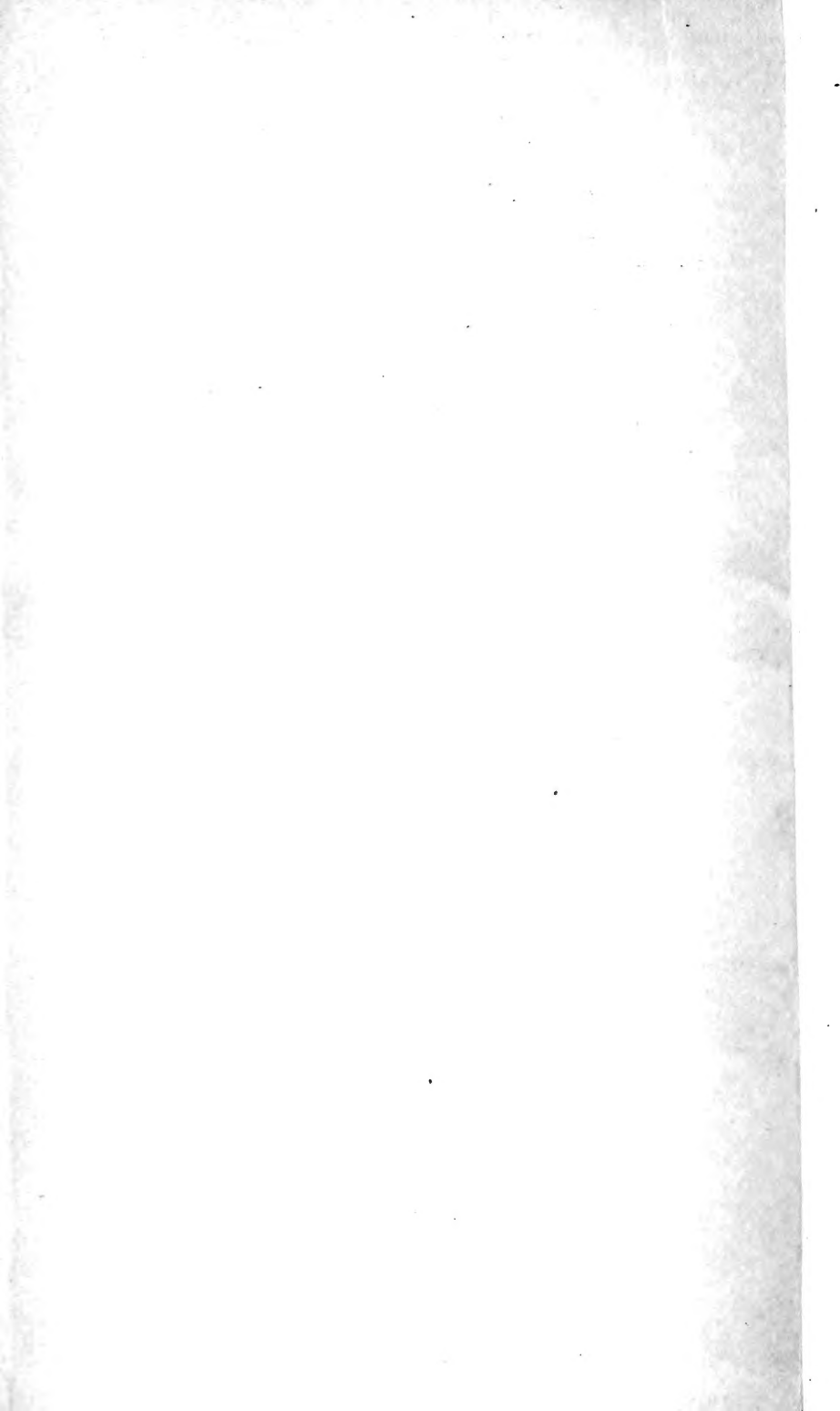
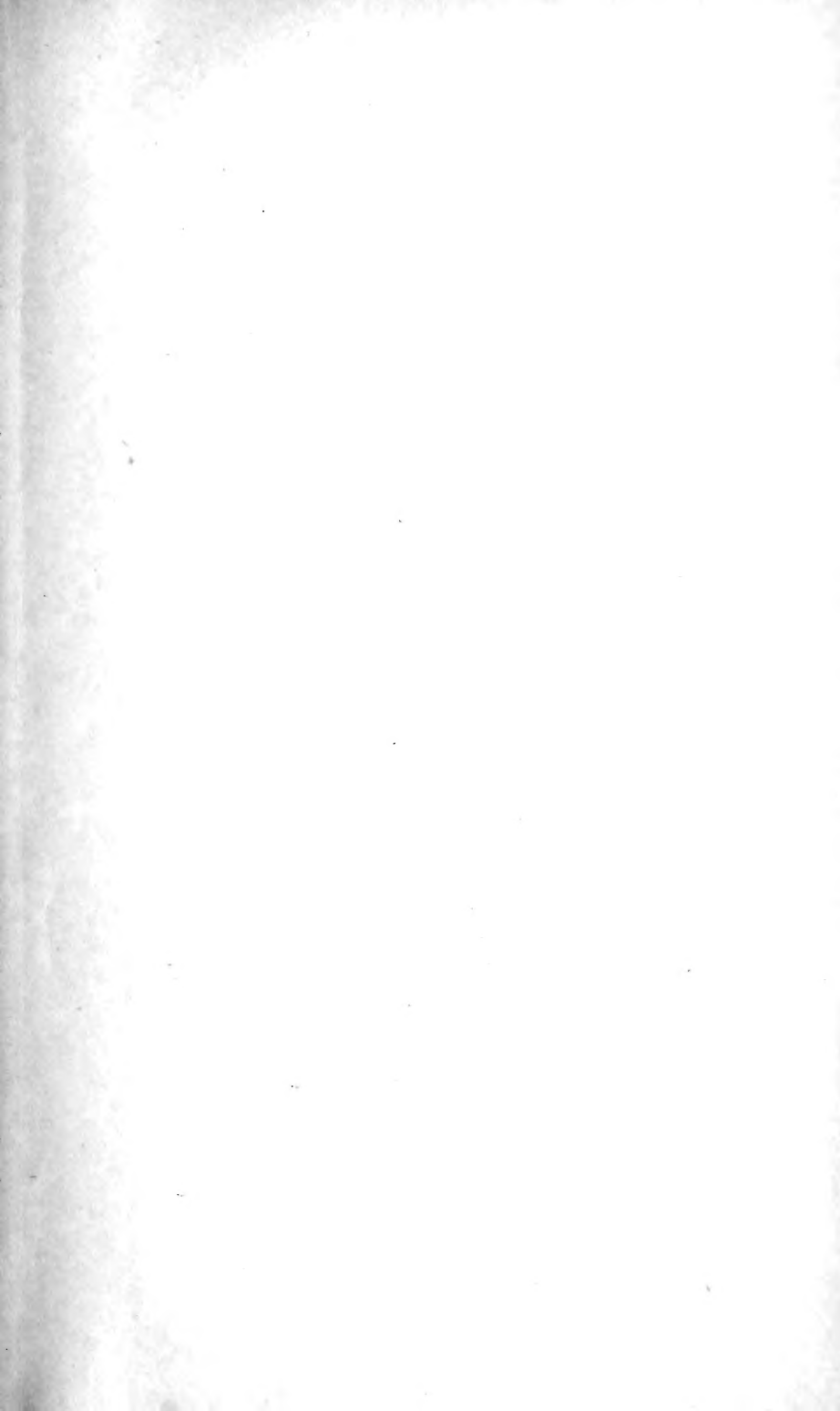


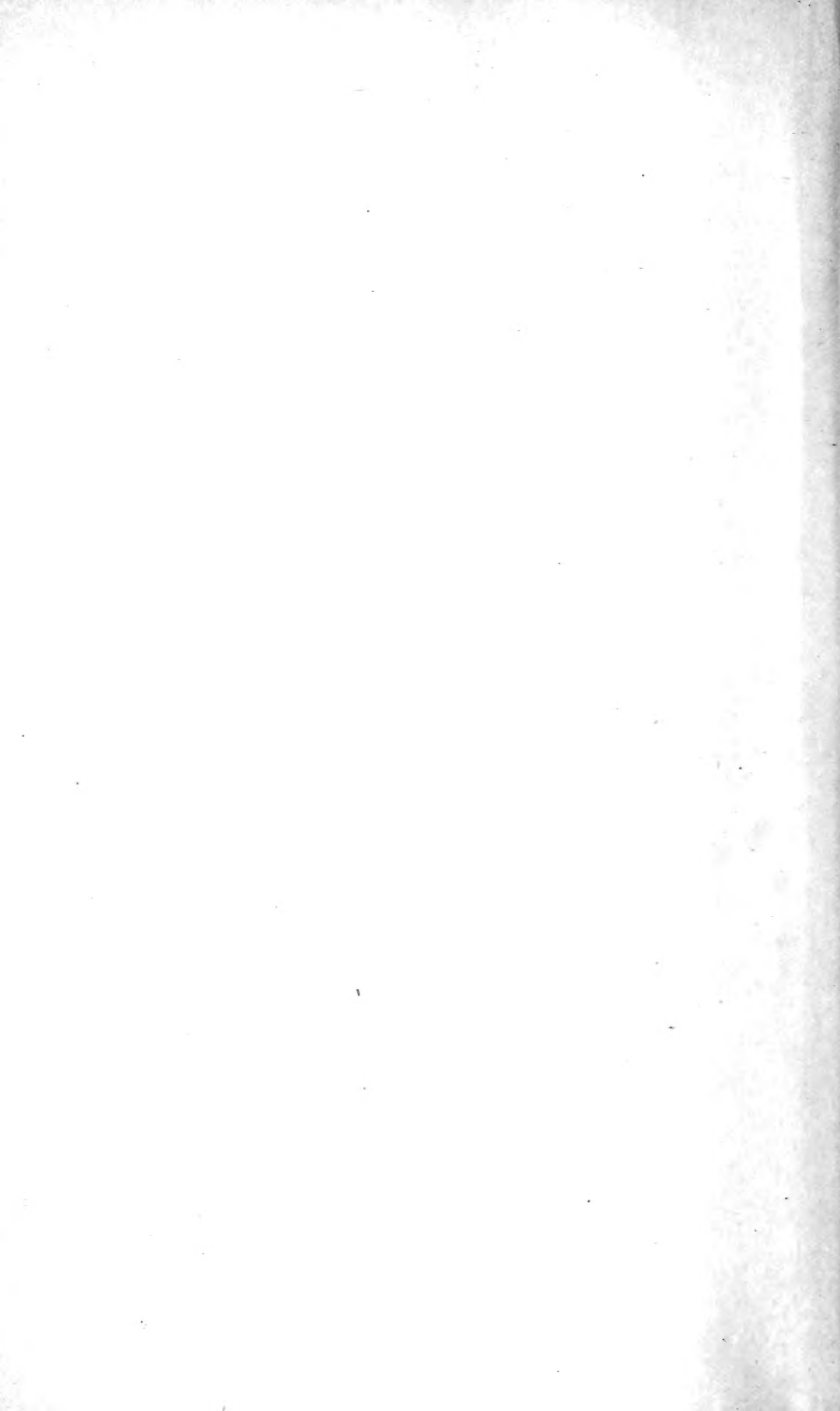
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TRANSACTIONS OF THE
CARDIFF NATURALISTS' SOCIETY

VOL. XLVIII

1915



Science
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Cardiff Naturalists' Society

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REPORT
AND TRANSACTIONS

VOL. XLVIII

1915

The Price of the Transactions is Ten Shillings and Sixpence



PRINTED FOR THE SOCIETY BY
WILLIAM LEWIS (PRINTERS), LTD., CARDIFF
1916

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CONTENTS

VOL. XLVIII. 1915

	PAGE
In Memoriam—	
ROBERT DRANE, F.L.S. D. R. PATERSON - -	1
THOMAS HENRY THOMAS, R.C.A. JOHN BALLINGER	5
The Coleoptera of Glamorgan. Concluded from Vol. XLVII. J. R. LE B. TOMLIN, M.A., F.E.S. -	17
On a Boring for Water at Roath, Cardiff; with a note on the underground structure of the Pre-Triassic Rocks of the Vicinity. F. J. NORTH, B.Sc., F.G.S.	36
Land Mollusca in the Vale of Glamorgan. J. DAVY DEAN - - - - -	50
Ornithological Notes, 1915. T. W. PROGER, D. R. PATERSON, and G. C. S. INGRAM - - - -	59
Entomological Notes, 1915. H. M. HALLETT, F.E.S. -	71
Meteorological Observations in the Society's District, 1915. E. WALFORD, M.D., F.R.Met.Soc. - -	75
Biological and Geological Section. Report and State- ment of Accounts for the Twenty-Eighth Session, 1914-15 - - - - -	97
Archæological Section. Report and Statement of Accounts for the Session 1914-15 - - -	101
Photographic Section. Report and Statement of Accounts for the Fourth Session, 1914-15 - -	103

CONTENTS (CONTINUED)

	PAGE
Report of the Council, 1914-15 - - - - -	107
Statement of Accounts for the Year ending September 30th, 1915 - - - - -	112
List of Members of the Society, and of the Sections, on Service with His Majesty's Forces at 1st January, 1916 - - - - -	114
List of Past Presidents of the Society - - -	116
Officers and Council of the Society, 1915-16 - -	117



ROBERT DRANE, F.L.S.

BORN 1833. DIED 1914.

ROBERT DRANE, F.L.S.

BORN 1833. DIED 1914.

By the death of Mr. Drane there passed away a figure well known as field naturalist and antiquarian who rendered useful service both to the Society and to the community at large. He was one of three original members who founded the Society in 1867, was its first life member, and its President in 1907. For a long term of years he served on the Committee, taking an active interest in its affairs and giving valuable help by his counsel, more particularly in the subjects which he had made his own.

