7
1878—79	50	20	35·9	29·0	32·4	53	24	43·1	35·6	39·3
Diff. from mean	2·8*b*	2·8*b*	8·4*b*	6·2*b*	7·3*b*	2·3*b*	1·0*b*	3·5*b*	1·3*b*	2·4*b*

b Below the mean.

WINTER TEMPERATURES

(continued).

Winters.	March. Extremes Max.	March. Extremes Min.	March. Mean daily Max.	March. Mean daily Min.	March. Mean daily Mean.	Summary of 5 Months. Extremes Max.	Summary Extremes Min.	Summary Mean daily Max.	Summary Mean daily Min.	Summary Mean daily Mean.
1866—67	58	19	43·7	31·5	37·6	62	0	46·7	33·8	40·2
1867—68	58	22	53·1	35·3	44·2	63	15	46·9	33·2	40·0
1868—69	53	27	44·4	32·9	38·6	58	21	47·5	36·7	42·1
1869—70	58	16	45·9	35·1	40·5	59	16	44·1	35·8	39·9
1870—71	65	31	53·1	39·0	46·0	65	9	45·2	34·5	39·8
1871—72	59	25	52·3	39·0	45·7	59	18	47·3	37·2	42·2
1872—73	65	28	50·1	37·0	43·5	65	26	46·9	37·8	42·3
1873—74	61	23	52·2	38·0	45·1	61	20	47·5	37·0	42·2
1874—75	59	28	47·4	36·1	41·7	59	15	44·5	34·8	39·6
1875—76	60	26	48·7	36·3	42·5	60	14	45·7	36·4	41·0
1876—77	58	26	47·8	36·4	42·1	60	24	48·2	39·2	43·7
1877—78	58	27	48·8	36·6	42·7	58	25	47·5	38·0	42·7
12 years. Max.	65	31	53·1	39·0	46·0	65	26	48·2	39·2	43·7
12 years. Min.	53	16	43·7	31·5	37·6	58	0	44·1	33·2	39·6
12 years. Mean	59·3	24·8	49·0	36·1	42·5	60·8	16·9	46·5	36·2	41·4
1878—79	61	30	48·4	36·4	42·4	61	14	41·9	33·5	37·7
Diff. from mean	1·7*a*	5·2*a*	0·6*b*	0·3*a*	0·1*b*	0·2*a*	2·9*b*	4·6*b*	2·7*b*	3·7*b*

a Above the mean. *b* Below the mean.

12.—Instance of the Voracity and Predatory Habits of the Great Black-Backed Gull *(Larus marinus.)*

By the President. J Gurney

[*Read November 19th*, 1879.]

About ten days ago I bought an adult male of this species in Leadenhall Market, and on dissecting it I found the stomach very full and much distended. On opening it I found what appeared to be the whole of the bones, except those of the wings and the breast bone, of a Black-Headed Gull. *(Larus ridibundus).* The tarsi and feet, which were entire and uninjured, were attached to the bones of the legs, which were also entire and were attached to each other by their ligaments. As each leg and foot were together about eight inches in length, the feet were necessarily some distance out of the stomach. They were side by side, and projected into the œsophagus some considerable way. The remainder of the bones were very much broken, and all the bones, with the exception of the feet and tarsi, had been cleared of their muscles and sinews by the action of the gastric juice. As there was hardly a single feather in the stomach, it seems clear that this large gull, having in some way got hold of the black headed bird, picked it, or skinned it, and then tore it to pieces, and ate it clean up, swallowing the legs whole. The powerful hooked beak of the Great Black-Backed Gull seems to prove it to be of carnivorous habits. It has been known, occasionally, to kill and eat small birds, and it has even been said to attack young and weakly lambs, but I have never met with any record of its having attacked or devoured a bird so large as a Black-Headed Gull, which would be about 16 inches in length, and I think, therefore, that this instance ought to be recorded. I have brought the feet and the bones of the legs and the whole of the beak, which is very sharp, for you to see. These, especially having regard to the red colour of the feet—which, however, has much faded—seem sufficient to identify the species.

13.—On a Hen Pheasant which has assumed the Plumage of the Male.

By the President.

[*Read December 17th*, 1879.]

On September 21st last I had the opportunity of examining a most interesting bird—a hen of the common Pheasant in male plumage—which is now in the possession of Mr. R. A. Heath. This bird was hatched in the spring of 1875. It was sent up in the autumn of the same year to Mr. Heath, and was placed by him, with a cock bird of the same species in an aviary in the grounds attached to his father's house in Park Lane. Since she has been in Mr. Heath's possession this bird has laid numerous eggs, and in 1878 she laid as many as 30. As these were placed under hens and many of them produced young birds, it is clear that the ovaries of the bird must have been in a healthy condition up to that time. This year the bird has not laid any eggs at all, nor has she shown any peculiarity in plumage until the autumn moult of this year, but the plumage which the bird has assumed as the result of that moult has all the peculiar characteristics of the plumage of the male. The case of this bird is very similar to that of the sterile Grey Hen (T. tetrix), which I exhibited and described at our meeting on March 19th last, and which I have brought again this evening. There is, however, this important difference between the two. The Grey Hen was, I have no doubt, sterile from disease of the ovaries which was congenital, and was probably, in consequence of that sterility, larger, considerably, than Grey Hens usually are. This hen Pheasant on the other hand has only become sterile later in life, and does not differ in size from an ordinary hen Pheasant. Mr. Heath very kindly offered to send the bird here this evening, but that offer I did not like to accept, as the bird, being naturally shy, would probably have injured itself. But I am authorised to say that any of our members who would like to see it can do so by calling at Baron Heath's house.

14.—On the Peculiar Species of the British Fauna and Flora.

By Alfred Russel Wallace.

[*Read March 17th*, 1880.]

Mr. Wallace, in the first place, called attention to the fact, now well established, that all large islands which have been separated for a long period of time from the mainland, possess species of animals and plants which are peculiar to them, the number of peculiar species, speaking generally, being large or small, according to the length of time during which the island has been cut off from the land of which it formerly formed part. He also pointed out that these are very significant facts in connection with the geographical distribution of animals and plants. He further stated that his researches having led him to the conclusion that the British islands, although they had only been separated from the continent in comparatively recent times, were no exception to this rule, he applied to a number of distinguished men who had made special studies of various departments of zoology and botany, but they one and all gave it as their opinion that there were no animals or plants which were peculiar to Great Britain, and that probably every species to be found in our islands would be found on the continent if proper and sufficient search were made for it. Not being satisfied with these replies, he proceeded with his investigation, which resulted in his coming to the conclusion that there are a considerable number of species recorded as occurring in Great Britain which are not to be found in any other part of the world.

Mr. Wallace went on to show that there is much direct and positive evidence that the British islands once formed part of the continent of Europe, and were formerly more extensive than they now are, also that their connection with the continent has been broken and again re-established more than once, and he went through this evidence in detail.

He next proceeded to show that the number of species of animals and plants which occur on the continent of Europe is much larger than the number which is to be found in Great Britain, and these again, in their turn, are considerably larger than the number of species which have been recorded as occurring in Ireland, whilst Ireland again has species which are not to be found in Great Britain. All this seemed to show that Ireland was separated, as an island, from Great Britain some time before Great Britain ceased to form part of the European continent. With regard to the species peculiar to the British islands, it is probable that they have all come into existence since the islands were last severed from the continent, and the fact that this severance took place in comparatively recent times would account for the comparatively small number of species which are peculiarly British.

Taking the animal kingdom in detail, Mr. Wallace shewed that, in the opinion of the best authorities, our islands have no peculiar species of Mammalia or Reptiles, but of birds there are three species, the Red Grouse (L. scoticus) the English Coal Titmouse (P. britannicus) and the British Long Tailed Titmouse (A. rosea), which do not occur elsewhere. Of fishes there are fifteen species, all of freshwater fish, which are not to be found on the continent; six of these are peculiar to Ireland, two of them to be found only in one lake. Of the British Trout, two species are peculiar to the Orkneys, one to the lakes of Dumfries (which are little more than moderate-sized fish ponds connected with Dumfries Castle), one to Wales, two to the English lakes, and three to the Scotch lakes. The difference between these species is not in colour only, but in structure, and the favourable conditions under which they have probably been developed was explained in detail by Mr. Wallace.

Passing to invertebrate animals, Mr. Wallace pointed out that insects, being smaller in size, and therefore more easily overlooked, were more difficult to deal with; but there is every reason to believe that there are many species of insects which occur only in the British isles. The English climate, from its mildness in winter, and other peculiarities, is favourable not only to the production of new species, but also to the survival of others, which are not able to endure the winter of many parts of the continent. Among the Lepidoptera there are over one hundred species, which have been found in our islands, but which are not known to occur on the continent. After making every allowance there are probably seventy of these species which are really peculiar to Great Britain and Ireland. Of these seventy species there are only unique specimens of some, others are very rare, and others rather common. Two of the unique specimens were taken at Sanderstead, near Croydon, one in 1848 and the other in 1854. Mr. Wallace exhibited a case of Butterflies and Moths, lent to him by Mr. Charles Stevens, containing, amongst others, the large Copper Butterfly (P. hippothoe), formerly abundant in some parts of Great Britain, but believed now to be extinct, and pointed out in it and described some of the unique specimens to which he had referred. He also exhibited a case of Butterflies and Moths taken in the Isle of Man, and with them a series of the specimens most nearly resembling them which are to be found in the other British islands, and the peculiarities of each were pointed out and described. Of Coleoptera about seventy-two species, and of Trichoptera three species are peculiar to

Britain. The little island of Lundy, in the Bristol channel, has two insects, one a distinct species, the other a variety only, which are peculiar to it, and other restricted areas have species and varieties of insects which are peculiar to them. Of Mollusca four species only, one of them considered doubtful, are peculiar to Britain.

Of plants, Mr. Wallace enumerated two Flowering Plants, sixteen Mosses, and ten Hepaticæ, which are peculiarly British.

Of the two flowering plants, one Brewers' Spotted Rock Rose (H. Breweri), is peculiar to Anglesea and Holyhead island; the other, a water Dropwort (Œ fluviatilis), an umbelliferous plant, is found nowhere but in the southern half of England and in one locality in Ireland. Great Britain also possesses two plants, both truly indigenous, which must have come to it from North America, as they are not to be found anywhere except in North America and the British isles. These are a small orchid (Spiranthes romanzoviana) which occurs in Ireland, and the Pipewort, (Eriocaulon septangulare) which is found in the Hebrides and in Ireland. There is no reason at all to believe that these species have been artificially introduced, and it is difficult to understand how they could have been transported to our shores. Ireland also possesses about twenty species of Flowering Plants which are not to be found in Great Britain. Many of these are known to occur in the south of Europe, and two of them are Arctic or Alpine plants. Of the British Mosses and Hepaticæ, three genera of each are not found in any other part of Europe, but occur in various parts of South America, and of Africa and Asia, and in the mountains of New Zealand. Probably these plants, and the twenty species which are peculiar to Ireland are the remains of forms, which, in the remote past, were spread over the greater part of the globe, and which have been enabled to survive in Ireland or Great Britain, by the exceptionally mild climate.

In conclusion, Mr. Wallace pointed out that, as has been shown by Mr. Darwin, the rarity of a species is one great proof that it is undergoing the process of extinction. Species are now, and always have been, liable to extinction by their enemies becoming too strong, or the conditions of life too severe, and hence it happens, that in islands where the enemies are less numerous, and the conditions more equal, the race is continued, and allowed to survive; and this fact should stimulate and encourage naturalists to make a more thorough and exhaustive investigation of the animals and plants which occur in the numerous islands which surround our coast. There is yet a great deal to be ascertained with regard to them, and no doubt new species yet to be discovered.

15.—On the Preparation of Objects for the Microscope.

By E. Lovett.

[*Read April* 21*st*, 1880.]

Mr. Lovett pointed out that it was by no means the case that the mounting of objects for the microscope was a very difficult matter, necessitating the use of all sorts of acids and chemicals. Some of the most beautiful of objects were most easily prepared and preserved for any length of time, provided only that a little care was exercised, and a few suggestions put into practice. By mounting dry in a cell the most natural state was obtained, and this was the simplest method of mounting. Nothing should ever be put in the cell unless it were perfectly dry, and if possible should not be mounted in damp weather. It was also well not to use any oil, cements, or varnishes for fastening the object in its position.

Describing a cell which he (Mr. Lovett) had used for some time without one instance of failure, he said it was easily and readily made. Having cleaned a glass slide, it was to be placed on the centreing table, and the operator must then lay a brass ring of the size required on the centre, and place on that a piece of black ozokerit; then hold the slip over a spirit lamp and the ozokerit melted and filled up the cell floor, cementing the ring to the slide, and forming a dull black concave chamber which hardened at once when laid down to cool, and was then ready for the object. The object should be attached to the centre by a little ordinary gum, almost dry; when this became dry the cover glass might be fixed with the same material, and when firm enough the slide could be placed on the turn table, and a good finish of asphalte varnish would bind the whole together and render the cell perfectly hermetically sealed. The objects suitable for such cells were unlimited, but they were such as Foraminifera, micro' fungi, leaf scales, leaf hair, seeds, many wood sections, &c., which were readily obtained and easily prepared. Many objects might be mounted dry and without a background.

Coming to objects which required a preservative medium, Mr. Lovett said balsam was the most generally used in those cases, and produced perhaps the most unsatisfactory result unless done properly. Objects for balsam required a period of soaking in turpentine or oil of cloves, &c., and before such soaking, should be dry. Mr. Lovett mentioned an easy and convenient method of keeping a lot of things in soak, and went on to point out that when the objects were found to be clear of air they should be mounted. Only just sufficient balsam should be placed on the slide, which should be gently heated. Plunging the object into the balsam, and seeing that the balsam closed well over it without enclosing bubbles, the operator should gently warm a perfectly clean thin glass cover and place it on the balsam, simply allowing it to settle down of its own weight, whereupon the balsam would flow to the edge of the cover, and the slide would not require cleaning of superfluous balsam. The slide could then be finished off with a cement composed of flake white and gumdamar, rendered fluid with chloroform. Beside those objects which required preparation for balsam, there were many others which might be so mounted without any preparation—such as plant hairs, scales, insect hairs, spores, micro' fungi, &c. Insects should be mounted without any pressure whatever being brought to bear upon them, and there should be only such removal of colour as was absolutely necessary to procure the requisite clearness of definition of structure. With regard to botanical specimens soaking was very necessary.

Describing the method of mounting which was of great value for such objects as did not do well in balsam, and could not be mounted dry, Mr. Lovett went on to refer to such things as internal parts of insects — crustacea, mollusca, &c.—and the ova of these animals, besides many other specimens which required a good preservative fluid medium hermetically sealed in a more or less deep cell. The best fluid for this kind of work was one composed of three parts of absolute alcohol, two parts of glycerine, and one part of distilled water, and the object required only a short period of soaking. The specimens could be placed in this fluid without previous preparation, and could remain there until it became convenient to mount them. Tubes containing this fluid could be carried about in the pocket, and when a specimen was found, it requiring no preparation, could be dropped into the fluid forthwith, the objects being ready for mounting as soon as the fluid had thoroughly permeated the specimen.

With respect to the *modus operandi* of mounting, Mr. Lovett described it as follows:—If it were desired to use a deep cell, the operator should cement a glass ring or square on to the centre of the glass slip with stiff marine glue, and lay it aside for a few days to thoroughly harden; then place a little gold size round the top of the cell near the outer edge, and hold it over the lamp to thoroughly harden it, so that it could not run into the cell; then fill the cell perfectly full, till there was a convexity, with fluid, and place the object on it, taking care that no air or foreign matter was enclosed with it; then take a cover glass of the same size as the exterior size of the cell, and after cleaning it, breathe on the side which would come downwards, and place it upon the cell slanting ways. This would drive out all the fluid that was not required, and the gold size would get through the fluid and attach the cover to the cell. When the cover was in its place the superfluous fluid should be secured by means of a brush or a damp blotting paper, and a little fast drying cement applied to the edge of the cell was then beneficial in assisting to fasten on the cover. In a few days a coating of asphalte might be applied to connect the cover glass to the slide, thus binding the whole firmly together, and if six or eight of such dressings were applied as soon as the former was hardened, he (Mr. Lovett) did not think there was any need to fear a leakage.

Speaking upon the question of finishing, Mr. Lovett said that with the assistance of a turn-table a neat ring could be added to the slide, but the asphalte ring should not be wider than was absolutely necessary, and might be relieved by a thin line of white or red.

Mr. Lovett further gave a short description of a new form of "objective" lately introduced by Mr. Baker, of Holborn. The arrangement of the object glass is such that it can be used for powers varying from three to six inches. The invention is likely to be of service in botanical investigations.

16.—On the Structure and Geological History of the Weald and of the Catchment Basin of the River Wandle.

By John Flower, M.A., F.Z.S.

[*Read Wednesday, May 19th*, 1880.]

There are probably but few of our members who have not spent more or less time in the district which is commonly known as "The Weald." This district, which comprises a large part of Kent, of Surrey, and of Sussex, and also the eastern part of Hampshire, has a special interest for those who live in Croydon and its neighbourhood. Being easily accessible by rail, the great and in some places extreme beauty of its scenery, and the great variety of the animals and plants which occur in it, have rendered it a sort of natural pleasure ground to thousands. And when we add to these natural advantages the great interest which attaches to its past history, whether historic or prehistoric, we have before us a tract of country in every way well deserving of attention, and one moreover which, in a sense, may be said to be peculiarly our own. And the interest which attaches to the Weald itself extends, though perhaps in a less degree, to the districts which adjoin it. These, though they do not form part of what is technically known as the Weald, are yet in reality integral parts of it, and the past history of them all is closely and inseparably connected. I propose this evening to describe shortly the main physical features of the Weald, then to give you the views which are now generally held as to the way in which it has been formed, and lastly to show its close connection with the Catchment Basin of the Wandle. I have here a geological model of the south-east of England, by Mr. Wm. Topley and Mr. J. B. Jordan, of the Mining Record Office, and published by Mr. Stanford, which will, I think, greatly assist me in making a description of the Weald intelligible.

If any of you were to start from Dover and proceed towards the south-west, you would find yourselves, for some five or six miles, on the top of high chalk hills, which here take the form of cliffs overlooking the sea. Just before reaching Folkstone, these hills leave the sea and extend in a north-westerly direction, and nearly in a straight line, for some 36 miles, nearly up to the City of Rochester. Then, turning again to the south-west, they extend for some 60 miles nearly in a straight line, down to the town of Farnham, in Surrey. From Farnham they turn southward for about 17 miles, and then turning eastward, they run round the town of Petersfield in Hampshire, and extend from there, for 57 miles or thereabouts, up to the well-known chalk promontory of Beachy Head in Sussex, where they end. These hills form between Folkstone and Farnham the North Downs, and between Petersfield and Beachy Head the South Downs. Throughout their entire length of 170 miles they are continuous, and are in all respects essentially the same. They vary in height, being in places nearly 900 feet above the sea, and as they are in all parts considerably above the country which lies within them, the views from them are magnificent. Their character is well seen in such places as Knockholt Beeches near Sevenoaks, White Hill near Caterham, Betchworth Clump, and Box Hill.