The son of a Congregational minister of literary tastes, Robert Drane was born at Guestwick in Norfolk. He was apprenticed to a provincial chemist at a time when a knowledge of botany and chemistry was deemed an important part of the training. To the last he remained one of the old school which has almost disappeared before the manufacturing druggist of the present day, and when he established himself in business in Cardiff he kept up the old practice—at that time general among provincial chemists—of giving advice on minor ailments, a custom which made him well known to the general public.

Robert Drane's taste for natural history appeared early and was probably developed by the training in botany which he received. Soon after settling in Cardiff he instituted a class for the study of field botany, which he conducted twice a week at 7.0 a.m. in the Sophia Gardens. As a young man he had made a reputation as an entomologist, for his name is found in Stainton's "Entomologist's Annual" from 1856 to 1860, and he assisted that author with specimens in the preparation of his work on the "Natural History of the British Tineina (Micro-Lepidoptera)." He took a keen interest in ornithology. He made a collection of the birds of the locality, many of which he stuffed himself and presented to the Museum. Two

species recorded by him—Rusty Grackle (an American bird) and Pallas' Great Grey Shrike—appeared for the first time in the British list. His extensive local knowledge enabled him to render excellent service as a member of the Society's Committee in the preparation of the "Birds of Glamorgan." His paper on the "Eggs of the Common Guillemot and Razor Bill," illustrated by a valuable series of coloured plates, was a notable contribution to the Society's Transactions (Vol. XXXI.).

A paper which attracted some attention was "The Hare in Captivity" (Transactions, Vol. XXVII.), in which he discourses in his characteristic style on the habits of a pet hare which he had reared. But his most important contribution to natural history was his discovery of the Skomer Vole, *Evotomys skomerensis*. Drane was undoubtedly the first to draw attention to this small mammal as a new species. On a visit to Skomer, a small island off the Pembrokeshire coast, in 1897, he found the vole and recognised that it showed certain differences from the ordinary bank vole, and he recorded this observation in the Transactions, Vol. XXXI. A further visit was paid to the island in the following year, and having secured living and dead specimens, he showed them at a meeting of the Biological Section, and also sent them to the Linnean Society and the British Museum. In a second paper (Transactions, Vol. XXXIII.) dealing with the subject, he wrote, "An authority at the British Museum, South Kensington, says that these Skomer voles are a 'local variety' of the bank vole. Well, I am not convinced," and he went on to enumerate his reasons. Soon afterwards, in 1900, a monograph by Miller on the continental distribution of these small mammals threw fresh light upon the subject and prepared the ground for a paper in 1903 by the late Capt. Barrett-Hamilton, which definitely settled the specific character of Drane's vole under the name of *Evotomys skomerensis*. It is abundantly clear that much of the credit for this notable addition to the British list is due to Mr. Drane's accurate observation.

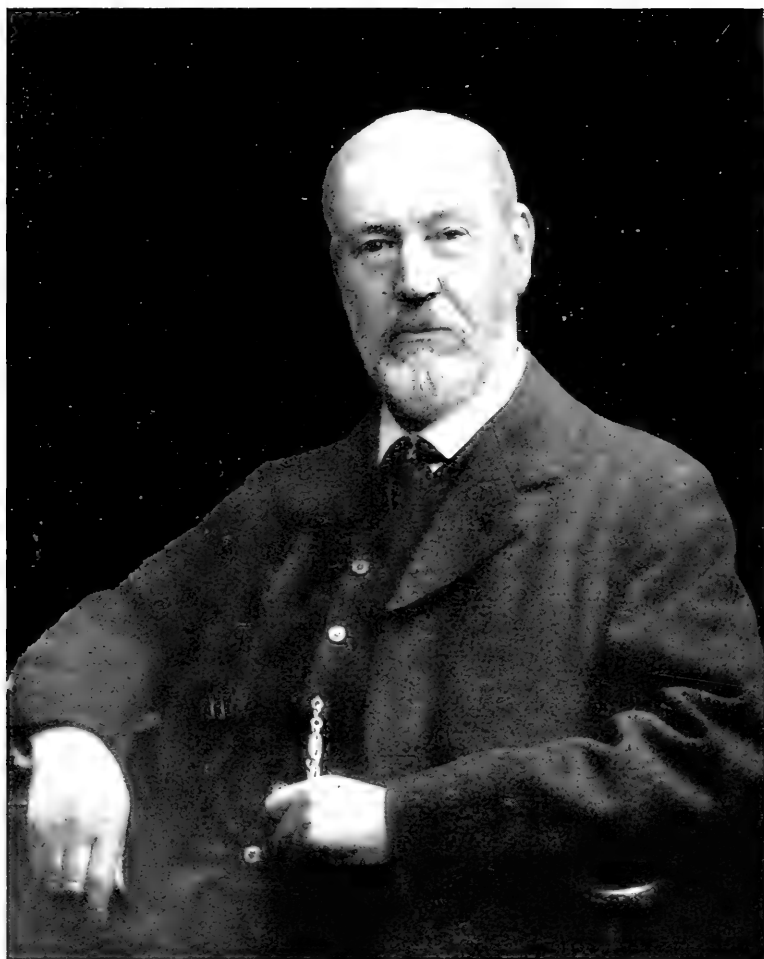
It is, however, as an antiquary that Mr. Drane was best known to the general public. His bent of mind ran largely in that direction. On settling down in South Wales he set himself to study the examples of Norman defensive architecture in the neighbourhood. In 1857 he published a small quarto brochure on Castell Coch—a gossiping guide to the ruins, as he called it—which is quite a literary curiosity. The view and plans of the castle are from drawings by his sister, Miss Drane. Dressed in the costume of James I. period, he acted as guide to the ruins on the occasion of a field meeting of the Society at Caerphilly Castle. Much interested in articles which formed the personal belongings of ladies and gentlemen of the period of James I. he brought together a large series of them. Old silver and other spoons, old English drinking vessels, early English needlework were among his hobbies. But it was to the department of ceramics that he devoted most of his attention. He helped in the production of Turner's "Ceramics of Swansea and Nantgarw" (published in 1897) and he wrote for that work the appendix on the "Mannerisms of the Artists." This contains some conclusions which there is reason to think he abandoned later. He was an undoubted authority on Worcester china, and he possessed one of the three typical collections in the country. Fifteen years ago he lent a selection of this porcelain to the Museum and compiled an interesting catalogue to it. This attracted a large number of visitors and connoisseurs, who referred to it in the highest terms. He had the gift of arranging all his collections in such a way as to give them a high educational value. Those who were privileged to see them at the Cardiff Exhibition and at the Society's conversazioni, illustrated by his explanatory notes, were impressed by the thorough grasp he had of his subject.

He rendered important service on the Museum Committee almost from its inception. He early realised the importance of making the institution a local museum and not merely a receptacle for curiosities of interest, and he ever kept this aspect before his fellow-members. As one of the Honorary

Curators he was always consulted in the purchases for the Antiquities Section. He was at his best in stating his reasons for recommending any article. He often wandered from the point, but his digressions were always most interesting and enlivened by witty sallies. In 1895-7 he presented several pieces of Welsh porcelain and pottery, most of which he had in his possession for years. From 1903 onwards he gave many pieces for the collection of old English pottery and added some articles to the "Byegones" Section. His advice was constantly in request by people interested in ceramics, and not a few of the leading authorities in the country were amongst his visitors at Cardiff.

To the end his mind retained its youthful keenness and enthusiasm. His knowledge covered a wide field, and he always approached the many things he studied from the comparative and evolutionary point of view. His conversation was therefore always interesting, whilst his quaint and discursive mannerisms gave it additional piquancy. Although his life was a somewhat lonely one, it was happily filled in by many interests. In the field he would forget his years, and would walk and climb like a young man. He was at home at the meetings of the Biological Section, of which he was a valued member. Always sure of a sympathetic audience, and having wide powers of observation, he never failed to contribute materially to the discussions and to enhance the usefulness of the proceedings.

D. R. PATERSON.



THOMAS HENRY THOMAS, R.C.A.

BORN 1839. DIED 1915.

THOMAS HENRY THOMAS.

BORN 1839. DIED 1915.

By the death of Thomas Henry Thomas, the Cardiff Naturalists' Society has lost one of its most loyal and accomplished members, who for nearly forty years, unobtrusively and with a charm all his own, contributed to the carrying out of the Society's aims, and to the pleasure of his fellow-members.

It is impossible in a short account to do more than indicate the main outlines of a life so full of achievement and interesting associations. I propose, therefore, to give only the outstanding features of his life and work, except in so far as his activities concern the work of the Society.

"Thomas Henry" as his intimates always called him, was born at the Baptist College, Pontypool, on the 31st March, 1839. His father, the Rev. Thomas Thomas, D.D., was Principal of that College for forty-one years, 1836-1877. Dr. Thomas was born at Cowbridge, but his father, a farmer, removed to Leckwith Bridge, near Cardiff, in the first decade of the 19th century. Dr. Thomas married Miss David, member of a well known and highly respected Cardiff family, so that Thomas Henry was closely associated with Cardiff through both his parents.

Thomas Henry's early education was obtained at home under the direction of his father. Later he went to an Academy kept by Dr. Bompas at Fishponds, Bristol, and attended the Bristol School of Art, where he won a national medal for design. Electing to follow an art career, he went (1858) to London, and entered Carey's School, Bloomsbury, proceeding to the Royal Academy Schools, and afterwards to Paris and then to Rome and other parts of Italy.

In the Royal Academy Schools Thomas studied under artists of the older tradition, and also those of the new epoch

in English Art just bursting into life. Under the system then in vogue at the Academy Schools, a month under Maclise was followed by similar periods under Millais, or Frith, Leighton, or Mulready. He describes the instruction he received as "mixed and tentative."

Among his fellow-students he mentions Fred Walker, Albert Moore, W. B. Richmond, and W. Luson Thomas, the wood-engraver and founder of *The Graphic*.

While in Rome he made the acquaintance of John Gibson, the sculptor, Penry Williams, the painter, and many other famous men. It is a matter for regret that he appears to have left no carefully written account of his own life in Italy. From occasional snatches of conversation it would appear that he knew and was in active sympathy with Garibaldi and other Italian patriots. His anti-militarist convictions prevented his taking an active share as one of Garibaldi's volunteers, but there is reason to suppose that he served the Italians' cause in other ways.

He returned to London in 1864, settled down as a painter, and married, in 1866, Miss Sully, a charming lady, who died after a brief period of wedded happiness. Thomas continued his work in London for some years, devoting himself chiefly to portraiture, design, book illustration, and lecturing on art subjects in London and the provinces. His work as a special artist for *The Graphic*, and later for *The Daily Graphic*, in the days when the artist and not the camera was all-important, is well known. He continued to draw for these journals down to a late period in his life, and went as their special artist with the British Association to Canada in 1884, making the extended tour from Montreal to the Rocky Mountains and the Yellowstone National Park the subjects of striking pictures of scientific value, some of them being reproduced in colour by *The Graphic*.

His father having retired from the Pontypool College in consequence of failing health and settled in Cardiff, Thomas

was more and more drawn to the home of his parents, and ultimately settled down in Cardiff, continuing the many lines of work and study in which he was so ardently interested—and developing on fresh lines, chiefly in connection with the Cardiff Naturalists' Society and the aspirations of the Welsh people. The Eisteddfod claimed much of his time and thought, as did also the Royal Cambrian Academy, of which Institution he was one of the first promoters, remaining in close touch with it to the end of his life.

His work in connection with the Eisteddfod and other Welsh movements was always done with conscientious care, and zeal for the success of the object aimed at. The National Museum and the Cardiff Museum, now merged into the National, owe much to him.

It is, however, with his work for the Naturalists' Society that these notes are more intimately concerned.

His first contribution to the Society's proceedings was read at a meeting on the 16th January, 1879. It dealt with a discovery made by him in the previous September at Newton Nottage. Wandering round the Church of that village, he "observed a huge slab of stone, and upon it five trifid impressions in a clear series." Ever on the alert, he felt that this was something unknown to the geology of Britain, and he at once communicated with some members of the Society, and also with Professor Sollas, who a few years before had given courses of University Extension Lectures on Geology in Cardiff.

The discovery proved an important one, and the new member of the Cardiff Naturalists' Society (his name appears as joining the Society in 1879) was recognised as a valuable acquisition to the small but faithful circle of working naturalists.

The discovery was communicated to the Geological Society of London by Professor Sollas, upon whose suggestion the name *Brontozoum Thomasii* was given to it in honour of its discoverer.

At the instance of Dr. Vachell, Colonel Turbervill of Ewenny, who was President of the Cardiff Naturalists' Society that year, took upon himself the cost of the purchase and removal

of the slab to the Cardiff Museum, and it will in due course be a feature of the geological department of the National Museum. The slab is 6ft. 6in. long, by 5ft. 6in. wide, averages 1ft. 6in. in thickness, and weighs about three tons.

The interest in the discovery was great, and the volume of the Society's Transactions for the year 1878 was held up for a short time in order that the communication might be published without delay. It will be found towards the end of Volume X., with two lithographic plates reproduced from drawings by Thomas.

The career of Thomas as a member of the Society thus brilliantly inaugurated was but the prelude to over thirty years of active work for the Society. The Editor of the Transactions has courteously acceded to my suggestion that a list of his contributions to the Society, to include some of his papers on cognate subjects printed elsewhere, shall be printed at the end of these notes. The list will disclose how much he did for the advancement of the subjects which it is the business of the Society to promote. I confine myself, therefore, to the more important features of his work from 1879 to the time of his death.

The flora of the Steep Holm, and other parts of the Society's district, had a great attraction for him, and several instances of contributions in the domain of botany will be found in the list of his papers.

In 1884, as already stated, he went with the British Association to Canada, as the special artist of *The Graphic*. Two years later, 1886, he spent a year or more in Dublin, preparing, with Professor Sollas, the illustrations for Volume XXV. of the Report on the Scientific results of the Challenger expedition. This volume contains the "Report on the *Tetractinellida* collected by H.M.S. "Challenger" during the years 1873-1876," prepared under the direction of Professor Sollas. It is illustrated with forty-four lithographic plates from drawings by Thomas.