Inside these chalk hills again, and running parallel with them, is a second range of hills formed of the Lower Greensand. This formation, which is hard in its character, is to be found at but a short distance from the chalk hills throughout their entire length, and in places like Ide Hill near Sevenoaks, Leith Hill, and Hindhead and Black Down near Haslemere, it forms some of the highest hills in the south of England. Leith Hill, which is the highest point in this part of England, is 967 feet above the sea. In some places, however, the Lower Greensand hills have been worn down and destroyed, by agencies to be presently described, and in others and especially on the south side of the Weald, this formation thins out and is reduced to small dimensions.

Between these two ranges of hills is a narrow valley, which seldom reaches a mile in width. The soil at the bottom of this is Gault, which is a stiff clay.

Inside the Lower Greensand hills is another and much larger valley, varying in width from two or three miles to twenty, the soil of which is made up of the Weald Clay, and in the centre of this is another range of high hills, formed of the Hastings Sands, which extends from Horsham to Hastings, and on this range stand East Grinstead and Tunbridge Wells. The highest point on it is Crowboro' Beacon, which is 804 feet above the sea.

Stated generally, then, we have in this district five things to explain and account for. The whole district is in shape a rather irregular elongated horseshoe, having the sea at its open end. Round the entire outside of this is the range of chalk hills, inside of which we have, successively, the narrow valley of the Gault, the hills of Lower Greensand, and the broad valley of Weald Clay; and in the centre of this are the hills of Hastings Sand. The geological model shows this very clearly.

The district which is within the chalk hills is now drained by ten rivers, all of which pass through the hills. Five of these, viz., the Stour, the Medway, the Darent, the Mole, and the Wey, flow northward into the Thames; and the five others, viz., the Arun, the Adur, the Ouse, the Cuckmere, and the Ashburn, flow southward direct into the sea. The high land in the centre of the Weald gives origin to most of the rivers which I have mentioned, but it has also another river, the Rother, which cuts through the Hastings sand, and flows eastward direct into the sea. In addition to the valleys of these rivers there are numerous valleys in the chalk, now dry, such as the Merstham and Caterham Valleys and many smaller ones, of which I shall have more to say later on.

The first question which offers itself for solution is how came the Weald district to assume the very remarkable form which I have described. Numerous theories have been framed to answer this question, but it was never, I believe, satisfactorily answered until the difficulty was solved by the theory which has been adopted by the members of the Geological Survey, the result of whose investigations is embodied in one of the memoirs of the survey, on "The Geology of the Weald," which I have here.

Stated shortly, the conclusions at which they have arrived are as follows: — Omitting the superficial deposits, the geological strata which are to be found within the Weald are seven in number: (1) the Chalk, which comes at the top, several hundred feet thick; and then successively below it (2) the Upper Greensand, from 0 to 80 feet thick; (3) Gault, probably from 60 to 150 feet thick; (4) Lower Greensand, from 70 to 500 feet thick; (5) Weald Clay, probably from 400 to 1000 feet thick; (6) Hastings Sands, also several hundred feet thick; and (7) Purbeck beds, probably about 400 feet thick. These were probably originally deposited in horizontal beds, one below the other, in the order which I have mentioned, and the beds now seen on our side of the Channel extended across the Channel, which did not then exist at all, and were continuous with corresponding beds now to be found in the north of France.

By one of those alterations in the surface of the earth, which were common enough in past times, the strata which were in the centre of the Weald were upheaved, and this upheaval, which extended across what is now the English Channel, and into the north of France, went so far that along the line from Horsham to Tunbridge Wells and then southward to Hastings, the Hastings sand, which in its natural position lies below all the other beds of the Weald, except the Purbeck beds, was brought to the surface; and in the north of France, where the force of the upheaval seems to have been greatest, beds which lie naturally below the Hastings sand came to the surface, and are now the common soil of the country. In one place on the English side of the Channel (between Heathfield and Battle in Sussex) the Purbeck beds, which lie below the Hastings sand, are on the surface, but only to a very limited extent. The result of this movement was that the beds, instead of lying horizontally as they did before the upheaval, came to be domed along that part of the centre of the Weald which is now occupied by the Hastings sand, and were made to dip considerably to the N. S. E. and W. from that central line.

The state of things which was thus brought into existence is well shown by a diagram, taken from Professor Ramsay's "Physical Geology and Geography of Great Britain" (page 110), which represents what would have been seen if the dome had been complete. There is no reason, however, to believe that it ever was complete, but as the upheaval proceeded the strata were planed off, probably by the action of breakers in a shallow sea, and in this way they were made to assume on the surface the form of a series of concentric rings as they now appear on the map. A rather homely illustration will make this, perhaps, rather more clear to those of you who are not familiar with geological phenomena. By the process of upheaval, the beds, instead of being as they were before, flat, one on top of the other, came in the centre of the Weald to assume the form which is seen in any bulbous root which is made up of successive layers (as for example a Spanish onion) when looked at with the side up, and after the planing process of which I have spoken they become on the surface like the same root as it would be after the upper part was cut off, in concentric rings. Having thus been formed, the Weald district was at last raised above the sea and became dry land. There seems no room to doubt that the movement or series of movements which raised up the central part of the Weald also caused the formation of the English Channel. They probably lowered the strata in what is now the middle of the Channel, and thus enabled the sea to cut a channel through them instead of merely planing them off as it did on the English side.

There is yet an important thing to be explained, the formation of the hills and valleys which are found in the Weald. The Weald, when first raised above the sea in the way which I have described, would be a plain, flat, or very nearly flat, and made up as we have seen of strata lying in concentric rings. Outside of all is the hard Chalk, with the equally hard Upper Greensand below it; then comes the soft Gault, next the hard Lower Greensand, followed by the soft Weald Clay, and in the centre of all is the hard Hastings

Sand. The Gault and Weald Clay have been worn away and removed, or, as it is technically termed, denuded, whilst the Chalk and Greensand, and the Hastings Sand, have been left standing as hills. The agency which has produced this denudation of the Gault and Weald Clay has been the subject of much controversy, and many theories have been put forward to account for it, but the theory now adopted by the members of the Geological Survey is very simple, almost provokingly so, and it is that the only agents which have produced this denudation are the action of the rain and the weather, and the streams. In this way the Weald has been formed into the shape in which we now see it.

There is one more very important feature to be mentioned and explained, and that is the formation of the valleys of the rivers which now flow, or formerly did, flow out of the Weald. When the Weald district was first left by the sea and became dry land, numerous streams, with lateral branches, must have been formed at once upon its surface by the action of the weather. These would naturally flow down the slope, in all directions, from the central high ground of the Hastings Sand, following the natural dip of the strata, and would cut channels, more or less deep, through the Weald Clay, Lower Creensand, Gault, Upper Greensand, and Chalk. In this way it would seem that five rivers or streams were formed in our immediate neighbourhood, the Darent, the Ravensbourne, the Wandle, the Hog's Mill River, and the Mole, which must have drained between them a considerable part of the country which lies to the south of the chalk hills.* As the denudation of the Weald progressed, the streams from the Weald would necessarily experience between themselves a keen struggle for existence, which would end as all such struggles inevitably must end, in the destruction of the smaller streams, and the survival of the streams which were most favoured by the natural configuration of the ground or by other natural advantages.

The first difficulty which the streams on the north side of the Weald would have to contend with would be created by the action of the weather on the Weald Clay. As this was worn down and denuded, the Lower Greensand formation would gradually be formed into a range of hills on its north side, and these would offer an impassable barrier to the passing of water northward from the Weald, except in places where the Lower Greensand was of small dimensions,

* These names are here adopted because they are the nearest modern names which are available, but except, perhaps, in the case of the Darent and the Mole, the modern streams are very different to their ancient prototypes both in character and extent.

or where, being bent into the form of a trough, streams were enabled to flow through the trough, and so get over it. Another effect of the formation of these hills would be, that the water, being uanble to get through them, the streams would be diverted eastward or westward, in which directions they would flow until they were able to join some stream which had been able to get through the Lower Greensand and then, by adding to its strength and therefore to its cutting power, they would materially assist it in its struggle with the other streams. The denudation of the Weald Clay therefore must in this way have been fatal to many of the lateral branches of the streams, and its effect upon the others would be that some would be considerably diminished in size by the stoppage of part of their supply of water, whilst the water of which they were thus deprived would go to swell the volume, and would therefore increase the strength of rival streams.

A very similar state of things would be repeated in the case of the Gault. Its denudation has converted the space between the Chalk and the Lower Greensand into the valley which I have already described. The Gault being softer than Chalk, and therefore more easily worn down, would soon be reduced below the level of some of the valleys in the Chalk through which the streams or their lateral branches flowed, and as this took place the several branches or streams, some of which would be already much weakened by the effects already described of the denudation of the Weald Clay, would be cut off entirely from the Weald, and their valleys would be necessarily converted into dry valleys.* At the same time the water which formerly flowed through them would be diverted eastward or westward down the valley, and would go to swell and strengthen rival streams. The competition, however, would still continue between these, and the very existence of each of them would come to depend entirely upon its ability to keep the area which it drained and its channel through the Lower Greensand and Chalk below the level of the area and channel of its rival neighbour. As each failed to do this it would be cut off from the source from which its water was derived, its valley would be converted into a dry valley, and its water would be swallowed up by its victorious rival. In this very simple way the whole of the streams, with all their lateral branches, which formerly flowed from the Weald northward through the chalk hills between the Mole and the Medway, a distance of 35 miles, seem to have disappeared from the scene,

* It is probable that many of these valleys later on were much deepened and enlarged by the action of periodical Bourne streams, like the one so frequently seen in the Caterham Valley. These Bourne streams would naturally be much more numerous in past times than they now are.

except the Darent. This is left, but only as a weakly stream, deriving a small amount of water from the small valley which runs from Westerham towards Sevenoaks, but, with that exception, having altogether lost its connection with the Weald. It seems to stand, in fact, like one of those very ancient forms so well-known to physiologists, an isolated relic of a byegone age, left as a connecting link for our instruction. With the unimportant exception above mentioned, in the case of the Darent, the whole of the country to the south of the chalk hills between the Mole and the Medway is now drained by those rivers, the sole survivors in their struggle for existence, and their branches may now be seen in the fields below White Hill near Caterham, within a very short distance of one another.