A copy of the volume presented to Thomas contains the following note :—

“ Illustrated by my dear friend and fellow-worker T. H. Thomas, to whom in grateful remembrance of many happy and laborious hours I dedicate this copy. W. J. Sollas.”

It was during this residence in Dublin that he accompanied, as artist, an expedition, July, 1886, to examine the ocean fauna off the S.W. coast of Ireland. The Scientific Staff was under the direction of Professor A. C. Haddon. Thomas gave in the Society's Transactions some useful notes on the organisation and expenses of the expedition “ thinking the information may be useful in view of future dredging expeditions being fitted out from Cardiff.”

In 1888 he was President of the Society and delivered an address reviewing the work of the Society, putting forward suggestions for development, many of them fruitful, as the Transactions show.

Three years later, he became President of the Biological Section, and with the help of Professor Parker and other biologists, much valuable work was done. He remained President of the Biological Section for seventeen years, but this did not deter him from giving useful help in the archæological and other branches of the Society's work.

One of the notable incidents of his career was a visit to the Gannet settlement upon the Island of Grassholm, off the Pembrokeshire coast, made in 1890. A company conveyed to the Island by one of H.M.'s ships had attacked the Gannets, doing serious mischief. Thomas was greatly annoyed by such wanton destruction, made drawings of what he saw, and they were published in the *Daily Graphic* and the *Animal World*. The incident created considerable stir at the time, a question being asked about it in the House of Commons. The offenders were afterwards prosecuted and fined. The action taken by Thomas greatly assisted the efforts of those who were interested in the preservation of wild birds. At the Cardiff meeting of the British Association in 1891, a Committee was appointed for the

purpose of considering the best means of protecting wild birds and their eggs. The Committee, of which Thomas was the Chairman, presented a report to the Edinburgh Meeting of the British Association the following year, and the Committee was re-appointed.

In 1899 he was one of a distinguished party of Italian and English Geologists, who, under the guidance of Dr. Johnston Lavis and Dr. Sambon, made a scientific tour to study the volcanoes of the two Sicilies and the Neapolitan district. Thomas read two papers on the subject before the Cardiff Naturalists' Society, illustrated by sketches and a small collection illustrating the geology, mineralogy, and botany of the islands.

His contributions to the Society on the Pre-Norman inscribed and decorated stones of Glamorgan, followed by studies of similar monuments in Breconshire and other parts of Wales, were not only valuable in themselves, but led to the movement for obtaining casts of these monuments for the Museum. In the carrying out of this scheme Thomas constantly gave assistance. Some monuments were found which had long been lost sight of, while the bringing together of accurate casts enabled comparative study to be undertaken.

Meanwhile he was pursuing a wide diversity of subjects in his own delightful way—the folk-lore of South Wales; the Calvary crosses of Glamorgan; the monumental brasses in South Wales; the influence of farm and cottage gardens upon the local flora; the Pontypool and Usk Japan ware; and many more. During these years, too, he was doing important work in connection with a number of Welsh movements. The Eisteddfod, and the Gorsedd; the proposal that the Arms of Wales should be incorporated in the Royal Arms; the National Museum; in fact, every scheme for the betterment of Wales, Welsh life, and the happiness and welfare of the Welsh people, commanded not only his sympathy, but his untiring support.

His researches with reference to the life and works of Welsh artists involved much study, and many journeys. It is a

matter for regret that he was unable to put these studies into a form in which he could publish them, but what information he collected on this, as on all other subjects, he placed freely at the service of other inquirers.

Thomas is "The Artist" so frequently referred to in the valuable series of articles "Some Highways and Byways in Monmouthshire," contributed to "The Red Dragon," Volumes VIII.-IX. (1885-6), by R. W. J., *i.e.*, Richard W. Jones, of Newport, a member of the Cardiff Naturalists' Society, and well known in his day as a cultured man, as was also his brother "Tom" Jones, Alderman of Newport. Both were close friends of Thomas.

I think it is not too much to say that Thomas brought increased vigour and a wider range into the work of the Cardiff Naturalists' Society. He led off with a brilliant discovery, which inspired others to observe and put the results on record. The foundations thus laid have formed the basis of much good work, especially since the opening of the College, with its succession of workers in many fields.

On the art side his help was invaluable. Before the introduction of process illustrations, now so extensively used, he illustrated the Transactions from time to time with drawings which add value and distinction to the volumes.

A keen observer, with a mind always on the alert for fresh knowledge, his calm, quiet way of approaching a subject, and his modest, unassuming manner, with his strong sense of humour, and his kindliness, made him beloved by everyone who knew him.

His interest in every aspect of the world about him was the key-note of everything he did and wrote. He was not a laborious worker with books, and the accumulated knowledge of others, but an observer, content to record briefly what he found. This fact, which gives to his work a unique and permanent value, will be apparent to those who read his printed papers.

Thomas retained his youthfulness up to a late period in his life. Until within a couple of years of his death it was difficult

to think of him as a man of seventy years and more. He suffered much during those last two or three years. He died on the 5th July, 1915, to the deep regret of all who had been privileged to know him. He bequeathed his collections to the National Museum (to which he had contributed many things in his life-time), and to the Reference Department of the Cardiff Public Libraries.

JOHN BALLINGER.

List of Papers, etc., contributed by Thomas Henry Thomas, R.C.A., to the Transactions of the Cardiff Naturalists' Society, and some printed elsewhere.*

- 1879.** Tridactyl Uniserial Ichinolites in the Trias of Newton Nottage, near Porthcawl, Glamorgan, read before the (C.N.) Society, January 16th, 1879. 19 pp., 2 litho. plates from drawings by T. H. T., and a note by John Storrie. Vol. X., 73.

NOTE.—This important paper was published in the Transactions for the year 1878. The discovery was also the subject of a paper communicated to the Geological Society of London by Professor W. J. Sollas.

- 1880.** Notes upon some fine specimens of Oak, Yew, Elm, and Beech, chiefly in the Counties of Glamorgan and Monmouth. 10 pp., 2 plates from drawings by T. H. T. XII., 15.

Notes upon fragments of Jadeite discovered in the "Grottes Baussé Roussé," Mentone. 3 pp. XII., 31.

Notes on specimens of incrustated carbonate of lime from Dripping Wells at Cwm Firwd near Merthyr Tydfil. 2 pp. XII., 34.

Fossil Man. 6 pp. XII., 78.

- 1882.** The human form as presented in the art of various periods—Part I. 8 pp., 1 plate from sketches by T. H. T. XIV., 63. See 1884 for part II.

Life at Mentone. "Red Dragon." Vol. I., 10 pp.

About Llantwit Major. "Red Dragon." Vol. II., 10 pp., illustrated.

The paintings comprised in the Menelaus Collection (in the Cardiff Museum and Art Gallery) described by T. H. T. and Edwin Seward. 16 pp. Published in pamphlet form.

- 1883.** Excursion to the Steep Holm. Notes on the Island by T. H. T. and a flora by John Storrie. 5 pp., 1 plate from drawing by T. H. T. XV., 89.

The Royal Cambrian Academy of Art. "Y Cymmrodor." Vol. VI.

* T. H. T. wrote for and illustrated many publications. I have not attempted to make a complete list.

- 1884.** The human form as presented in the arts of various periods. Part II. 9 pp. and folding litho. plate from sketches by T. H. T. XVI., 12. See 1882 for Part I.
- 1885.** Note on *Pæonia Corallina*, with illustration by F. W. Burbridge. 1 p. XVI., 139.
Folding litho. plate from drawings by T. H. T., illustrating C. T. Whitmell's paper, "The Yellowstone National Park." XVII. Facing p. 84.
- 1886.** Excursion to Dean Forest. 4 pp., 1 plate. XVIII., 46.
Note on Expedition to examine the Ocean Fauna of the South-West Coast of Ireland, July, 1886. 2 pp. XVIII., 90.
- 1887.** The Excursion of Members of the British Association from Montreal to the Rocky Mountains, September, 1884. 14 pp., 3 plates. XIX. Part 1., 9.
The Ladies' Day of the Cardiff Naturalists' Society, Excursion to Bath. 5 pp. XIX., Part 1., 58.
- 1888.** Presidential Address to Cardiff Naturalists' Society. 10 pp. XIX., Part 2, 26.
NOTE.—A review of the work and the position of the Society.
The colouration of the Cubs of the Lion and Puma. 2 pp., 2 plates. (Reprinted from "The Graphic"). XX., Part 1, 40.
The identity of some plants native to the Rocky Mountains with local species. 2 pp. XX., Part 1, 46.
Four drawings by T. H. T. to illustrate Mr. Storrie's account of the excavations made near Llantwit Major in a field called Cae Worgan. XX. Part 2, 49-61.
An Ant's nest in a Cardiff garden. 2 pp., 1 plate. XX., Part 2, 108.
Address on "The Meetings of the British Association at Bath, and the International Geological Congress at London." Not printed in the Transactions.
- 1889.** Note upon the Thunder storm at Forest Hill, near London. June 6th, 1889. 2 pp. XXI., Part 2, 95.
- 1890.** A Visit to the Lipari Islands and Etna. 16 pp. XXII., Part 1, 11. For Part 2, see 1891, A Visit to the Volcanoes of S. Italy.
The Ladies' Day at Tewkesbury. 3 pp. XXII. Part 1., 29.
A visit to the Gannet settlement upon the Island of Grassholm. 8 pp., 3 plates reprinted from "The Animal World," and 2 plates reprinted from the "Daily Graphic." XXII., Part 2, 57.
Woodpecker and Telegraph Pole. 1 plate reprinted from "The Graphic." XXII., Part 1, 57.
List of plants collected on Flat Holm by T. H. T. and John Storrie. 3 pp. XXII. Part 2, 109.

Remarks on a few plants collected on Etna, Vesuvius, and the Lipari Islands. Read at Biological Section. Not printed.

Notes upon a series of Miniatures and Paintings in Miniature style belonging to J. L. Wheatley, of Cardiff, by T. H. T. and Edwin Seward. 24 pp.

The Miniatures were on exhibition in the Cardiff Museum. The notes were published in pamphlet form.

- 1891.** Celtic Art, with a suggestion of a scheme for the better preservation and freer study of the monuments of the Early Christian Church in Wales. 23 pp. "Y Cymmrodor," XII., 87.

A Visit to the Volcanoes of Southern Italy. Part 2. The Neapolitan district. 3 pp., XXII. Part 2, 126. For Part 1 see 1890.

An account of observations made by T. H. T. and C. T. Whitmell on the speed at which the Severn "Bore" travels, made in anticipation of the Society's excursion to Newnham, etc., to witness the bore. 3 pp., XXII. Part 2, 126.

NOTE.—The account was written by C. T. Whitmell. The proposed excursion was abandoned owing to the severity of the weather.

T. H. T. exhibited at the Biological Section some sketches taken at the Flat Holm.

- 1892.** Note on a Field Walk of the Biological Section to the Neath Valley on June 17th, 1891. 4 pp. XXIV., Part 1, 76.

Inscribed Stones. (Some account of the pre-Norman inscribed and decorated stones of Glamorganshire, being explanatory notes upon the series of photographs made by Mr. T. Mansel Franken). 13 pp., 4 half-tone plates. XXV., Part 1, 34. (This is the first time half-tone illustrations were used in the Transactions.)

Botanical notes during the summer of 1892. 2 pp. XXV., Part 1, 76.

Note on elongation of the axis in Roses, with illustration reproduced from "The Christian Pictorial." XXV. Part 2, 82.

- 1894.** Methods of illustration for scientific works. Read at the Biological Section. Not printed.

- 1895.** Note on Gower plants. Read at the Biological Section. Not printed.

Exhibited at the Biological Section, various water-colour sketches, including a chrysalis attacked by Cardiceps; and a variety of oak leaf.

- 1896.** Note on Eophrynus. (Specimen found in the Rhondda Valley.) By F. T. Howard and T. H. T. 3 pp., 1 plate. XXVII. Part 1, 52.

Monstrous form of "Plantago Major." 1 p., 1 plate. XXIX., 58.

The entry of Mari Lwyd (Glamorganshire, 1895). Sketch by T. H. T., from the "Christmas Pictorial." XXIX., facing p. 90.

- 1897.** Note upon wheat from Cae'r Fendith, Ysgafell Farm, Montgomeryshire. Read at the Biological Section. Not printed.
T. H. T. exhibited at the Biological Section, Ears of Barley from the Orkneys; Drawings of *Sirex*; Book of ear-markings of sheep, etc.
Some devices and ornaments upon ancient British coins. "Archæologia Cambrensis." April, 1897. 5 pp., illustrated.
- 1899.** Notes on the Herbarium in the Cardiff Museum. Read at the Biological Section. Not printed.
T. H. T. exhibited at the Biological Section numerous drawings of Ferns and other plants.
Notes upon the Psalter of Ricemarch. 6 pp., 6 plates. XXXIII., 47.
Notes on new and rare Glamorganshire plants. Read at the Biological Section. Not printed.
Exhibited at Biological Section, photographs of living specimens of *Althium ampeloprasmum*! Fruits of the Persimmon or date plum—a species of *Diospyros*.
- 1901.** Note on *Asplenium lanceolatum*. Read at the Biological Section. Not printed.
Exhibited at the Biological Section, original sketches of Botanical and Geological subjects.
- 1902.** Note upon *Mecanopsis*. 2 pp. XXXIV., 63.
The Upper Vale of Neath Field Walk. 4 pp. XXXIV., 86.
- 1903.** Some Folk Lore of South Wales. 13 pp., 2 plates (4 drawings by T. H. T.) XXXVI., 52.
Archæological Section. "Cup and ring rock markings." Not printed.
- 1904.** "Calvary" crosses in Glamorgan. 11 pp. (4 diagrams illustrating 23 crosses). XXXVII., 53.
Biological Section. Exhibited sketch of Horn-cores of *Bos*, found in 1842 at Penarth Dock, at a depth of 7 feet.
Fuschia leaves cut by leaf-cutting bee.
Elected to Sub-Committee to consider re-publication of the Flora of Glamorgan.
- 1905.** The influence of farm and cottage gardens upon flora in part of the district of the Cardiff Naturalists' Society. 8 pp. XXXVIII., 61.
Pontypool Japan Ware. 18 pp., 4 plates. XXXVIII., 74.
Biological Section. Botanical notes made during an excursion round Ireland in 1904. Not printed.
Some Welsh Artists and their work. Not printed.
A National Museum and Library for Wales. 9 pp., "The Library." N. S. VI., 212.

- 1906.** Monuments of the Pre-Norman period recently discovered in Breconshire. 5 pp. XXXIX., 103.
 Biological Section. "Dr. Alfred Russel Wallace and his connection with South Wales." Not printed.
 Biological Section. Exhibited Inflorescence of *Eucalyptus Globulus*; fruit of pepper tree from Mentone; fruit of almond grown in the open air near Oswestry; sketches and prints of Vesuvius.
 Archæological Section. "Domed dove-cots and pig-cots in Glamorgan and Monmouthshire." Not printed.
- 1907.** Biological Section. "Welsh names of plants." Not printed.
 Biological Section. "A Book on Palæontology by Edward Lloyd, published in 1760." Not printed.
- 1908.** Biological Section. "Nests of Weaver Birds from India and Congo." Not printed.
 Archæological Section. "Monumental Brasses in South Wales." Not printed.
 Archæological Section. "Mediæval Cross Slabs." Not printed.
- 1909.** Archæological Section. "Cardiff and King Arthur." Not printed. See Cardiff Records. Vol. VI.
- 1910.** Sydenham Edwards of Usk, painter and draughtsman of Natural History. 5 pp., 1 plate. XLIII., 15.
 Biological Section. Exhibited "A Shoot from a Pear tree showing a remarkable growth of thorns."
- 1912.** Biological Section. Exhibited a nodule from Fforch Dwm.
- 1914.** Charles Henry James, J.P. 2 pp., XLVII., 7.

THE COLEOPTERA OF GLAMORGAN.

(Concluded from Vol. XLVII, p. 33).

BY J. R. LE B. TOMLIN, M.A., F.E.S.

This, the concluding portion of the list comprises the beetles belonging to the *Heteromera* and the *Rhynchophora*.

It is satisfactory to find that the publication of this list has proved an incentive to further collecting, and I already have quite a substantial number of species to go towards a supplementary list, whenever it may be considered expedient to publish it. In the meantime, I should like to appeal to all local collectors for consignments of beetles, preferably in fairly damp chopped laurel. Naturally the more minute species are most likely to yield novelties. There are still a good many cosmopolitan species such as frequent warehouses, granaries, or corn, bone and hide stores, which must occur in a County with so many great commercial centres as Glamorgan.

TENEBRIONIDÆ.

Blaps mucronata, Lat. Swansea, occasionally found in old houses; Cardiff Castle grounds and elsewhere in the Cardiff district!

Blaps similis, Lat. I once found a specimen of this uncommon species in my lodgings at Llandaff!

Heliopathes gibbus, F. A very common species along the coast, wherever it is sandy, and to be found in most months of the year! Mr. Hallett took it at Cwrt-yr-ala in July, 1913!

Microzoum tibiale, F. With the last, and almost equally common!

Phaleria cadaverina, F. Not uncommon under decaying seaweed and in carrion on the shore from Briton Ferry westwards, July to September! It probably occurs elsewhere, but has not hitherto been noticed.

Scaphidema metallicum, F. Swansea—"has been received from the neighbourhood by Dr. Leach"; Cwrt-yr-ala, Old Cogan and Penarth from February to May, Sully, in October, under stones (Hallett)!

- Tenebrio molitor, L.** Swansea, common; Cardiff district, occasional in bakehouses! Penarth, at light (Hallett)!
- Gnathocerus cornutus, F.** Cardiff, in a mill, Jan., 1916, and Old Cogan, September, 1913 (Hallett)!
- Tribolium ferrugineum, F.** Rare in mills and warehouses, Cardiff Docks (Hallett)!
- Tribolium confusum, Duv.** Common in a warehouse with the last (Hallett)! Llandaff, in a bakehouse, Jan., 1894!
- Helops cœruleus, L.** Swansea, under bark, not common.
- Helops pallidus, Curtis.** Swansea (Millard), in "Steph. Ill.," v., p. 26; Llangenydd Burrows, one on Oct. 10th, 1914 (J. W. Allen).
- Helops striatus, Fourc.** Not uncommon under bark!

LAGRIDÆ.

- Lagria hirta, L.** Common and generally distributed in June and July!

CISTELIDÆ.

- Cistela murina, L.** Common and generally distributed in summer! The var. **fusca Steph.** is equally common!
- Cteniopus sulphureus, L.** Generally common along the coast in July and August, sometimes very abundant!

MELANDRYIDÆ.

- Orchesia micans, Pz.** In a wood near Penllergaer (Dillwyn).
- Clinocara undulata, Kr.** Cwrt-yr-ala, in rotten wood, Feb. and March, 1916 (Hallett)!
- Melandrya caraboides, L.** Swansea, occasionally found in decaying timber and under the bark of ash trees; Leckwith Woods and Castell Coch, rare in June!

PYTHIDÆ.

- Lissodema quadripustulata, Marsh.** Swansea, "occasionally found in woods and, I believe, mostly on the leaves of elms"; Llandaff, one beaten from an old hedge in May, 1896!
- Rhinosisimus ruficollis, L.** Woods at Penllergaer, not common.
- Rhinosisimus viridipennis, Steph.** Llandaff, occasionally beaten from ivy in autumn! Cwrt-yr-ala, Feb. to April, 1916 (Hallett)!
- Rhinosisimus planirostris, F.** Swansea, not uncommon in woods; Llandaff, not uncommon by sweeping and sometimes caught on the wing! Cwrt-yr-ala and Penarth (Hallett)! Porthcawl in June (Hallett)!

CEDEMERIDÆ.

Cedemera nobilis, Scop. Swansea, rather common on flowers; Rhosilli (J. W. Allen); Taffs Well (Hallett)! Castell Coch, rather common on various *Compositæ* in June and July! Candleston, common!

Cedemera lurida, Marsh. Swansea, not uncommon; Cwrt-yr-ala, June to August, 1913 (Hallett)!

Oncomera femorata, F. Porthkerry (W. E. R. Allen)!

Nacerdes melanura, L. Common as a rule along the coast in old posts, logs, and timber! This species was recently found to have done such damage to a floor in a Cardiff factory, that the boards had to be taken up.

Ischnomera cœrulea, L. Swansea, not uncommon on flowers of *Cratægus oxyacantha* and other plants.

PYROCHROIDÆ.

Pyrochroa coccinea, L. Castell Coch, very rare under oak bark, June, 1897 (Wotton)! Dillwyn says that he has a memorandum of its occurrence in the Swansea neighbourhood, but doubts its accuracy.

Pyrochroa serraticornis, Scop. Swansea, common; Llantwit Major! Porthkerry, common (W. E. R. Allen)! Penarth and Penylan (Hallett)! Sully! Llandaff neighbourhood, sometimes very common in early summer! A large stump by the roadside between Llandaff and Fairwater for several years acted as a breeding-place for this beetle, and I have seen it literally red with them after emergence.

MORDELLIDÆ.

Mordella fasciata, F. Swansea, occasionally found on flowers of *Cratægus oxyacantha*, etc.

Mordella aculeata, L. Swansea, common on flowers of *Cratægus oxyacantha*, etc.; Castell Coch, rare on flowers of *Viburnum lanana*, June and July, 1897!

Mordellistena abdominalis, F. Swansea, not uncommon; Leckwith Woods, on may blossom, rare! Llandaff, one on sallow, June, 1893!

Mordellistena neuwaldeggiana, Pz. Swansea, frequently found on flowers of *Cratægus oxyacantha* and other plants; Llandaff, very rare in an old hedgerow, June, 1894!

Mordellistena pumila, Gyll. Swansea, not uncommon on *Umbelliferæ*.

Anaspis frontalis, L. Common on may blossom, *Umbelliferæ*, and other flowers in early summer!

Anaspis garneysi, Fowler. Cwrt-yr-ala, June, 1913 (Hallett)!

- Anaspis pulicaria, Costa.** Swansea, not uncommon ; Cardiff district, common in June and July on flowers, especially those of *Umbelliferae* ! Lavernock ! Candleston ! Old Cogan, Oct., 1913 (Hallett) !
- Anaspis rufilabris, Gyll.** Llandaff, moderately common on may blossom ! Penarth (Hallett) !
- Anaspis geoffroyi, Mull.** Swansea, not common ; Cardiff district, fairly common in May, June, and July on flowers, especially may blossom ! I once bred it out of rotten wood in April.
- Anaspis ruficollis, F.** Common and generally distributed in early summer on flowers ! Old Cogan, Oct., 1913 (Hallett) !
- Anaspis costæ, Emery.** Swansea, common on flowers ; Penarth, June, 1913 (Hallett) ! Llandaff ! Cwrt-yr-ala, Aug., 1914 (Hallett) !
- Anaspis maculata, Fourc.** Abundant everywhere on flowers and herbage in summer, and stragglers occur up to October !

RHIPIDOPHORIDÆ.

- Metoeus paradoxus, L.** In wasps' nests at Porthkerry in 1888 (W. E. R. Allen) !

ANTHICIDÆ.

- Notoxus monoceros, L.** Common in summer on the coast sandhills ! It occurs sparingly at Llandaff near the River Taff ! The black variety occurs also, but is rare.
- Anthicus floralis, L.** Generally abundant in hayricks and in all kinds of rubbish heaps, for most of the year !
- Anthicus antherinus, L.** Cardiff district, rare in June ! Once in a nest of *Lasius flavus*, in June, 1890 !
- Anthicus bimaculatus, Ill.** Sandhills at Kenfig, rare, May to July, 1899 ! This rare species is nocturnal in its habits, and would probably be taken freely after dusk.

MELOIDÆ.

- Meloe proscarabaeus, L.** Swansea, common ; Sully, common (Hallett) ! Llandaff, occasionally in May !
- Meloe violaceus, Marsh.** Swansea, taken by Mr. Jeffreys.

ANTHRIBIDÆ.

- Brachytarsus fasciatus, Forst.** Swansea, not common.
- Platyrhinus latirostris, F.** Swansea, occasionally found on ash trees, not common.

CURCULIONIDÆ.

- Apoderus coryli**, L. Swansea, on *Corylus avellana*, not common.
- Rhynchites æquatus**, L. Cardiff district, fairly common in June and July !
- Rhynchites minutus**, Hbst. Moderately common in the Cardiff district in summer, and sometimes lasts till October ! Dillwyn's **Rhynchites alliarie** is very probably this species.
- Rhynchites nanus**, Pk. Castell Coch on birch, not uncommon in June ! Candleston on dwarf willow (*Salix repens*), fairly common, May, 1914 !
- Rhynchites sericeus**, Hbst. Aberdylais (A. R. Wallace).
- Deporaus megacephalus**, Germ. Castell Coch, rare with **Rhynchites nanus** !
- Deporaus betulæ**, L. Swansea, not common ; Castell Coch, common on birch in May and June !
- Apion subulatum**, Kirby. Llantrisant, Sept., 1891 (Chitty in "Ent. Mo. Mag.," 1893, p. 19) ; Llandaff and Miskin, scarce on *Vicia cracca*, July to October !
- Apion ulicis**, Forst. Generally common on *Ulex europæus*, March to October !
- Apion malvæ**, F. Swansea, not uncommon on *Malva sylvestris*.
- Apion urticarium**, Hbst. Swansea, common on *Urtica dioica*.
- Apion miniatum**, Germ. On species of *Rumex* ; common in the Cardiff district, March to October ! Kenfig (Hallett) ! Candleston ! Very probably Dillwyn's **Apion frumentarium** is this. So common and conspicuous a species is not likely to be absent from his district, or to have escaped notice.
- Apion cruentatum**, Walt. Llantrisant, Sept., 1891 (Chitty in "Ent. Mo. Mag.," 1893, p. 19).
- Apion hæmatodes**, Kirby. Generally distributed, but not as common as in some districts !
- Apion pallipes**, Kirby. On *Mercurialis perennis* : common all round Llandaff from June to October !
- Apion rufirostre**, F. Swansea, frequent on mallows .
- Apion vicie**, Pk. Llandaff, fairly common on *Vicia cracca*, June to September ! Old Cogan, Oct., 1913 (Hallett) ! Llantrisant, Sept., 1891 (Chitty).
- Apion difforme**, Germ. Cardiff district, very fairly common by sweeping, and later on in haystacks, etc., June to January ! Sully, Porthcawl, and Kenfig (Hallett) !
- Apion varipes**, Germ. Old Cogan, Oct., 1913 (Hallett) ! Sully, not uncommon, Jan., 1916 (Hallett) !