Another curious and interesting effect would seem to result from the state of things above described. The drainage down the gault valley would flow east and west into the rivers, and as these, following the natural dip of the strata, flow towards the north, the tendency of the flow of the water down the gault valley would be to cut off the corners, where the gault valley joins the river valley, and, taken with the gradual lowering of the gault valley, to form the trumpet-shaped mouths, with sloping sides, which are seen at the southern extremity of many of the river valleys on the north side of the Weald.

With regard to the survival of the Mole, it seems probable, on reference to the map, that this has been due to the exceptional advantages which it has enjoyed over the other rivers in its immediate neighbourhood. In the first place the Lower Greensand formation is reduced to very small dimensions where the river passes into the chalk, and this has given it, without interruption, the drainage of the large area of Weald Clay which lies immediately to the south of the Mole valley. Then again, in the way already pointed out, it has been enabled to secure for itself, and thus to monopolise, all the drainage of that part of the valley of the Gault which lies for 10 miles to the east and for some few miles to the west of it. And lastly the short distance which it has to pass over the Chalk before it reaches the London Clay, which here approaches very near to the Gault, has very materially assisted it.

I have gone much into detail with regard to the structure and history of the Weald because it is so closely connected with the districts which adjoin it that its past history is necessarily part and parcel of theirs: so much so indeed that until the manner in which it has been formed is properly understood, it will be impossible to understand the history of the valleys which run into it. If the above explanation be borne in mind it will not be difficult now to see how the Catchment Basin of our own river, the Wandle, has been formed.

Before proceeding to examine this in detail it will be as well perhaps to explain what is meant by a Catchment Basin. It must not be supposed that the area which is drained by any particular river is merely the area upon which it is seen on an ordinary map. For a variety of reasons it very seldom happens that this is the case. The whole of the area which a river drains is termed its Catchment Basin, because it is bounded on all sides by a ridge of high ground, termed its watershed, which separates it from the basins of adjoining rivers, and within this circle of high ground is caught all the rain, which, by the natural process of drainage, forms the river. The above definition, however, has reference only to the surface drainage. The underground flow of water follows, as a rule, the same course as the surface water, but, as will be explained hereafter, this is not by any means always the case. The distance between the streams which are actually flowing and the edge of the basin differs very considerably in different river basins, and is regulated entirely by the nature of the soil, and the natural structure of the district. Thus, on clay soils, which are impervious to water, the rain which falls is obliged to flow over the surface of the ground, and therefore if the Catchment Basin of a river is bounded by beds of clay, as is the case, in some places, with the basins of the Mole and Medway, the streams will run right up to the boundary of the basin. But if, on the other hand, the edges of the basin are on a porous soil, like Chalk, the rain which falls sinks in at once, and does not come to the surface again until some natural peculiarity of the ground compels it to do so.

The Hog's Mill river seems to afford a very good illustration of what I have just said. This river appears in the map as a very insignificant stream, which falls into the Thames at Kingston, having one branch which originates near Epsom, and another which originates near Ewell, and apparently it has no connection whatever with the Weald. The Catchment Basin of this river, however, seems to prove that at one time the Hog's Mill river was a much larger and more important stream than it is now. Its Catchment Basin extends right up to the chalk hills, narrowing rapidly at its southern extremity, and ultimately runs into that very remarkable deep valley, cut out of the southern slope of the chalk, which is to be seen immediately to the north of Betchworth station, and up which passes the high road to Walton-on-the-Hill. This valley may now represent the opening in the chalk through which the ancient Hog's Mill river passed out of the Weald, for there seems good reason to believe that this river once drained a part of the area to the south of the chalk hills, until, like the other streams on the north of the Weald, its supply of water was cut off, as explained above, by the deepening of the valley of the Gault. The reasons why this river has shrunk as it were so far from the edges of its basin will be better explained a little later on, in connection with the Wandle basin, with which it has much in common.

In dealing with the Wandle it will be convenient first to describe the chief physical features of its river basin, and then to try and see how, in all probability, they have been brought into existence. I have here a large tracing, taken from the six-inch Ordnance map, of that part of the area drained by the river Wandle which lies between the chalk hills, which are the southern boundary of its Catchment Basin, and a line drawn east and west through the southern part of Croham Hurst. This tract of country is about seven miles across from north to south. I hoped to have been able to add to this a similar tracing of the remainder of the Wandle basin, but the time at my disposal has not allowed of this. This tracing shows all the contour lines on the Ordnance six-inch map, and shows therefore, and to any one who is accustomed to contour maps at a glance, the exact position and size and shape of every valley in this, which is, for our purpose, the most important part of the area which is drained by the Wandle. The contour lines to the south show the shape and heights of the chalk hills. The broad blue line on the east side shows the line of the watershed between the Wandle and Ravensbourne river basins, and the corresponding broad blue line on the west side indicates the watershed between the basin of the Wandle and that of the Hog's Mill river. These two watershed lines at their southern extremity are eleven miles apart, but as they go northward they rapidly converge, the eastern one passes close to Sanderstead Church, and the western one close to Banstead Church, and at this part, which is about six miles from the southern edge of the Wandle basin, they are only about five miles apart.

If we examine in detail the district which is comprised in this tracing we shall see that in the centre of it is the narrow continuous valley which runs from Croydon to Merstham. The highest point in this valley is about three-quarters of a mile north of Merstham Church, at which point the valley is a little less than 450 feet above the sea level. From there to Beddington, a distance of about nine miles, the valley slopes gradually down towards the Thames, and at Beddington it is only 100 feet above the sea level. There seems reason to believe that before the Wandle was cut off from the Weald by the lowering of the Gault, in the way which I have described, there was a considerable stream down this valley. Now there is no stream to be seen in it till you reach Croydon, the first seven miles of it from Merstham being, in ordinary seasons, quite dry. It seems possible that this stream may originally have come out of the Weald in two branches, one of which came down the main valley, and the other down a smaller valley which is a little to the west of it, and which joins the main valley near Chipstead Church. The highest point in this smaller valley is about 530 feet above the sea level.

The tract of country which lies on the west side of the Merstham valley is drained through a large and deep valley, which runs into the Merstham valley at Smitham Bottom, opposite the Red Lion Inn. This valley has three great branches on its western side, one runs up to Banstead Church, another to Kingswood Church, and the third is about intermediate between the other two. These all originate in the high ground about Walton Heath, rather less than 600 feet above the sea level, and they slope gradually down into the Merstham valley which, at the point where they join it, is only about 250 feet above the level of the sea. The distance from the head of the valley which runs from Kingswood Church to the Merstham valley is about six miles. The main valley into which these three branches run may also have been a river valley in times long gone by. This may have passed out of the Weald about the point where the road from Reigate to Upper Gatton crosses the chalk hills, at which point their height above the sea level is 687 feet, or it may have passed over further to the westward. All these valleys at the present time however are perfectly dry.

The remainder of the district which is shewn on the tracing may be divided into two portions, viz., the high ground which lies between the Merstham valley and the Caterham valley, and the Caterham valley with the valleys which run into it. The Caterham valley, which joins the main valley at Caterham Junction, runs from that point for about 3½ miles without receiving any branches of any size, it then divides into numerous branches, all of which run up into the chalk hills. Two of these valleys, viz., the main Caterham valley and the valley which runs through Marden Park, run out into the Weald, and the remainder of them end in shallow passes. The passes, which are on the top of the chalk hills, are only 6 or 6½ miles distant from Caterham Junction. The hills in which these valleys originate are the highest along the whole chalk range, Bottley Hill, near Titsey, which is the highest of them all, is 881 feet above the sea. The height of the Merstham valley near Caterham Junction, where the Caterham valley joins it, is only about 210 feet, so that here, in about six miles, we have a fall of about 670 feet, and which from the lower hills is about 500 feet. The highest point in the main Caterham valley is 560 feet, and in the Marden Park valley 623 feet. Probably the Caterham valley is an old river valley, which had its own stream before its connection with the Weald was severed. Like all the other valleys of the district, the valleys which run into the Caterham valley are now perfectly dry.

The high ground which lies between the Merstham valley and the Caterham valley has three large valleys which have been formed in it, and which originate in ground which is over 700 feet above the sea level. One of these runs up to and passes on either side of Chaldon Church, another passes to the east of Coulsdon Church, and a third runs up between the other two. All of these valleys run into the Merstham valley, one close to the Red Lion Inn, and the other two, one a little to the north, and the other a little to the south of it. If to the above-mentioned valleys we add one or two smaller ones which run into the Merstham valley from the high ground about Sanderstead, we shall have before us all the valleys which it is important for us now to consider.

Taken as a whole, all the valleys which are comprised in the Wandle basin have exactly the same relation to one another that the branches of a stream would have. The smaller branches run into and coalesce with the larger ones, and all ultimately flow into and join the Merstham valley, in which valley our town stands. Like branches of a stream too, they have a gradual and continuous fall. If you trace any one of them down from its origin in the high ground to the Merstham valley you will find no ups and downs in it, no hills and valleys. The bottom of the valley is a complete trough, with a steady and gradual slope down to Croydon. How then were these valleys formed? To answer this question satisfactorily it would be necessary to take each valley in succession, and subject it to a minute and exhaustive examination. This is of course impossible this evening. It would moreover require a great deal more time and attention than as yet I have been able to give to the subject. But stated generally it seems probable that more than one of the main valleys were, in the first instance, cut out by streams, lateral branches of the ancient Wandle, which flowed out of the Weald, but which one by one were converted into dry valleys by the deepening of the valley of the Gault, as already pointed out. Since that time they have been greatly deepened and enlarged, and smaller lateral valleys have been formed to them, by the action of the rain and Bourne streams, and one or the other of these causes seems sufficient to account for all the valleys as they now exist.

It must be borne in mind that all these valleys are formed out of the Chalk, which is acted upon by rain in a very peculiar way. Rain is, of course, nothing more nor less than distilled water. During its passage through the air it absorbs from it a considerable quantity of carbonic acid. This, falling on the chalk, dissolves and carries away with it a large quantity of chalk, as Dr. Carpenter showed us at one of our recent meetings, and so its action is to keep constantly increasing the size and depth of every valley and depression which exists in the chalk. It cannot, however, dissolve the flints with which the chalk abounds. These are set free, and, if left to themselves, either remain exposed on the surface, or drop down into the valleys, where they accumulate. In the neighbourhood of Kingsdown, which is near Dartford, in Kent, they may be seen, in thousands of tons, in large heaps, in the bottom of the valleys, though here they have, no doubt, been greatly assisted in their descent by the constant ploughing of the land. If these flints had come within the reach of the streams they would have been carried along by them, and ultimately have come to form part of some of the numerous beds of angular gravel which abound in all chalk districts. The flints out of some of the Wandle valleys which we have considered this evening must now form part of the beds of angular gravel which are to be found under Croydon and in its immediate neighbourhood, but the question by what precise means they were transported to and deposited in their present resting places is not at all an easy one to answer.

I have not by any means exhausted the subject of the Wandle basin, but I have only time this evening to call attention to two more points of interest connected with it. I have mentioned above that the underground flow of water does not always follow the same course as the surface drainage. The Wandle basin seems to afford a remarkably good illustration of this. This most interesting subject, that is, the underground flow of water in the Wandle basin, is now, and has been for some years, the special study of one of our members, Mr. Baldwin Latham, but as his elaborate series of observations has not yet been completed, the result of them, necessarily, has not been made known. With him the problem, or rather the problems to be solved are in very able hands, and the results of his labours are looked forward to with great interest in the scientific world. One thing, however, I believe Mr. Latham has established, and that is that, contrary to what is usually the case, the underground drainage of the Wandle basin does not, in some places, follow the same course as the surface drainage. Possibly this may be due to the levels to which the valleys have been lowered in the manner above mentioned. The height of the Merstham valley at the Red Lion Inn, Smitham Bottom, is about 250 feet above the sea. The height of the corresponding point in the valley of the Hog's Mill river, which is just three-quarters of a mile south of Epsom, and is about six miles due west of the Red Lion, is 200 feet only, whilst the valley of the Mole at Leatherhead, which is about three miles south-west of this point, is 100 feet only. At their southern extremities the difference between the heights of the Merstham and Mole valleys is still more striking, the Merstham valley being, as we have seen, about 450 feet, whilst the Mole valley at Burford Bridge, distant rather over seven miles, is 130 feet only. The levels of these valleys therefore are lower as we go westward, and the natural effect of this would seem to be that the water, instead of going northward, as one would naturally expect it to do, would soak into the porous chalk, and would drain away to the westward.

I have only one more thing to call attention to. We have seen that the Catchment Basin of the Wandle extends from the chalk hills to the Thames. Its dimensions are roughly about 10 miles from east to west, and about 14 from north to south. The southern half of this basin is chalk, the northern half, on the other hand, is clay. Now there is not, so far as I am aware, a single stream running above ground throughout the length and breadth of the chalk part of the basin, and the same remark applies equally to the chalk part of the basin of the Hog's Mill river. The Bourne, of course, being an exceptional and periodical stream, I do not reckon. The reason for this is as follows:—The Chalk which is so common in our district consists of a thick bed, which slopes gradually down from the chalk hills, and bending under London comes up again on the other side, where it forms in Hertfordshire another district somewhat similar to our own. The curve in the Chalk is filled up with gravels and sands, on the top of which is the London Clay. Below the Chalk again is the Gault. The rain which falls on the Chalk sinks down into it and drains away underground in a direction towards the Thames. The Gault, which is impervious to water, does not allow the water to pass downward out of the Chalk. When this water therefore reaches the edge of the London Clay it reaches a point where the Chalk, lying in a curve between the Gault and the London Clay, is necessarily saturated with water, and the rain which falls on the Chalk to the south of the area which is covered with the London Clay, not being able to make further progress through the Chalk, forms springs all along at the edge of the clay, from which originate streams which flow over the clay into the Thames.

This peculiarity of the district seems to have had a very curious effect upon the distribution of the chief towns in our neighbourhood. You will see from the geological map that the line of the southern edge of the London Clay is a very irregular one, and yet along it are placed in succession Croydon, Beddington, Carshalton, Sutton, Cheam, Ewell, and Epsom, and numerous smaller towns and villages. These, no doubt, were placed where they are on account of the springs of which I have spoken. On the Chalk, on the other hand, owing, no doubt, to the scarcity of water, not a single large town is to be found, except in the immediate neighbourhood of one of the few streams which now flow through it from the Weald.

In conclusion, I trust that I have been able to make intelligible to you all the facts and problems which I have dealt with this evening. My aim has been throughout to deal with general principles, rather than to go minutely into details, and I think I have shown that there is a very great deal in our immediate neighbourhood which is well worthy of the attention of those of our members who are interested in geology and physical geography. The amount of leisure which I am able to command is unfortunately but small, and I have not therefore been able to make my paper as complete as I should have liked, or to prepare all the diagrams that I had intended, but if my paper has no other effect, it will have helped to call the attention of our members to some matters of great interest, and will, I hope, afford some assistance to those who, like myself, have striven to understand the very remarkable series of changes which have brought our district into the condition in which we now see it.

17.—On Preparing and Mounting for Exhibition Crustacea and similar Objects.

By Edward Lovett.

[*Read December 15th, 1880.*]

Mr. E. Lovett commenced his paper by remarking how few persons had written upon British stalk-eyed crustacea, a fact due, no doubt, partly to the limited area, and partly to the difficulty of obtaining specimens, fishermen generally discarding from their nets everything which was not edible, whilst amateur collectors had few opportunities of dredging for themselves. But by holding out a small inducement to fishermen they could succeed in procuring good specimens; dredgers, trawlers, lobster and crab catchers, and herring men, were the most likely; and at Bournemouth the herring men frequently got some good specimens of a somewhat rare form. Mr. Lovett then went on to say—Lobster pots may be examined with very satisfactory results, and where no fishing of any sort is done it is wonderful what may be taken from a small boat by using a light dredge and tangles, as invented by the captain of the "Porcupine." Lobster pots may be improvised out of old hampers or boxes, and if judiciously worked on good rocky shores should yield many varieties.

We will now pass on to the preservation of these animals. If the specimens cannot be set out at once, or if they are caught by anyone who intends sending them, after some days or weeks, to the person forming a collection, they may be kept in a preservative salt, at present a patent, which hardens and preserves the colour in a marked degree. I hope to obtain the correct composition of this valuable material shortly. Having well soaked the specimen in *fresh* water for ten or twelve hours (except in the case of very hot weather or when decomposition has set in), we proceed as follows: In the case of the macrura, or crabs proper, the carapace should be taken off by cutting round the edge with a knife, the whole of the interior structure removed, and the exoskeleton well washed with fresh water; powdered alum should next be sprinkled over the anterior of the specimen, care being taken that none of it is allowed to adhere to any of the external parts. The specimen should then be laid upon a piece of soft board, and the extraneous moisture removed, the carapace replaced, the legs, antennæ, &c., arranged in the desired position with pins, and the board placed in a good drying locality.

It will now be a question whether the specimen is to be spoilt or not, for if the heat or light be sufficient to act upon the carbonate of lime it will look like a boiled specimen at once, whilst if it be slowly, carefully, and at the same time thoroughly dried, it will always preserve its life-like appearance, if kept in the dark. The reason why the specimens in the show cases of museums cannot keep their colour, but always bleach, is that they are constantly exposed to the light. When the carapace is sufficently thin, cotton wool of a suitable colour may be introduced with great advantage to bring about the desired tint. In the case of lobsters or crayfish, the abdominal segments should be carefully separated from the thorax, and the same treatment followed as in the case of crabs, except that the antennæ should be turned back and not allowed to project forward, in which position they are liable to get broken off; imperfect specimens should always be kept, as two bad ones *of a size* will often make one good one. Small crustacea of all kinds may be set up as they are, but as much as possible of the flesh of even small ones should be removed, as the result is always more satisfactory. The flesh may be got out of the claws of larger specimens by means of an iron wire bent at right angles for about three-sixteenths of an inch and flattened; but if it should be necessary to remove a limb it can be readily replaced with cement. I have never varnished or glazed specimens in any way, but I think that a varnish drying very hard, but with a very slight and colourless glaze, would be of great advantage, and I should be glad to hear if such a varnish is obtainable.