- Apion apricans, Hbst.** Common and universally distributed all the year round ! In winter it often abounds in haystacks and rubbish heaps. It is attached to *Trifolium pratense* and other *Papilionaceæ*.
- Apion assimile, Kirby.** Swansea, not uncommon ; Kenfig ! Llandaff, occasional in September ! Sully, Jan., 1915, Penarth, Aug., 1915, and Cwrt-yr-ala, April, 1914 (Hallett) !
Dillwyn's specimens were in all probability named by Kirby himself.
- Apion trifolii, L.** Llandaff, scarce, in July ! Old Cogan, Oct., 1913, and Kenfig (Hallett) !
- Apion dichroum, Bedel.** Crwmllyn Burrows, amongst herbage (Dillwyn) ; Cardiff district, generally distributed in summer, but not always common ! Kenfig (Hallett) !
- Apion nigritarse, Kirby.** Common and ubiquitous on the eastern side of the county from Cardiff to Kenfig ! Like **Apion apricans** it occurs practically all the year. Not recorded further west than Kenfig, though no doubt it occurs everywhere.
- Apion æneum, F.** On *Malva sylvestris* and *Malva rotundifolia* : Sketty Burrows, at times plentiful (Dillwyn) ; Rhosilli (Allen).
- Apion radiolus, Kirby.** On mallows : Crwmllyn Burrows (Jeffreys in Dillwyn) ; Penarth, June to August, and Old Cogan, Oct., 1913 (Hallett) ! Porthcawl (Hallett) !
- Apion onopordi, Kirby.** Taken by Mr. Jeffreys near Danygraig (Dillwyn). Cwrt-yr-ala, Dinas Powis, Penarth, and Old Cogan, August to March (Hallett) ! Llandaff, by sweeping, July to October ! Kenfig (Hallett) ! Rhosilli (Allen) ; Porthcawl, June (Hallett) !
- Apion carduorum, Kirby.** Universally distributed and usually common, on *Carduus arvensis*, June to December !
- Apion vicinum, Kirby.** Llantrisant, Sept., 1891 (Chitty in "Ent. Mo. Mag.," 1893, p. 19).
- Apion virens, Hbst.** Common and ubiquitous, by sweeping or in haystacks, etc., all the year round ! Not recorded by Dillwyn, though it must be common in the Swansea district. I can vouch for it as far west as Briton Ferry, and Mr. J. W. Allen has found it commonly at Rhosilli.
- Apion punctigerum, Pk.** On species of *Licia* : Cardiff district, common May to September !
- Apion pisi, F.** On various *Papilionaceæ* : common and generally distributed !
- Apion æthiops, Hbst.** Llandaff, in summer, scarce ! Cwrt-yr-ala and Penarth, May to August (Hallett) ! Llangenydd, in flowers of *Geranium robertianum*, June, 1915 (Wakefield) ! Porthcawl (Hallett) !

- Apion ebeninum, Kirby.** Llantrisant, Sept., 1891 (Chitty, in "Ent. Mo. Mag.," 1893, p. 19); Llandaff, rather common on *Vicia cracca*, June to October!
- Apion striatum, Kirby.** On *Ulex europaeus*: common in April at Rhosilli (J. W. Allen).
- Apion ononis, Kirby.** On *Ononis repens*: plentiful about Veranda (Jeffreys in Dillwyn); Llangenydd (J. W. Allen); Llandaff, Kenfig, and Candleston, June to October! Porthcawl (Hallett)!
- It probably occurs wherever the plant grows.
- Apion spencei, Kirby.** On *Vicia cracca*, Llantrisant (Chitty); Llandaff, common by sweeping, June to October! Old Cogan, common in October, 1913 (Hallett)! Porthcawl and Penarth, May to August (Hallett)!
- Apion ervi, Kirby.** On *Vicia* and *Lathyrus*: generally distributed and common, May to October!
- Apion gyllenhali, Kirby.** Llantrisant, Sept., 1891 (Chitty in "Ent. Mo. Mag.," 1893, p. 19).
- Apion unicolor, Kirby.** Llantrisant (Chitty); Llandaff, common on *Vicia cracca*, June to October!
- Apion loti, Kirby.** Swansea, "taken in July by Mr. Jeffreys on *Antirrhinum linaria* in St. Helen's lane"; Briton Ferry and Kenfig on *Lotus corniculatus*! Cardiff district, fairly common, June to September! Miskin!
- Apion seniculum, Kirby.** Cwrt-yr-ala, Penarth, and Old Cogan (Hallett)! Llantrisant (Chitty); Llandaff, common by sweeping, June to October, and in winter in haystacks!
- Apion tenue, Kirby.** Swansea, plentiful on *Medicago sativa* (Jeffreys in Dillwyn); Llandaff, scarce, July to October! Penarth (Hallett)!
- Apion pubescens, Kirby.** One at Porthcawl, June, 1915 (Hallett)!
- Apion marchicum, Hbst.** Llandaff, by sweeping, Aug., 1896!
- Apion violaceum, Kirby.** Generally distributed and common, June to November!
- Apion hydrolapathi, Kirby.** On *Rumex hydrolapathum* and *Rumex obtusifolius*: Llandaff and Ely, not uncommon, May to October! Old Cogan, Penarth, and Cwrt-yr-ala (Hallett)!
- Apion humile, Germ.** Generally distributed and common, July to October!
- Otiorhynchus tenebricosus, Hbst.** Swansea, common on the sandhills; Porthkerry (W. E. R. Allen)! Sully, April, 1916 (Hallett)!
- Otiorhynchus atroapterus, De G.** Not uncommon on the coast sandhills in spring and summer!

- Otiorhynchus raucus, F.** Swansea, "among herbage and nettles, and sometimes early in summer is plentiful on the naked sandhills."
- Otiorhynchus scabrosus, Marsh.** Swansea, on the sandhills, not common; Cwrt-yr-ala, April to August (Hallett)!
- Otiorhynchus ligneus, Ol.** Porthcawl, June, 1915 (Hallett)!
- Otiorhynchus picipes, F.** Abundant everywhere, and occurs all the year round!
- Otiorhynchus sulcatus, F.** Common and generally distributed, and occurs all the year round!
- Otiorhynchus rugifrons, Gyll.** Swansea, under the name of **Otiorhynchus dillwynii**; also taken near Swansea by Mr. Wakefield!
- Otiorhynchus ovatus, L.** Generally distributed and moderately common!
- Trachyphloeus scabriculus, L.** Of general occurrence in summer on the coast sandhills, sometimes common!
- Cænopsis waltoni, Boh.** One in moss near Rhosilli (J. W. Allen).
- Strophosomus coryli, F.** Common and universally distributed in woods, copses, etc., May to December!
- Strophosomus capitatus, De G.** Swansea, "not uncommon, particularly in woods, and a specimen I sent to him was thus [viz., **Strophosomus obesus**, which is a synonym] named by Mr. Marsham."
- Strophosomus retusus, Marsh.** Swansea, among herbage in woods, and at times rather plentiful in Crwmllyn Burrows; Old Cogan, Oct., 1913 (Hallett)! Merthyr Mawr, Miskin, and Kenfig, in summer! Llandaff, not uncommon by sweeping in summer, and in haystacks in winter!
- Strophosomus lateralis, Pk.** Swansea, not common.
- Exomias araneiformis, Schr.** Swansea, not uncommon in woods and on the sandhills; Cardiff district, common in woods amongst herbage and moss nearly all the year!
- Brachysomus echinatus, Bons.** Swansea, amongst herbage, not common; Rhosilli (J. W. Allen).
- Sciaphilus muricatus, F.** Generally distributed and fairly common in woods, copses, and hedgerows, and seems to occur all the year round!
- Tropiphorus tomentosus, Marsh.** Swansea, "has been taken in the neighbourhood."
- Liophloeus nubilus, F.** Not unfrequent under stones on Crwmllyn Burrows or on the naked sandhills, and I have taken it in a hedge-bank at Penllergaer (Dillwyn); Penllergaer and Porthkerry (W. E. R. Allen)! Castell Coch, in June! Llandaff, sparingly every year on ivy, May to August! Sully (Hallett)!

- Polydrusus micans, F.** Swansea, in woods, not common; near Swansea (Wakefield)! Castell Coch, on beech, scarce in May and June, 1898!
- Polydrusus sericeus, Schal.** Swansea, in woods, not common.
- Polydrusus tereticollis, De G.** Taken on oaks at Briton Ferry by Mr. Millard, and among herbage in the Penllergaer Woods, not common (Dillwyn); Castell Coch, moderately common on hazel, May to August! Cwrt-yr-ala, on broom (Hallett)!
- Polydrusus pterygomalis, Sch.** Common and generally distributed in woods, etc., throughout summer!
- Polydrusus cervinus, L.** Swansea, in woods, not common; Llandaff and Castell Coch, fairly common on trees and hedgerows in summer! Old Cogan, Oct., 1913, and Cwrt-yr-ala (Hallett)!
- Polydrusus chrysomela, Ol.** Swansea (Fowler, B. C., v., p. 202); Candleston, not rare by the River Ogmore, May 30th, 1914 (Perrins)!
- Polydrusus confluens, Steph.** Swansea, on the sandhills, not common. This beetle is attached to broom and gorse.
- Phyllobius oblongus, L.** Common on herbage throughout the county in May and June! Old Cogan, Oct., 1913 (Hallett)!
- Phyllobius calcaratus, F.** Sometimes rather common about midsummer in the woods at Penllergaer (Dillwyn); Cwrt-yr-ala and Taffs Well in June (Hallett)! Llandaff, occurs widely but very sparingly on hawthorn in May and June! Porthkerry! Leckwith Woods!
- Phyllobius urticæ, De G.** Common and generally distributed on nettles in May and June!
- Phyllobius pyri, L.** Very common everywhere on trees, hedges, and herbage from end of April to September!
- Phyllobius argentatus, L.** Swansea, common early in summer on oaks and on nettles in woods; Cardiff district, common in similar situations in May and June!
- Phyllobius maculicornis, Germ.** Castell Coch, common in June and July, especially on birch!
- Phyllobius pomonæ, Ol.** Llandaff neighbourhood and Castell Coch, common in early summer, especially on nettles! Cwrt-yr-ala in August (Hallett)!
- Phyllobius viridiæris, Laich.** Common throughout the county on trees, hedges, and all kinds of herbage, May to October!
- Tanymecus palliatus, F.** Swansea, taken on a nettle near the seaside. I have usually found this beetle attached to *Carduus arvensis*.
- Philopedon geminatus, F.** Abundant on the coast sandhills, and occurs all the year! Odd specimens occasionally at Llandaff! Cwrt-yr-ala (Hallett)!

- Atactogenus exaratus, Marsh.** Swansea, occasionally on the sandhills, not common.
- Barynotus obscurus, F.** Under stones on Crwmllyn Burrows and on the sandhills, not uncommon (Dillwyn); Rhosilli (J. W. Allen); Llangenydd (Wakefield)! Llandaff, scarce, May to July!
- Barynotus elevatus, Marsh.** Swansea, among grass in woods, not common; Crawley Wood, 21st September, 1915 (Wakefield)! Llandaff and Leckwith Woods, rare under stones, May and June!
- Alophus triguttatus, F.** Swansea, common on the sandhills; Cwrt-yr-ala, by sweeping, June 2nd, 1914! Llandaff, one in hay, March, 1894!
- Sitones griseus, F.** Common in summer on the coast sandhills!
- Sitones cambrius, Steph.** Crwmllyn Burrows, not uncommon (Dillwyn); Kenfig, April, 1899! Candleston, May, 1899! Lavernock, Dec. 6th, 1914 (Hallett)! This weevil is found in damp or marshy ground.
- Sitones regensteinensis, Hbst.** Common and of general occurrence on gorse!
- Sitones waterhousei, Walton.** Llandaff, by sweeping near a clover-field, June and July, 1898!
- Sitones crinitus, Hbst.** Swansea; Candleston and Kenfig, not uncommon, May to July! Llandaff, rare!
- Sitones lineellus, Gyll.** Swansea.
- Sitones tibialis, Hbst.** Generally distributed, and common, as a rule, on broom and gorse, May to October!
- Sitones hispidulus, F.** Generally distributed and not uncommon by sweeping, as well as in haystacks, moss, etc., in the winter!
- Sitones flavescens, Marsh.** Swansea, taken on a quince tree at The Willows in June; Penarth and Cwrt-yr-ala (Hallett)! Llandaff!
- Like the last species, **Sitones flavescens** seems to occur all the year.
- Sitones puncticollis, Steph.** Castell Coch (Wotton)! Llandaff, in July! Candleston, fairly common!
- Sitones suturalis, Steph.** On *Lathyrus pratensis* and *Vicia cracca*. Llangenydd, June, 1915 (Wakefield)! Kenfig, Briton Ferry, and Candleston in summer! Sully, Cwrt-yr-ala, Penarth, January to October (Hallett)! Llandaff!
- Sitones lineatus, L.** Attached to *Papilionaceæ*: only too common everywhere, and occurring all the year round!
- Sitones sulcifrons, Thunb.** Attached to *Papilionaceæ*: generally distributed and fairly common for most of the year!
- Gronops lunatus, F.** Crwmllyn Burrows in 1809 (Dillwyn); Candleston, where I have found it regularly, but very sparingly, from May to August, crawling on the sandy flats towards the River Ogmore!

- Hypera punctata, F.** Occasionally on nettles at Penllergaer, and sometimes on the sandhills (Dillwyn).
- Hypera fasciculata, Hbst.** This extremely local species is not at all uncommon on our coast sandhills from Candleston westwards, at the roots of *Erodium cicutarium*, from May to September!
- Hypera rumicis, L.** On species of *Rumex*: Swansea district, sometimes plentiful, particularly about midsummer on Crwmllyn Burrows; Candleston, common! Cardiff district, generally distributed and common, April to August!
- Hypera pollux, F.** Crwmllyn Burrows, not common (Dillwyn); one at Llanmadoc (J. W. Allen).
- Hypera polygona, L.** Swansea, sometimes plentiful on the sandhills; Kenfig, May 3rd, 1899!
- Hypera suspiciosa, Hbst.** "Several specimens were taken, I believe all on Crwmllyn Burrows, near twenty years ago [i.e., about 1809], and I have not since observed it" (Dillwyn); Llantrisant, Sept., 1891 (Chitty, in "Ent. Mo. Mag.," 1893, p. 19); Llandaff in a haystack, November, 1894!
- Hypera variabilis, Hbst.** On *Papilionaceæ*: Swansea, not uncommon; Candleston, Kenfig, and Briton Ferry, not uncommon in summer! Sully on *Medicago sativa*, May, 1914 (Hallett)! Llandaff, June to November, on species of *Vicia*, *Lathyrus pratensis* and in haystacks! Porthcawl (Hallett)!
- Hypera murina, F.** Sully, May, 1914, on *Medicago sativa* (Hallett)!
- Hypera plantaginis, De G.** Generally distributed and fairly common, especially on the coast, most of the year! This species is generally said to be confined to species of *Plantago*, but it certainly occurs also on *Papilionaceæ* and Mr. Hallett swept it off *Medicago sativa* at Sully.
- Hypera trilineata, Marsh.** On *Papilionaceæ*: generally distributed and somewhat locally common in summer! Like most of the other species of **Hypera**, it occurs in autumn and winter in haystacks (e.g., at Llandaff) and other suitable retreats.
- Hypera nigrirostris, F.** On *Papilionaceæ*: generally distributed and common, occurring all the year round!
var. **ononinis, Fowler.** Llandaff, on *Ononis spinosa*!
- Cleonus sulcirostris, L.** Crwmllyn Burrows, occasionally found on nettles and thistles, and is not uncommon on the naked sandhills (Dillwyn); Candleston and Kenfig on *Carduus arvensis* in summer, not common!
- Liosoma ovatum, Clair.** Generally distributed and fairly common amongst herbage and in moss at all times of the year! It prefers ground that is somewhat damp and shady.
- Liparus coronatus, Goez.** Swansea, on the sandhills, not common.

- Curculio abietis, L.** Castell Coch, June, 1896! near Neath (A. R. Wallace).
- Pissodes pini, L.** Candleston, on fir, May 31st, 1914 (Perrins)! No doubt introduced with the fir trees.
- Pissodes notatus, F.** Dunraven (Mitchell in "Trans. Cardiff Nat. Soc.," XXIX., p. 70). Sully, April and May, 1916 (Hallett)!
- Orchestes scutellaris, Gyll.** Common on *Alnus glutinosus*, particularly about Sketty Bog (Dillwyn).
- Orchestes quercus, L.** Penarth, Aug., 1915 (Hallett)!
- Orchestes alni, L.** On elms: Swansea, not unfrequent; Penarth and Cwrt-yr-ala, January to August (Hallett)! Llandaff, common in summer! Kenfig (Hallett)!
- var. **ferrugineus, Marsh.** Swansea; Llandaff, July, 1895!
- Orchestes ilicis, F.** Swansea, on oaks, not common.
- Orchestes avellanæ, Don.** Swansea, not uncommon in woods.
- Orchestes fagi, L.** On beech: Swansea, in woods, not common; Castell Coch, fairly common in June and July! Taffs Well (Hallett)!
- Orchestes rusci, Hbst.** On birch: woods at Penllergaer (Dillwyn); Castell Coch, not uncommon, June and July!
- Orchestes stigma, Germ.** Swansea, not uncommon on willows and alders; Penarth, August, 1915 (Hallett)!
- Orchestes salicis, L.** Swansea, not uncommon, particularly about Crwmllyn Bog, on nettles and on willows (Dillwyn); Llandaff, rare on sallow, July, 1893!
- Rhamphus flavicornis, Clair.** Cardiff district, common in summer on trees, shrubs, and hedgerows! Kenfig (Hallett)!
- Orthochætetes setiger, Beck.** Kenfig, in summer, not common! near Rhosilli in moss (J. W. Allen); Llandaff, on one of the dog violets, scarce, April to October!
- Orthochætetes insignis, Aube.** This species was introduced to the British List in 1912, on the strength of specimens from Southsea, Cornwall, and Glamorganshire (cf. "Ent. Mo. Mag.," 1912, p. 211). Kenfig, common on *Viola curtisii* at the beginning of June, 1914 (see "Ent. Mo. Mag.," 1915, pp. 18, 292)! Llandaff, on one of the dog violets, rare! Cwrt-yr-ala, January 31, 1915 (Hallett)!
- Grypidius equiseti, F.** On *Equisetum arvense*: Swansea, not uncommon; Candleston, common in June and July! Leckwith Woods!
- Eirirhinus bimaculatus, F.** Crwmllyn Bog on nettles, not uncommon (Dillwyn).
- Eirirhinus acridulus, L.** Swansea, rather common throughout the summer; marshy ground at Kenfig, June, 1914! Sully, Penarth, and Cwrt-yr-ala (Hallett)! Llandaff, common in damp ground, May to October! Leckwith Woods in damp moss!

- Thryogenes nereis, Pk.** Crwmllyn Bog, amongst herbage, sometimes plentiful in summer (Dillwyn); Llantrisant, Sept., 1891 (Chitty); Llandaff, sparingly in May and June at the old brickpits!
- Dorytomus tremulæ, Pk.** Swansea, in woods, not common.
- Dorytomus maculatus, Marsh.** Generally distributed and, as a rule, common in spring and summer on poplars, willows, and sallows! Dillwyn records it off alder, but that must have been accidental. I have taken it at Llandaff up to October, and Mr. Hallett at Cwrt-yr-ala as early as January!
- Dorytomus affinis, Pk.** Swansea, taken amongst herbage.
- Dorytomus pectoralis, Gyll.** Swansea. I take Dillwyn's **Dorytomus melanophthalmus** [*sic*] to mean this species.
- Tanysphyrus lemnae, F.** Common as a rule round Llandaff on *Lemna minor*, May to October!
- Bagous alismatis, Marsh.** On *Alisma plantago*: Swansea, common; Sully, February, 1914 (Hallett)! Llantrisant (Chitty); Leckwith Common, very common at the sides of ditches, May to November!
- Bagous binodulus, Hbst.** Taken several years ago. I believe on Crwmllyn Bog (Dillwyn, "Memoranda," p. 40).
- Bagous nigritarsis, Thomson.** Candleston, in damp ground, not uncommon in June and July! This form is so distinct and so often occurs alone, that it seems to deserve specific rank.
- Anoplus plantaris, Naez.** Swansea, "has been taken, I believe, among herbage in woods"; Castell Coch, fairly common on birch, May to July! Cwrt-yr-ala in August (Hallett)!
- Tychius venustus, F.** Swansea, occasionally found among herbage. This beetle is attached to broom.
- Tychius squamulatus, Gyll.** Briton Ferry and Candleston, rather common on *Lotus corniculatus* in July!
- Tychius meliloti, Steph.** Cwrt-yr-ala, Aug., 1915 (Hallett)!
- Tychius lineatulus, Steph.** Llandaff, one in hay, Nov., 1894!
- Tychius tomentosus, Hbst.** Candleston, one swept in July, 1898!
- Miccotrogus picirostris, F.** Swansea, not common; Kenfig, by sweeping, in summer!
- Sibinia primitus, Hbst.** Common, crawling on sandy ground, at Candleston and Kenfig, May to August! Penarth and Cwrt-yr-ala (Hallett)! The specific name is often printed as **primita**, but erroneously. The word **primitus** is an adverb, and therefore indeclinable.

- Miarus campanulæ, L.** Swansea, not common, attached to *Campanula glomerata* and *Campanula rotundifolia*.
- Gymnetron beccabungæ, L.** Candleston and Llandaff, on *Veronica beccabungæ*, in July! Only the black form has occurred.
- Gymnetron melanarius, Germ.** Castell Coch, one swept in May, 1898! There is a doubtful Swansea record.
- Gymnetron pascuorum, Gyll.** Llantrisant, September, 1891 (Chitty); Llandaff, by sweeping and in a haystack, August to November!
- Gymnetron labilis, Hbst.** Llantrisant, Sept., 1891 (Chitty); Llandaff, one in hay, November, 1894! One swept at Llangenydd (J. W. Allen).
- Mecinus pyraister, Hbst.** Generally distributed and not uncommon by sweeping, in moss, under bark, etc.! It seems to occur all the year round.
- Mecinus circulatus, Marsh.** Swansea, sometimes on the sandhills, and has been taken early in spring under stones in the firwoods above Gnoll Castle.
- Anthonomus ulmi, De G.** On hedge roses and particularly on the flowers of *Rosa spinosissima* on Sketty Burrows, not uncommon, and I have observed it on the flowers but not on the leaves of *Cratægus oxyacantha* (Dillwyn); Llandaff, sometimes not uncommon on hawthorn, May to November! Lavernock, December 6th, 1914 (Hallett)!
- Anthonomus rosinae, Des Goz.** Llandaff, a few on hawthorn, Sept., 1894!
- Anthonomus pedicularius, L.** Swansea, not uncommon; Castell Coch, in June, 1897! Cwrt-yr-ala, July, 1913 (Hallett)!
- Anthonomus rubi, Hbst.** Fairly common and generally distributed on herbage, trees, and hedgerows! I have records of it for every month in the year.
- Anthonomus comari, Crotch.** Several swept in damp ground at Kenfig, June 1st, 1914! Porthcawl (Hallett)!
- Nanophyes lythri, L.** Swansea, common on *Lythrum salicaria*.
- Cionus scrophulariæ, L.** Somewhat local, but as a rule common on *Scrophularia nodosa* and *Scrophularia aquatica*, June to August! Jeffreys observed it abundant on *Buddleia globosa*.
- Cionus thapsus, F.** Swansea, common on *Verbascum thapsus* and *Verbascum blattaria*.
- Cionus hortulanus, Marsh.** Swansea, on a *Verbascum*, not common; Cwrt-yr-ala, July, 1913 (Hallett)! S. Fagans and Llandaff, on *Scrophularia nodosa*, May to August! Very common in Leckwith Woods at the end of June on *Scrophularia nodosa*!

- Cionus blattariæ, F.** Swansea, not uncommon on *Scrophularia aquatica*; I have taken it commonly on *Scrophularia nodosa* and occasionally on *Scrophularia aquatica* at Candleston, Llandaff, and Leckwith Woods from May to August!
- Cionus pulchellus, Hbst.** Swansea, not uncommon on *Scrophularia aquatica*; Llandaff and St. Fagans, common on *Scrophularia nodosa* in June and July!
- Orobitis cyaneus, L.** On *Salix argentea* and among herbage on Crwmllyn Burrows, not very uncommon (Dillwyn); Porthcawl (Hallett)! Kenfig and Briton Ferry, not uncommon on *Viola curtisii* in summer! Llandaff, scarce on one of the dog violets, June to October! Probably the occurrence on *Salix argentea* was accidental.
- Cryptorrhynchus lapathi, L.** Plentiful on willows on Crwmllyn Bog (Dillwyn).
- Acalles roboris, Curt.** Sully, Feb., 1916 (Hallett)!
- Acalles ptinoides, Marsh.** Swansea, not common; one swept at Castell Coch, May 18, 1898!
- Acalles turbatus, Boh.** Llandaff, beaten rarely off dead hawthorn, in October! Penarth and Cwrt-yr-ala, April, 1916 (Hallett)!
- Cœliodes rubicundus, Hbst.** Castell Coch, rare on birch, June, 1899!
- Cœliodes quercus, F.** Swansea, not very uncommon in woods; Castell Coch, not uncommon on oak in June! Cwrt-yr-ala (Hallett)!
- Cœliodes ruber, Marsh.** Swansea. It is very distinct from **Cœliodes quercus**, of which Dillwyn surmised it to be a variety.
- Cœliodes erythroleucus, Gmel.** Llantrisant, September, 1891 (Chitty in "Ent. Mo. Mag.," 1891, p. 331); Crawley, on oak, 3rd August, 1915 (Wakefield)!
- Cœliodes cardui, Hbst.** Kenfig and Candleston, rare on the sandhills in May!
- Cœliodes quadrimaculatus, L.** Abundant everywhere on nettles! It occurs for most of the year.
- Cœliodes geranii, Pk.** Crwmllyn Burrows amongst herbage (Dillwyn); Llangenydd on *Geranium sanguineum*, June, 1915 (Wakefield)! Horton (Gower), July, 1914 (Hallett)! As its name implies, it is attached to various species of *Geranium*.
- Poophagus sisymbrii, F.** Kenfig, rare on *Veronica beccabunga*, June, 1914! Cwrt-yr-ala (Hallett)!
- Ceuthorrhynchus assimilis, Pk.** On *Cruciferae*: Swansea; Porthcawl (Hallett)! Candleston and Briton Ferry! Cardiff district, common in summer, especially on *Sisymbrium officinale* and *Brassica sinapis*! The occurrences on other orders of plants mentioned by Dillwyn are, of course, as in many other cases, accidental.

- Ceuthorrhynchus constrictus, Marsh.** Among herbage on Crwmlyn and Sketty Burrows, not uncommon (Dillwyn).
- Ceuthorrhynchus cochleariæ, Gyll.** Dinas Powis, by sweeping in damp ground, June 2nd, 1914 !
- Ceuthorrhynchus ericæ, Gyll.** Llandaff, a few taken in July, 1894 !
- Ceuthorrhynchus erysimi, F.** On *Cruciferae*: generally distributed and very fairly common at times !
- Ceuthorrhynchus contractus, Marsh.** A universally common species by sweeping or in haystacks, etc., all the year round ! It is attached to *Cruciferae*.
- Ceuthorrhynchus hirtulus, Germ.** Several specimens swept at Candleston, May 31st, 1914 (Perrins and Tomlin) !
- Ceuthorrhynchus pilosellus, Gyll.** Several specimens on Llangenydd Burrows (J. W. Allen); one on the sandhills at Candleston, May 31st, 1914 !
- Ceuthorrhynchus quadridens, Pz.** On *Cruciferae*: Swansea, not uncommon; Lavernock on *Brassica sinapsis* ! Penarth, common in May (Hallett) ! Llandaff, common, especially on turnip and horseradish, May to October !
- Ceuthorrhynchus geographicus, Goez.** Crwmlyn Burrows, on thistles, and I have never seen it on *Echium vulgare* (Dillwyn).
- Ceuthorrhynchus pollinarius, Forst.** On *Urtica dioica*: common and generally distributed, May to October !
- Ceuthorrhynchus pleurostigma, Marsh.** Swansea, "rather plentiful in the spring of 1805 on the sandhills, and I have not lately observed it"; Candleston and Kenfig, occasional in May ! This species is attached to *Cruciferae*.
- Ceuthorrhynchus resedæ, Marsh.** On *Reseda lutea*: Swansea, not uncommon.
- Ceuthorrhynchus marginatus, Pk.** Llandaff, single specimens swept very occasionally, June to November !
- Ceuthorrhynchus rugulosus, Hbst.** Among herbage about Penllergaer (Dillwyn); Candleston, scarce on *Matricaria chamomilla* in May and June !
- Ceuthorrhynchus melanostictus, Marsh.** Swansea, occasional; Candleston, rare in May and June on *Veronica beccabunga* !
- Ceuthorrhynchus asperifoliarum, Gyll.** Swansea, not common; Kenfig and Candleston, not rare on *Cynoglossum officinale* in May and June !
- Ceuthorrhynchus litura, F.** On thistles: Swansea, not uncommon; Llandaff, common in summer on *Carduus arvensis* !