The importance of recording when and where the specimens were caught, the time of year, their size and apparent age, were dwelt upon, as the reader had found that many species considered by Bell and others to be very rare were exceedingly abundant in even limited localities, a sandbank near the Nore yielding numerous varieties presumed to be scarce. The best works on the subject are those by Leach, Milne, Edwards, Bell, and White, with a very useful handbook in Gosse's "Marine Zoology."

In conclusion, Mr. Lovett expressed the pleasure it would afford him to give all the information in his power to any member of the club who required it.

18.—A Table of the Girths, Positions, and estimated Ages of Churchyard Yew Trees in the Eastern Half of the County of Surrey.

By E. Straker.

[*Read December 15th, 1880.*]

N.B.—Of 53 Churchyards visited, 27 possess Yew Trees of noticeable age and 26 do not.

The position of each tree is fixed from its compass bearing from the centre of the Church.

No.	*Name of Parish.*	*Girth. ft.*	*in.*	*Height at which the Girth is taken.*	*Bearing.*	*Estimated age about*
1	Crowhurst	30	6	5-ft.	E.N.E.	1800 years
2A	Tandridge	30	0	,,	W.S.W.	1700 ,,
2B	,,	11	0	,,	N.N.W.	400 ,,
3A	Warlingham	20	6	,,	S.S.E	870 ,,
3B	,,	7	9	,,	S.	250 ,,
3C	,,	17	0	,,	W.S.W.	730 ,,
4A	Farley	19	6	,,	W.S.W.	850 ,,
4B	,,	8	6	,,	N.N.W.	290 ,,
5A	Chelsham	6	0	,,	S.S.W.	200 ,,
5B	,,	7	3	,,	S.E.	245 ,,
5C	,,	4	6	,,	E.S.E.	160 ,,
6	Woldingham	14	0	2-ft.	S.	550 ,,
7	Merstham	6	6	4-ft.	S.S.W.	220 ,,
8	Nutfield	4	6	2-ft.	S.E.	160 ,,
9A	Bletchingley	7	0	5-ft.	S.	240 ,,
9B	,,	5	0	,,	S.W.	175 ,,
10A	Caterham	10	0	4-ft.	S.S.W.	400 ,,
10B	,,	4	0	6-in.	S.S.E.	140 ,,
11	Beddington	10	0	5-ft.	S.S.E.	360 ,,
12	Cheam	5	9	,,	S.S.W.	180 ,,
13A	Banstead	15	3	,,	S.	900 ,,
13B	,,	2	0	1-ft.	S.W.	100 ,,
14	Coulsdon	4	0	3-ft.	W.	140 ,,
15	Chaldon	8	3	5-ft.	W.S.W.	300 ,,
16	Chipstead	22	9	,,	N.E.	1200 ,,
17H	Gatton	7	6	,,	W.	180 ,,
17T	,,	8	0	,,	W.	200 ,,
18A	Sanderstead	16	3	,,	S.S.W.	670 ,,
18B	,,	7	0	,,	S.S.E.	240 ,,
18C	,,	12	3	,,	E.	500 ,,
19	Addington	18	6	,,	W.S.W.	1000 ,,
20A	Limpsfield	13	3	1-ft.	W.	500 ,,

No.	*Name of Parish.*	*Girth. ft.*	*in.*	*Height at which the Girth is taken.*	*Bearing.*	*Estimated age about*
20B	Limpsfield	11	3 ...	5-ft. ...	W.S.W. ...	470 years
21	Tatsfield	16	3 ...	,, ...	E.N.E. ...	700 ,,
22	Ashtead, about...	24	0 ...	,, ...	W.S.W. ...	1400 ,,
23A	Walton-on-the-Hill	7	0 ...	2-in. ...	W.S.W. ...	500 ,,
23B	,, ...	9	6 ...	5-ft. ...	W.S.W. ...	500 ,,
24A	Burstow	13	6 ...	,, ...	S.E. ...	500 ,,
24B	,, ...	9	9 ...	,, ...	E.S.E. ...	400 ,,
25A	Horley	19	9 ...	,, ...	W.N.W. ...	900 ,,
25B	,, ...	23	0 ...	,, ...	W.S.W. ...	1000 ,,
26	Charlwood	21	5 ...	,, ...	S.E. ...	1300 ,,
27	Capel	14	6 ...	,, ...	E.S.E. ...	600 ,,

The bearings to the points of the compass.

4 Trees bear	...	W.	1 Tree bears	...	E.
9 ,,	...	W.S.W.	1 ,,	...	E.N.E.
2 ,,	...	S.W.	1 ,,	...	N.E.
5 ,,	...	S.S.W.	1 ,,	...	N.N.E.
4 ,,	...	S.	0 ,,	...	N.
3 ,,	...	S.S.E.	2 ,,	...	N.N.W.
5 ,,	...	S.E.	0 ,,	...	N.W.
3 ,,	...	E.S.E.	2 ,,	...	W.N.W.

The predominating and average bearing is S.S.W.

There are—

35	Trees having	...	SOUTH bearings
8	,, ...	...	NORTH ,,
28	,, ...	...	WEST ,,
15	,, ...	...	EAST ,,

19.—On the Peculiar Shape of the Claw of the Middle Toe of Birds.

By the President.

[*Read December 15th*, 1880.]

The peculiarly serrated shape of the claw of the middle toe of the Nightjar (C. Europœus) is well known, and many are the ingenious theories which have been framed to account for its peculiar form. The claw of the middle toe is also serrated in the Herons and Cormorants, and in other birds peculiarities in this claw have been noticed. It is not, however, my intention now to go through these in detail, or to endeavour to explain the reason for their peculiarities. I propose on the present occasion merely to point out a matter of some interest, which seems to throw some light upon the peculiarities to which I have referred.

The number of birds in which peculiarities in the claw of the middle toe have been noticed and described is comparatively small, and it is somewhat singular that all naturalists who have dealt with this subject have described these cases as something altogether exceptional, as if, in fact, they were the only birds in which this claw is different from the others. I believe, however, that a close and exhaustive examination of the feet of birds would show that there are very few, if any, birds in which the claw of the middle toe is not more or less modified in form. The outside edge of this claw, as a rule, is not peculiar, but the inside edge is so far modified that it is easy to tell whether any particular foot is a right foot or a left foot by this peculiarity alone.

The series of birds' feet which I have here, and which comprise numerous examples from each of the five orders into which British birds are divided, will make this very clear. In all of them the inside edge of the middle claw is much developed and altered in shape.

It would be dangerous to attempt to frame a theory to account for this peculiarity until the matter has been more fully considered and investigated, but I hope our members will not lose sight of this subject, and if any remarkable modification of this claw should come under their observation they should not fail to bring it forward at one of our meetings.

RULES.

Title and Objects of the Club.

The Club shall be called "THE CROYDON MICROSCOPICAL AND NATURAL HISTORY CLUB," and shall have for its object the mutual help of its Members in the study of Microscopy and Natural History, the investigation of the Meteorology, Geology, Botany, and Zoology of the neighbourhood of Croydon and the County of Surrey, and the dissemination amongst its Members of information on the subjects of Microscopy and Natural History.

Management of the Club.

The business of the Club shall be conducted by a President, Treasurer, and Hon. Secretary *(ex-officio)*, and a Committee of nine Members, who shall be elected by ballot at the Annual General Meeting, three to form a quorum. The office of President shall not be occupied by the same Member for more than two years in succession.

Membership.

1.—Every candidate for Membership shall be proposed by two or more Members, one of whom, at least, shall have a personal knowledge of him, and who shall sign a certificate in recommendation of him, according to the form appended. The certificate shall be read from the chair, and the candidate therein recommended balloted for at the following meeting. One black ball in five to exclude.

2.—The Annual Subscription shall be 10s., payable in advance on the 1st of January (or on election, if previous to November), and no person shall be entitled to the privileges of the Club until his Subscription shall have been paid.

3.—Distinguished men may be elected Honorary Members of the Club; such Honorary Members shall not be subject to any of the expenses of the Club, and shall have no vote in its affairs.

4.—In order to encourage the study of Microscopy and Natural History amongst mechanics, &c., residing in the district, individuals of that class may be admitted as Associates, provided they shall first communicate some original information or observation on Microscopy or Natural History, or exhibit such specimens as shall, by their merit, satisfy the Committee. Such Associates shall enjoy the privileges of Honorary Members.

5.—No Member shall be considered to have withdrawn from the Club until he shall have paid his arrears, and given a written notice to the Secretary of his intention to resign.

6.—If it shall be thought desirable to expel any Member from the Club, the same shall be done by a resolution of the Committee, which shall be read at the next ordinary meeting; and at the following meeting a ballot shall take place with respect to the proposition, and if two-thirds of the Members present shall vote for such Member's expulsion, he shall no longer be considered a Member.

7.—Any Member may introduce a visitor at an ordinary meeting, who shall enter his name, with that of the Member by whom he is introduced, in a book to be kept for that purpose.

Ordinary Meetings.

1.—The ordinary meetings of the Club shall be held on the third Wednesday in every month (excepting the months of June, July, and August), at seven o'clock in the evening; the chair to be taken at half-past eight precisely; or at such other times as the Committee may appoint.

2.—The ordinary course of proceedings shall be as follows:—

I.—The minutes of the previous meeting shall be read and submitted for approval as being correct.

II.—The names of candidates for Membership shall be read, and the ballot for the election of Members shall take place.

III.—Scientific communications shall be read and discussed; after which the chair shall be vacated, and the meeting shall resolve itself into a conversazione, to terminate at ten o'clock.

3.—In the absence of the President, the Members present at any ordinary meeting shall elect a Chairman for that evening.

4.—No paper shall be read which has not received the sanction of the Committee; and, whenever it is possible, early notice of the subject of the papers to be read shall be given by the Secretary to the Members. No paper shall exceed twenty minutes in the actual reading, unless by the special permission of the Chairman.

5.—In addition to the above ordinary meetings, others, for conversation and the exhibition of Microscopical objects and Natural History specimens, shall be held on the first Monday in each month, at eight o'clock in the evening.

Business Meetings and Election of Officers.

1.—The accounts of the Club shall be audited by two Members appointed at the ordinary meeting in December. No member of the Committee shall be eligible as an Auditor.

2.—At the same meeting, notice of the Annual Meeting in January shall be given from the chair.

3.—An Annual Meeting of the Club shall be held, in the place o the ordinary meeting, on the third Wednesday evening in January, at half-past eight o'clock, when the election of officers for the year ensuing shall take place, and the report of the Committee on the affairs of the Club, and the balance sheet, duly signed by the Auditors, shall be read.

4.—No permanent alteration in the Rules shall be made, except at one of the monthly meetings of the Club, and notice of any proposed alteration or addition must be given at or before the preceding ordinary meeting.

Form of Certificate for Election of Members.

Croydon Microscopical and Natural History Club.

Mr. ....

of ....

being desirous of becoming a member of this Club, we beg to recommend him for election.

(on my personal knowledge.)

This Certificate was read 188

The Ballot will take place 188

NOTE.—Original Rules drawn and adopted at a Meeting held March 16th, 1870.

Rules as to Election of Officers and number of Committee-men revised January, 1872.

Rules as to Payment of Subscriptions and establishment of Conversational Meetings revised and adopted January, 1876.

Rules as to Tenure of Office by the President of the Club, and as to Election of Members revised January, 1877.

Addition to title of Club made January, 1877.

Further Alterations made April, 1879.

LIST OF BOOKS,

THE PROPERTY OF THE CLUB.

American Entomology ...	*Say.*
Botany ...	*Sachs.*
British Diatomaceæ (2 vols.) ...	*Smith.*
British Flora (2 vols.) ...	*Bentham.*
British Land and Fresh Water Shells ...	*Turton.*
British Rainfall (7 vols.) ...	*Symons.*
Cryptogamic Botany ...	*Berkeley.*
Foraminifera ...	*Carpenter.*
Fresh Water and Marine Algœ ...	*Nave & Spicer.*
Human Microscopic Anatomy...	*Köllicker.*
Lectures on Histology ...	*Quekett.*
Marvels of Pond Life ...	*Slack.*
Memoirs of N. L. Austen ...	*Buckland.*
Microscope, The Achromatic ...	*Beck.*
Microscope, How to work with the ...	*Beale.*
Microscope, Treatise on the use of the ...	*Quekett.*
Microscope, The... ...	*Carpenter.*
Microscope, The (ed. 1875) ...	*Carpenter.*
Microscopical Manipulation ...	*Suffolk.*
Microscopical Objects, The Mounting and Preparation of ...	*Davies.*
Natural History Specimens, Notes on Collecting and Preserving ...	*Taylor.*
Natural History of Selborne ...	*White.*
Polarized Light ...	*Woodward.*
Spectrum Analysis ...	*Suffolk.*

Journal Royal Microscopical Society.

Journal Quekett Microscopical Club.

Reports of the Clubs and Societies in Correspondence.

Science Gossip.

SOCIETIES & CLUBS IN CORRESPONDENCE.

Royal Microscopical Society.

Berwickshire Naturalists' Field Club.

Brighton and Sussex Natural History Society.

Colchester Natural History Society.

Eastbourne Natural History Society.

East Kent Natural History Society.

Epping Forest and County of Essex Natural Field Club.

Geologists' Association.

Greenwich Microscopical and Natural History Society.

Hackney Microscopical and Natural History Society.

Hertfordshire Natural History Society.

Margate Microscopical Club.

New Cross Microscopical and Natural History Society.

Northampton Natural History Society.

Quekett Microscopical Club.

Societe Belge de Microscopie.

Societe Royale Malacologique de Belgique.

South London Microscopical and Natural History Club.

Sydenham & Forest Hill Microscopical & Natural History Club.

Tower Hill Microscopical Club.

West Kent Natural History, Microscopical, and Photograph Society.

West London Scientific Association and Field Club.

LIST OF MEMBERS

(Revised to June, 1881.)

~~Adams T. Rutherford, M.D., St. James' Road~~
Adamson William, jun., Mavis Bank, Park Hill Rise
Allen Rev. Francis A., 118, Waddon New Road

Backwell Richard, 2 Lawn Cottages, Sunnybank, S. Norwood, S.E.
Baddeley J., jun., 60 London Road
Bailey Edwin, Lansdowne Road
Baker Samuel, Lansdowne Road
Baldiston Frederick, Glastonbury Lodge, Sydenham Road
Baldock J. H., F.C.S., 3 High Street, South Norwood, S.E.
Barnes Thos. H., M.D., Lynton Villa, St. James' Road
Baynes W. W., D.L., J.P., Whitehorse Road
Beeby William H., F.R.M.S., 14 Ridinghouse Street, London, W.
Bennett Arthur, 107 High Street
Berney Edward, M.R.C.S., 58 North End
Berney John, F.R.M.S., 61 North End
Blackett Rev. H. Field, St. Andrew's Vicarage, Bramley Hill
Blades William, Oakdene, Park Hill Road
Blake W. J., jun., High Street
Bogle-French Nat., 57 Strand, London, W.
Bonella John, Duppas Hill
Bonus C. W., Oakwood House, Sydenham Road
Bridgman J. H., M.R.C.S., London Road, Broad Green
Brock Geo. E., South Park Hill Road
Brodie Robert, M.A., George Street
Browne Lewis, 95 Wellesley Road
Brewer J. G. B., Havelock Road
Buck James, 63 High Street
Budd Percy, High Street
Burbidge W. H., Stanley House, Alleyn Park, West Dulwich, S.E.

Carpenter Alfred, M.D., J.P., Duppas House
Carpenter A. B., Duppas House
Carter Jas. A., Reedham, Coulsdon, Surrey
Chambers W. E., J.P., Eversfield, Sutton
Cheeswright Fred., St. Peter's Road
Cheshire William, Stirling Villas, Sutton
Chisholm Jas., Highbury Villa, Nicholson Road
Chumley John, Langford House, Havelock Road
Clarke Josiah, 20 George Street
Cleaver H. A., M.R.C.S., 40 North End
Close H. J., Addiscombe Road
Coates W. N., Fairfield Road
Compton Thomas, Mitcham
Cooper Richard, 4 George Street
Cooper Walter, 4 George Street
Cooper W. Reeve, Oakfield Road
Cooper C., Dingwall Road
Corden George, F.M.S., 53 High Street

Corry John, Rosenheim, Park Hill Road
Cowan J. G., 42 St. James' Road
Cowdell H. S., Bramley Hill
Crowley E. A., 62 High Street
Crowley Jonathan S., 3 Park Hill Rise
~~Crowley Philip, Waddon House~~
~~Curling George, Elgin House, Addiscombe Road~~
Cushing Thomas, F.R.A.S., Woodstock Villa, Alexandra Road

Dade Wm. C., 34 Outram Road, Addiscombe
Davies Arthur Capel, Arundel Road, Duppas Hill
Davis A. M., 17 Morland Road
Dickens Richard Joseph, Addiscombe Road
Dickinson William, M.A., F.G.S., Warham Road
Dix T. H., 36 High Street
Drage John, Tamworth Road
Drummond A. W. B., 15 Dingwall Road
Drummond H., 15 Dingwall Road
Drummond William, 76 North End
Duke Thomas Jeffrey, Queen's Road
Dukes Charles, M.D., Wellesley Road
Duncan P. T., M.D., Putney, S.W.
Duncan W. A., M.D., 24 George Street

Eastty Alfred, Addiscombe Grove
~~Eaton H. S., M.A., F.M.S., Chepstow Road~~
Edridge T. R., J.P., The Elms, High Street
Emery John, 15 Dagnall Park, South Norwood, S.E.
Emmett W. H., Lynton Villa, Whitehorse Road
Epps W., jun., Biggin Wood House, Upper Norwood, S.E.
Evans Henry, M.R.C.S., F.S.A., 64 High Street

Fagg Edward, Clarence Lodge, Canning Road
Field William, Oval Road Schools
Flower John, M.A., F.Z.S., Fairfield Road
Footit W. F., Oxford Lodge, Whitehorse Road
Freeland A., jun., Fairfield Road
Frewer J. R., Lower Addiscombe Road
Frisch George, Katharine House, Addiscombe
Frith John, 2 Oaklands, Park Hill Road
Fuller W. J., The Retreat, Sutton

Geldart Rev. E. M., 3 Denbigh Villas, Lower Addiscombe Road
Gardner Maitland, Fairfield Lodge, Park Lane
Gibson John, Canning Lodge, Addiscombe Road
Gill Edmund, Linn Villa, Sutton Hill, Sutton
~~Grundy Charles, Melton Lodge, Havelock Road~~

Haddock Roland, Park Hill Road
Hall G. H., Elmer's End, Beckenham
Hall Robert, Garth Villas, Addiscombe
Hanscomb B., Charlton Villa, Clarendon Road
Hart P., Lyndhurst, Fairfield Road
Harwood W. H., Glebelands, Mitcham