- Ceuthorrhynchidius floralis, Pk.** On *Cruciferae*: generally distributed and common in summer!
- Ceuthorrhynchidius pyrrhorhynchus, Marsh.** On *Sisymbrium officinale*: taken by Mr. Millard in the nursery garden near Ffynone (Dillwyn); Cwrt-yr-ala, Penarth and Porthcawl, common in summer (Hallett)! Kenfig, June 1st, 1914!
- Ceuthorrhynchidius nigrinus, Marsh.** Among herbage on Crwmllyn Burrows, not common (Dillwyn).
- Ceuthorrhynchidius melanarius, Steph.** Kenfig! Dinas Powis, common on *Nasturtium officinale*, June 2nd, 1914! Penarth, common (Hallett)!
- Ceuthorrhynchidius terminatus, Hbst.** Penarth, one specimen, August, 1915 (Hallett)!
- Ceuthorrhynchidius troglodytes, F.** Common everywhere and occurs all the year round, either by sweeping or in haystacks and rubbish!
- Amalus hæmorrhous, Hbst.** Llandaff, one swept in October, 1897!
- Rhinoncus pericarpus, L.** Cardiff district, fairly common, March to October! I have always found it attached to *Rumex obtusifolius*. It is surprising to have no record of it from the Swansea side; Possibly Dillwyn meant to record this species as **Rhinoncus interstitialis**, though that name is merely a synonym of **Rhinoncus castor**.
- Rhinoncus perpendicularis, Reich.** Penarth, April, 1916, and Cwrt-yr-ala, August, 1914 (Hallett)! This is attached to species of *Polygonum*.
- Rhinoncus castor, F.** A common species on the coast sandhills in summer!
- Eubrychius velatus, Beck.** Llantrisant, September, 1891 (Chitty in "Ent. Mo. Mag.," 1893, p. 19).
- Litodactylus leucogaster, Marsh.** Llantrisant, September, 1891 (Chitty, *l.c.*); Llandaff, not uncommon on floating chips, etc., in the old brick-ponds, April to October! Kenfig Pool, June 1st, 1914!
- Phytobius comari, Hbst.** Llangenydd, Sept., 1915 (J. W. Allen).
- Phytobius quadrituberculatus, F.** Candleston, in damp ground, May 17th, 1899!
- Phytobius muricatus, Bris.** Penarth, under a stone, March 25th, 1913 (Hallett)!
- Limnobaris t-album, L.** Crwmllyn Bog (Dillwyn): its occurrence on *Erica tetralix* was merely accidental.
- Balaninus venosus, Grav.** Porthkerry, on oak, May, 1896 (W. E. R. Allen)! Old Cogan, August, 1913 (Hallett)! Dillwyn has a doubtful record from Swansea.

- Balaninus nucum, L.** Swansea, not unfrequent on *Corylus avellana*.
- Balaninus betulæ, Steph.** Llandaff, one on head of *Heracleum sphondylium*, July, 1893!
- Balaninus villosus, F.** Swansea; Castell Coch, once on oak, June 2nd, 1899!
- Balaninus salicivorus, Pk.** Swansea, on willows, at times plentiful; Cardiff district, common in early summer on willows and sallows!
- Balaninus pyrrhoceras, Marsh.** Swansea, not uncommon in hedges; Kenfig! Castell Coch, Miskin, and Leckwith Woods, not uncommon on oak, May to July!
- Calandra granaria, L.** Swansea, in granaries, the Welsh call it "Gwyfyn-yr-yd"; Old Cogan and Penarth (Hallett)!
- Calandra oryzæ, L.** Cardiff Docks, August, 1913 (Hallett)!
- Cossonus ferrugineus, Clair.** Taken near Swansea and is far from common (Dillwyn).
- Rhopalomesites tardyi, Curt.** Several in Crawley Wood (Gower), September, 1915 (Wakefield)!
- Rhyncolus lignarius, Marsh.** Taken in a house at Swansea, and by Mr. Jeffreys on the sandhills (Dillwyn).
- Caulotrypis æneopiceus, Boh.** Swansea, on the sandhills; Rhosilli in dead wood (J. W. Allen).
- Codiosoma spadix, Hbst.** Candleston, in an old log on the shore, May 17, 1899!
- Magdalis armigera, Fourc.** Swansea, on birch, not common; Fairwater, rather common on an ash, June, 1889! Leckwith Woods, rare on hazel, June, 1890!
- Magdalis pruni, L.** Llandaff, two specimens, on hawthorn, June, 1894!

SCOLYTIDÆ.

- Scolytus destructor, Ol.** Swansea, under bark of elm, and less commonly of other trees; Sully, October, 1914 (Hallett)!
- Hylastes ater, Pk.** Candleston, under fir bark!
- Hylastes opacus, Er.** Swansea; Candleston, under fir bark, May, 1899!
- Hylastinus obscurus, Marsh.** Swansea.
- Hylesinus crenatus, F.** Taken in an old ash at Penllergaer (Dillwyn).
- Hylesinus fraxini, Pz.** Swansea, common in ash; Sully and Penarth, August to December (Hallett)! Candleston! Llandaff, in ash bark and beaten off hawthorn in May!

- Myelophilus piniperda, L.** Swansea ; Candleston, under fir bark, December, 1899 ! Dunraven (Mitchell in "Trans. Cardiff Nat. Soc.," XXIX., p. 70). Sully, April, 1916 (Hallett) !
- Cissophagus hederæ, Schm.** Llandaff, one specimen beaten off a hedge in June, 1894 !
- Pityophthorus pubescens, Marsh.** Penarth, one in December, 1915 (Hallett) !
- Xylocleptes bispinus, Duft.** In stems of *Clematis vitalba* : Dinas Powis, June 2nd, 1914 ! Llandaff, occasional, April to June !
- Dryocætes villosus, F.** Swansea, in bark of oak, not uncommon ; Penarth, in bark of oak, rather common, May to November (Hallett) !
- Tomicus laricis, F.** Several in a timber-yard at Cardiff, March, 1916 (J. Grimes) !

ON A BORING FOR WATER AT ROATH,
CARDIFF; WITH A NOTE ON THE UNDER-
GROUND STRUCTURE OF THE PRE-
TRIASSIC ROCKS OF THE VICINITY.

By F. J. NORTH, B.Sc., F.G.S.,

Geological Department, National Museum of Wales.

(*Read before the Biological and Geological Section on December
2nd, 1915.*)

CONTENTS.

- I. Introduction.
- II. Section of the borehole.
- III. Description of the core.
- IV. List of fossils from the Silurian (Ludlow) rocks
traversed by the boring.
- V. The southern boundary of the Cardiff-Rumney
Silurian inlier.
- VI. Note on the underground structure of the pre-
Triassic rocks of the vicinity.
- VII. Bibliography.

I. INTRODUCTION.†



The importance of carefully recording the evidence, and if possible, preserving specimens from deep borings cannot be over-estimated, for the light thus thrown upon the nature and succession of the strata beneath the surface may be of the utmost value in unravelling the geological structure of a district.

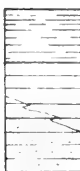
In many cases only the workmen's charts are available: and these, although answering the purpose for which they are intended, are, unfortunately, often of little value to the geologist.

(†) A preliminary account of the boring appeared in the "Geological Magazine," Sept., 1915, pp. 385-7.


2, 6





 Alluvium and Estuarine marls.
 River Gravels

 LOWER LIAS and RHAETIC
 Marls passing into Breccias and Conglomerates

} TRIAS (KEUPER)

 CARBONIFEROUS LIMESTONE SERIES
 Sandstone and Conglomerate
 Red Sandstones
 Red Marls

} OLD RED SANDSTONE

 LUDLOW GROUP
 WENLOCK GROUP with RUMNEY GRIT

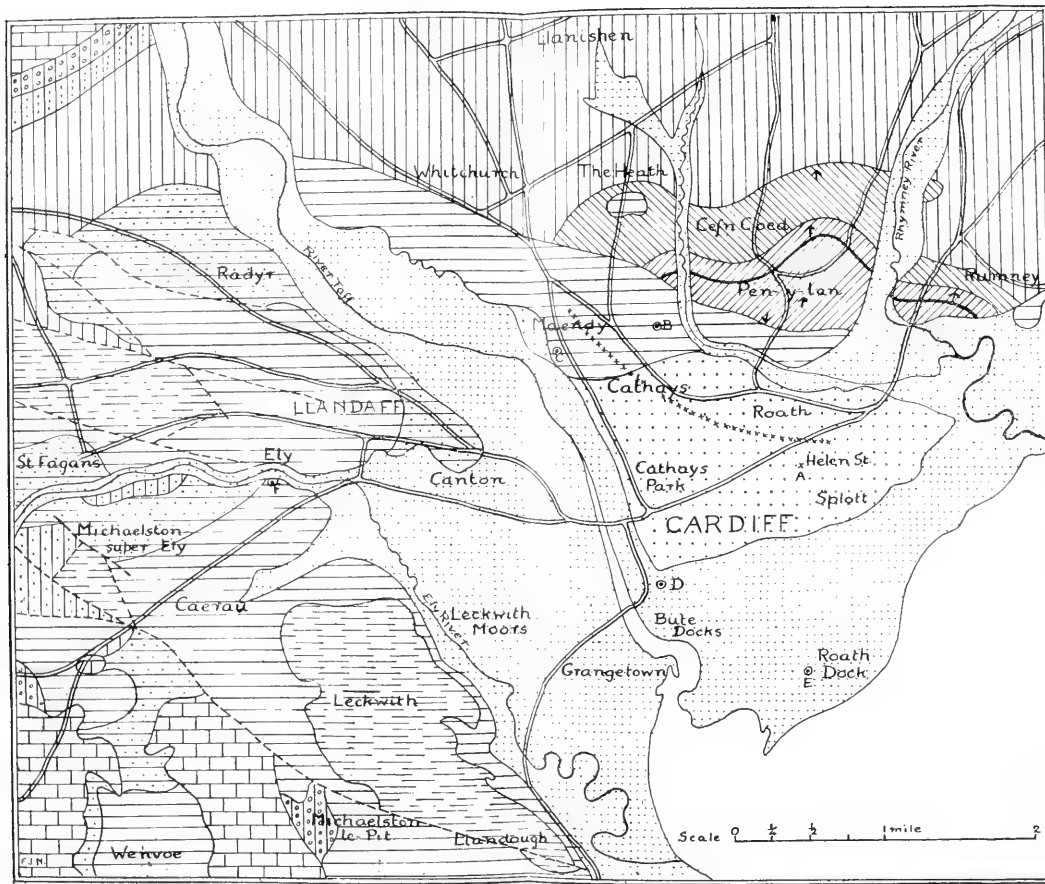
} SILURIAN











Faults - - - - -

Direction of Dip →

Concealed boundary between Old Red Sandstone and Silurian Rocks. *****

F.J.N.



-  Alluvium and Estuarine marls.
-  River Gravels
-  LOWER LIAS and RHAETIC
-  Marls passing into Breccias and Conglomerates
- TRIASS (HEUPER)**
-  CARBONIFEROUS LIMESTONE SERIES
-  Sandstone and Conglomerate
-  Red Sandstones
-  Red Marls
- OLD RED SANDSTONE**
-  LUDLOW GROUP
-  WENLOCK GROUP with RUMMY GRIT
- SILURIAN**
- Faults - - - - -
- Direction of Dip ↗
- Concealed boundary between Old Red Sandstone and Silurian Rocks. ······

GEOLOGICAL MAP OF THE COUNTRY AROUND CARDIFF.

(Based upon the 1-inch map of the Geological Survey.)

In the present instance, for example, the beds were recorded by the workman as "red marl," "red and blue shaly marl," "grey rock," "conglomerate," "granite," etc., and in the absence of specimens such terms would convey no definite information in a district where Trias, Old Red Sandstone, and Silurian rocks are developed with many lithological resemblances.

Fortunately, the Helen Street boring was brought to the notice of the Director of the National Museum of Wales at an early stage, and every facility given for the examination and removal of the cores. Good service from an economic, as well as from a scientific standpoint would be rendered to Geology, if all borings and deep excavations could be examined while in progress and detailed records kept.

The writer would here acknowledge his indebtedness to Mr. T. C. Cantrill, of H.M. Geological Survey, who kindly examined some of the specimens from the core: and to Professor T. Franklin Sibly, of University College, Cardiff, for valuable help and advice during the preparation of this report.

The core to be described was obtained from a deep boring, at the southern end of Helen Street, Roath,* on the site of the new Bottling Premises of Messrs. S. A. Brain & Co., Ltd., who generously placed all the material at the disposal of the National Museum of Wales. Information respecting the depth from which the sections of the core were obtained, was furnished by the foreman of Messrs. Isler & Co., by whom the boring was conducted.

The boring was commenced in November, 1913, and having reached a depth of about 627 feet without yielding any water, was discontinued in December, 1914.

A dug-well, 16ft. 6in. deep was sunk, and a hole "punched" for a further depth of 112ft. (*i.e.*, to 128ft. 6in. from the ground-level). A nine-inch rotary drill was used for the remainder of the boring. The "punched" portion naturally yielded no

(*) See 6-inch Ordnance Map, Glamorganshire; 43, S.E., and 1-inch Geological Map, New Series, Sheet 263.

core, and, this portion of the work having been completed before the boring came under the notice of the present writer, the workman's chart is the only record of the strata passed through. For the remaining 500ft., however, the core has been examined and characteristic specimens preserved in the Museum for future reference. (The Accession number, to which all specimens from the core are referred, is 14/336).