Hawker Rev. John Kingscott, 69 Croydon Grove
Hebb W. H., Heathfield Road
Henman Charles, jun., 6 Acacia Villas, Oakfield Road
Hibberdine H. D., Oakfield Road
Hinton James T., M.D., High Street
Hodges O. T., Yester Road, Chislehurst
Holah Ernest, 1 & 2, Fish Street Hill, London, E.C.
Horsley Henry, M.R.C.S., London Road
Hovenden C. W., 93 City Road, London, E.C.
Hovenden R. G., Heathcote, Park Hill Road
Hovenden T., Arbor End, Selhurst Road, South Norwood, S.E.
Hudson Robert, F.R.S., J.P., Clapham Common, S.W.
Hulbert John, Fairfield Road
Hyslop William, Dingwall Road

Ingham, Charles B., Moira House, Addiscombe
Ingrams William, Whitgift Schools, Church Road

Jaques John, Duppas Hill
Jarrett C., St. John's Grove
~~Jenkins B., Derwent Villas, Outram Road~~
Johnson J. S., M.R.C.S., 105 High Street
Jones E. F., 34 Eastcheap, London, E.C.
Justican J. W., Moreton Villa, Outram Road

Kemp-Welch Henry, 18 Billiter Street, London, E.C.
Klaassen H. M., F.G.S., 2 Chepstow Road

Laing R. A., St. Peter's Road
Lambert A., jun., High Street
Lambert Stampa W., Sydenham Road
Lanchester Henry, M.D., Park Lane
~~Lane Harry, Havelock Road~~
Lashmar Charles, M.D., Wellesley Road
~~Latham Baldwin, C.E., Park Hill Rise~~
Lee Henry, F.L.S., F.G.S., F.R.M.S., Ethelbert House, Margate
Lee Harry, 43 Holland Street, Blackfriars Road, London, S.E.
Lee J. R., 115 High Street
Ley J. H., Exotic Nursery, London Road
Linney Geo. F., Saffron Walden, Essex
Linton Henry, Oakwood, Duppas Hill
Lister Charles H., Addiscombe Road
Loftus T., Lower Addiscombe Road
Long Henry, 90 High Street
Lovett Edward, Holly Mount, Addiscombe Road
Ludlam Felix, Shirley, Surrey

McKean Kenneth, Warham Road
Mackenzie David, Beulah Road Schools, Thornton Heath
Major Charles M., Duppas Hill Terrace
Malleson W. T., Duppas Hill
Manners Charles, Dingwall Road
Manners George, F.L.S., F.S.A., 26 Dingwall Road
Marshall Edward, M.R.C.S., Church House, Mitcham

Marks S. G., 78 Church Street
Marks J. G., 115 Waddon New Road
Martin Howard, Havelock Road
Martin Richard, Chepstow Road
Mather C. W., Dingwall Road
Mawley Edward, F.M.S., Outram Road
Mawson Matthew, Albert Road, South Norwood, S.E.
Mead Frank, Sutton, Surrey
Melliss W. J. M., St. Clair, Addiscombe Road
Mennell H. T., Park Hill Rise
Miller William F., Havelock Villas, Havelock Road
Mitchiner J. H., Burgos House, Sydenham Road North
Mitchell E., Laurel Cottage, St. James' Road
Moore John, Oakwood, Park Hill
Morland Charles C., Rastrick Lodge, Morland Road
Morris A., Beddington, Surrey
Morton Shadforth, 4 George Street
Moules Edward R., Whitgift Lodge, Wellesley Road
Moules Henry, Wellesley Road
Muggeridge T. Benjamin, The Vale, Sydenham

Nash F. W., Rochfort, South Norwood, S.E.
Nation W. J., 1 Clifton Villas, Thornton Heath
Newberry George, Station Road, South Norwood, S.E.
Newton Charles, Crossland Villa, Broad Green
Nicholls Alfred, Roslyn Grange, Park Hill Rise
Noakes Henry, Poplar Cottage, St. James' Road

Odling A., Wickham House, Oakfield Park
Oldfield John, 16 Tamworth Road
Oswald H. C., Duppas Hill
Oswald John C., Duppas Hill
Owen Hugh R., London Road
Overton S., Selsdon Road
Owst Robt. Clement, 51, Thornton Heath

Packham James, Katharine Street
Page Joseph, 4 Derby Houses, Derby Road
Paget Peter, Coombe Lane
Parsons Franklin, M.D., F.G.S., 18, Whitworth Road, S. Norwood, S.E.
Peek Sir Henry W., Bart., M.P., Wimbledon
Pelton John, Stroud Green Lane
Petherick H. W., Maple Lodge, Havelock Road
Phillips James, 28 Lansdowne Road
Philpot Charles W., M.D., 13 Wellesley Road
Podmore H. R. B., Bramley Hill
Pope Michael, Chatsworth Road, Park Lane
Price George N., High Street
Price Herbert D., Highfield, Addiscombe Road
Puddicombe Beynon, 10 Elgin Road
Puxon E. W., Wintons, Park Hill Road
Pye-Smith Arnold, 6 Elgin Road

Ranger A. Washington, Warham Road

Reid George, Havelock Road
Rich Alfred William, 1 Wellington Terrace, St. James' Road
Richardson T. A., 24 London Road
Ridge Byron, 60 North End
Roberts Rev. George R., D.D., The Limes, High Street
Roberts H., 3 Reigate Villas, Sutton
Robinson G. E., Lee Villas, Canning Road
Robinson W. Mosse, Kenley, Surrey
Roby R. F., Shirley House, Selhurst, S.E.
Rosser Walter, M.D., George Street
Rowlands Percy T., F.R.G.S., Hillside, Addiscombe
Rowland William H., Tavistock Road, Bedford Park
Rowland William, Tavistock Road
Russell William J., Waddon New Road
Rymer James, London Road
Rymer S. L., George Street

Serjeant W. Low, 11 Walter's Road, South Norwood, S.E.
Simons George, Beddington Lane, Mitcham
Smith Henry T., 6 Thornhill Road
Smith William F., Belfort, Park Hill Rise
Spencer John, The Grange, Sutton Common, Sutton
~~Stanley W. F., South Norwood, S.E.~~
Steele Joseph, L.D.S., M.R.C.S., London Road
Stevenson Albert, Brighton Road, Sutton
Straker E., Hazelshaw, Kenley, Surrey
~~Strong Henry J., M.D., North End~~
Sturge Edward B., The Waldrons
Swaine J. C., Park Hill Road

Taylor A. D., 22 Dingwall Road
Thompson Francis, St. Peter's Road
Thompson Dr., 8 Addiscombe Villas, Lower Addiscombe Road
Toms Joseph, Lychett Villa, Tavistock Road
Toms J. A., 2 Masham Villas, Clyde Road
Topley William, F.G.S., Hurstbourne, Elgin Road
Turner Charles Price, The Chestnuts, North End
Turner Henry, The Chestnuts, North End
Tylor Alfred, F.G.S., Shipley House, Carshalton
Twentyman Alfred, Park Hill Road

Walker Thomas, Waddon Road
Wallace A. C., Leigham Court Road West, Streatham, S.W.
Wallis J. W., Lansdowne Road
Walton A., Tavistock Road
Walton Francis M., 6 Canterbury Villas, London Road
Ward Jesse W., Katharine Street
Warner A., 2 Grosvenor Villas, Holmesdale Road, Selhurst, S.E.
Warren Francis, Fairfield Road
Waterall Nathaniel, Waddon Lodge
Wenham William P., 80 Church Street
West Frederick, The Waldrons
Whealler G. Anson, Elgin Road
Whitling Henry T., F.R.C.S., F.R.M.S., High Street

Williams Edwin, 3 Wellesley Villas, Wellesley Road
Wise Charles, Bramley Hill
Woodward John, 1 Lee Villas, Canning Road
Wormald Edward, Woodcote Hall, Carshalton
Wright James S., Duppas Hill Terrace

Youle A. P., Chepstow Rise

HONORARY MEMBERS.

Cole R. Beverley, M.D., San Francisco, California, U.S.A.
Evans John, D.C.L., F.R.S., Hemel Hempstead, Herts
Flower, W. H., LL.D., F.R.S., Royal College of Surgeons, Lincoln's Inn Fields, London
Prestwich Joseph, 34 Broad Street, Oxford

ASSOCIATE.

Collyer Edward B., Selsdon Road

6

PUBLICATIONS OF THE CLUB.

PRICE ONE SHILLING EACH.

Professor John Morris, F.G.S., &c.

LECTURE ON THE GEOLOGY OF CROYDON

IN RELATION TO THE GEOLOGY OF THE

LONDON BASIN AND OTHER LOCALITIES.

With Map, Coloured Geologically.

DELIVERED BEFORE THE MEMBERS, FEBRUARY 17TH, 1875.

Professor T. Rupert Jones, F.R.S., F.G.S., &c.

LECTURE ON THE ANTIQUITY OF MAN,

ILLUSTRATED BY THE

CONTENTS OF CAVES AND RELICS OF THE CAVE FOLK.

DELIVERED BEFORE THE MEMBERS, APRIL 26TH, 1876.

Croydon Microscopical and Natural History Club.

OFFICERS FOR 1881.

President:

PHILIP CROWLEY, F.Z.S.

Treasurer:

JOHN FLOWER, M.A., F.Z.S.

Committee:

A. CARPENTER, M.D., J.P., F.R.M.S.
JAMES CHISHOLM.
THOS. CUSHING, F.R.A.S.
J. S. JOHNSON, M.R.C.S.
EDWARD LOVETT.
GEO. MANNERS, F.S.A., F.L.S.
H. T. MENNELL.
A. D. TAYLOR.
HENRY TURNER.

Hon. Secretary (pro tem.):

KENNETH McKEAN.