II. SECTION OF THE BOREHOLE.

The strata traversed include post-glacial terrace gravels, Trias (Keuper Marls and Conglomerates), Old Red Sandstone (Red Marls), and Silurian rocks (Ludlow shales and mudstones), details of which are given in the following table.

(Height of surface above O.D. about 38 feet).

	Thickness.		Depth from Surface.	
	ft.	in.	ft.	in.
SUPERFICIAL DEPOSITS.				
1. Made ground and soil	1	9	1	9
2. Red sandy loam	5	3	7	0
3. Coarse gravel with pebbles	16	0	23	0
TRIAS (KEUPER MARLS).				
4. Mottled red and green marl	31	0	54	0
5. Conglomerate	4	0	58	0
6. Red marl with bands of conglomerate	24	0	82	0
7. Mottled red and green marl with bands of gypsum	182	0	264	0
8. Hard red and grey marl	9	3	273	3
9. Grey sandy marl	3	0	276	3
10. Hard red marl	12	0	288	3
TRIAS (KEUPER CONGLOMERATE SERIES).				
11. Conglomerate	3	9	292	0
12. Hard red gritty marl	28	0	320	0
13. Coarse pink dolomitic grit	6	0	326	0
14. Hard red gritty marl	4	0	330	0
15. Coarse pink dolomitic grit with small quartz pebbles	12	0	342	0
OLD RED SANDSTONE.				
16. Dark red micaceous sandstone	20	0	362	0
17. Red and blue marl with cornstones	67	0	429	0
18. Red and blue marl	15	0	444	0
19. Red micaceous mudstone including a thin band with crustacean tracks	24	0	468	0
20. Hard calcareous grit with fragments of mudstone in the lower part	6	0	474	0

	Thickness.		Depth from Surface.		
	ft.	in.	ft.	in.	
SILURIAN (LUDLOW).					
21.	Red and blue micaceous mudstone	36	0	510	0
22.	Dark red ferruginous mudstone and grit	1	0	511	0
23.	Blue micaceous mudstone	8	0	519	0
24.	Red ferruginous rock with fossils	8	0	527	0
25.	Grey mudstone with thin calcite veins	7	6	534	6
26.	Red sandstone	4	6	539	0
27.	Grey micaceous mudstone with two limestone bands each about one inch in thickness..	36	0	575	0
28.	Hard grey calcareous mudstone	26	6	601	6
29.	Thin shelly limestone	0	1	601	7
30.	Hard blue and green mudstone with fossils ..	25	0	626	7

III. DESCRIPTION OF THE CORE.

THE SUPERFICIAL DEPOSITS (2 and 3)*.—These include a reddish-brown sandy clay above, and coarse pebble beds beneath. In the latter, the pebbles consist principally of sandstone from the upper Carboniferous and the Old Red Sandstone. The beds belong to the post-glacial terrace gravels deposited by the River Taff and the Rhymney River. Such gravels underlie the greater part of Cardiff east of the Taff, and, resting as they do on impervious Keuper Marls, hold much water. They were at one time an important source of water for the City, but the water is subject to pollution and is not now used for domestic purposes.

THE KEUPER MARLS AND CONGLOMERATES.—These are a series of red-brown and chocolate coloured marls, with green spots and patches. The first 110 feet, for reasons already mentioned have not been preserved, but the rocks were described by the workman as "Red and Blue shaly marl with gypsum." Certain sandy and conglomerate beds (5 and 6) which were first met with at a depth of 52 feet may possibly

(*) The numbers in round brackets are those by which the beds are designated in the preceding section.

represent the "Upper water Bed" † of Storrie, but yielded no water in this case.

For the next 182 feet (7), the beds are normal mottled red and green Keuper Marls, with bands of gypsum from $\frac{1}{4}$ to 1 inch thick, inclined at various angles and sometimes intersecting. The marls vary in colour from chocolate-brown to dark brick-red. The brown marls readily break in a horizontal direction, the fractured surface being bright and shining; the brick-red marls, on the other hand, are compact and dull. Green spots and patches are abundant throughout, and small grains of quartz up to $\frac{1}{20}$ ins. in diameter occur, especially in the more compact bands. The angle of dip is small, being 4 or 5 degrees, although this could not be determined with precision, and there was no evidence as to the direction in which the beds were inclined.

At a depth of about 265 feet (top of 8) there is a band of hard homogeneous green-grey marl, somewhat gritty and micaceous. Under the microscope this rock is seen to consist of small quartz grains with flakes of white mica in a fine argillaceous matrix in which are developed small rhombs of dolomite, that sometimes enwrap or abut against the quartz grains. The hard grey-green marl gives place to a hard red marl, with greenish spots, which become more abundant until at a depth of 268 feet the whole rock is green in colour. The hard grey-green and red marls closely resemble certain beds exposed in the brick pit at Maendy, near Cardiff.

From this point to a depth of 342 feet there is a series of dull red compact marls (with some grains of quartz and occasional

(†) According to the late John Storrie, water-bearing beds occur in the local Trias at two horizons, to which he gave the names "Upper Water Bed" and "Lower Water Bed" respectively. The Upper Water Bed is a band of Sandstone near the top of the Keuper Marl, first noticed in a boring in Frederick Street. The outcrop is unknown, and Storrie suggested that much of the water, which is saline and had a distinct ebb and flow, may have been derived by percolation from the sea. The "Lower Water Bed" occurs in association with the conglomeratic deposits at the base of the Keuper, and is the source of supply for most of the wells in Cardiff.

quartz pebbles), red sandstones, with or without pebbles, and coarse pink dolomitic grits. These types pass gradually one into another, and it is difficult to assign a definite thickness to any of them. (11) is a red and grey conglomerate, consisting of small pebbles of quartz in an almost completely dolomitised matrix. (12) is a red-brown compact marl or mudstone, containing small quartz-grains, and having a peculiar nodular fracture. (13) is a pink dolomitic grit consisting of abundant quartz-grains in a ground mass of dolomite rhombs. These rhombs have resulted from the recrystallisation of the original matrix, traces of which remain as an opaque residue filling the interspaces between the crystals. (15) is similar in appearance but has a coarse texture.

The beds (11-15) represent the conglomeratic series developed at the local base of the Trias. Conglomerates of this type are especially well developed at Radyr, where they are known as Radyr Stone. True Radyr Stone is absent from the present boring, the beds being less conglomeratic, probably owing to the greater distance from the outcrop of the Carboniferous Limestone, and the coarse deposits developed in the upper portion of the Old Red Sandstone. Storrie's "Lower Water Bed" occurs in this conglomerate series at the base of the Trias, but water-bearing beds were not met with in the present boring.

THE OLD RED SANDSTONE.

The highest beds of this series present in the boring are dark red highly micaceous sandstones, with dark red mottled purple marls. (17 and 18) are a thick series of red and purple marls with small green patches and cornstone nodules. (19) includes soft red micaceous mudstones, with a thin band containing crustacean tracks. One specimen of *Lingula* was obtained from these mudstones, which pass down into a band of calcareous grit (20), containing in its lower portion, fragments of the underlying mudstones. This grit may be regarded as the basement-bed of the Old Red Sandstone.

Samples of some of these rocks were submitted to Mr. T. C. Cantrill, of H.M. Geological Survey, who referred the specimen of *Lingula* to *L. cf minima*, Sow., and compared the crustacean tracks to those described by G. E. Roberts* from the lower part of the Old Red Sandstone at Bouldon Quarry, near Ludlow. Mr. Cantrill also confirmed the opinion that the grit bed (20) referred to above, might in the absence of any more likely bed, be regarded as the basement-bed of the Old Red Sandstone.

The Old Red Sandstone has not been recorded from other well-sections in Cardiff; all the red marls, conglomerates and mudstones passed through before fossiliferous Silurian rocks were reached, being regarded as of Keuper age. The marls and conglomerates of the Trias closely resembles those of the Old Red Sandstone, and in the case of the conglomerates the resemblance is increased by the fact that some of the Triassic beds contain material derived from the Old Red rocks. Furthermore, the uppermost beds of the Ludlow and the lowest beds of the Old Red are closely similar in appearance, and it is possible that the Old Red Sandstone has been pierced in at least one of the earlier borings. This cannot now be verified, because no specimens appear to have been preserved, and the workmen's charts from which the sections have been compiled, give no clue as to the precise nature of the rocks that were traversed.

In view of the difficulty of distinguishing the deposits of the two formations, and of the fact that the presence or absence of the Old Red Sandstone had an important bearing upon the conclusions to be drawn from the evidence supplied by the boring, specimens from neighbouring outcrops were collected for comparison and confirmed the conclusion that both Trias and Old Red Sandstone were present in the core. The marls of the Trias are slightly different in colour from the Old Red Marls. The former vary from brick-red to chocolate-brown, and never have the purplish hue which characterises the latter.

(*) Roberts, 1863, pp. 233-235.

Green patches occur in both series, but on the one hand gypsum bands occur only in the Keuper, while on the other hand, beds of dark green micaceous sandstone are peculiar to the marls of the Old Red.

The micaceous sandstones and their associated marls with cornstones, in the core, closely resemble the Old Red Rocks exposed in the Railway Cutting at Llanishen, about four miles N.N.W. of the site of the boring. Moreover, these marls with sandstone have a greater dip than those in higher parts of the core; in this connection it is interesting to note that in the Cardiff Brick Company's pit at Maendy,* two miles N.N.W. of Helen Street, Keuper marls with a dip of 9 degrees rest upon Old Red Marls with a dip of 20 degrees. It has already been remarked that on being broken the marls present shining surfaces. These in the Keuper are predominantly horizontal, while in the older marls, which have a much less regular fracture, they are vertical. While it is not implied that the direction of the fracture and the accompanying bright surfaces are criteria for distinguishing the marls of the two formations under consideration, they are nevertheless noticeable characters, not only in the core, but also locally wherever the marls are freshly exposed.

THE SILURIAN ROCKS.

These consist of red, grey, and blue mudstones, more or less micaceous, with some red ferruginous grits and very thin limestone bands. The red ferruginous beds which occur in the first fifty feet of the Silurian rocks traversed by the boring closely resemble other red grits and mudstones in the top of the Ludlow series formerly exposed on the eastern side of Roath Park; and may also be compared with certain red beds recorded by Professor Sollas in the Ludlow series at

* This name is locally spelt Maindy, but we have here followed the spelling adopted on the Survey Maps.

Rumney. The red and blue mudstones which make up the bulk of the Silurian rocks in the boring differ only in colour from those exposed at the surface, the latter having become yellow or brown as the result of weathering.

Fossils are abundant in the Silurian rocks at three horizons :—

1. Depth 520-527 feet. In the red ferruginous bed (24) the following fossils occur—*Wilsonia wilsoni* (abundant), *Strophonella euglypha*, *Stropheodonta filosa* (abundant), *Atrypa reticularis*, *Spirifer elevatus*, *Phacopidella downingiae*.

2. Depth 545-560 feet. In the grey and green mudstones, the abundance of mollusca is particularly noticeable. They include *Pterinea retroflexa*, *P. tenuistriata*, *Aviculopecten danbyi*, *Rhombopteria mira*, *Mytilarca mytilimeris*, *Orthonota amygdalina*, *Modiolopsis platyphylla*, *Modiomorpha complanata*, *Murchisonia lloydi* (abundant), *Omphalotrochus funatus*, *Ecculiomphalus laevis*, *Orthoceras bullatum*, *O. ibex*. In addition to the mollusca the following also occur—*Wilsonia wilsoni*, *Chonetes striatella*, (abundant), *Atrypa reticularis*, *Stropheodonta filosa*, *Dalmanella (Orthis) elegantula*, *Camerotoechia nucula*, *Dalmanites caudatus*, etc.

3. Depth 620-626 feet. In the hard bluish-green mudstone (30)—*Atrypa reticularis*, *Dalmanella elegantula*, *D. lunata*, *Wilsonia wilsoni*, *Stropheodonta filosa*, *Syringopora bifurcata*, *Calymene blumenbachi*, *Dalmanites caudatus*, etc.

IV. LIST OF FOSSILS FROM THE SILURIAN (LUDLOW) ROCKS IN THE HELEN STREET BORING.

Those previously recorded from the Wenlock or Ludlow beds, Cardiff-Rumney inlier, are indicated by asterisks in the respective columns.*

* Sollas, 1879, pp. 486-7.

Fossils from the Helen Street Boring.	Wenlock.	Ludlow.
MOLLUSCA.		
<i>Aviculopecten danbyi</i> (M'Coy)	—	—
<i>Modiolopsis platyphylla</i> (Salter)	*	*
<i>Modiomorpha complanata</i> (J. de C. Sowerby)..	—	—
<i>Mytilarca mytilimeris</i> (Conrad) [<i>Mytilus</i>]† ..	—	*
<i>Orthonota amygdalina</i> (J. de C. Sowerby) ..	—	—
<i>Pterinea retroflexa</i> (Wahl.)	*	—
„ <i>tenuistriata</i> (M'Coy)	—	*
<i>Rhombopteria mira</i> (Barr.)	—	—
<i>Cyclonema turbinatum</i> , Sollas	—	*
<i>Cyrtostropha corallii</i> (J. de C. Sowerby) ..	—	*
<i>Murchisonia lloydi</i> , J. de C. Sowerby	—	*
<i>Omphalotrochus fnatus</i> (J. de C. Sowerby)		
[<i>Euomphalus</i>]	—	*
<i>Bellerophon trilobatus</i> , J. de C. Sowerby ..	—	*
<i>Ecculiomphalus lævis</i> (J. de C. Sowerby) ..	—	*
<i>Tentaculites anglicus</i> , Salter	—	—
<i>Orthoceras bullatum</i> , J. de C. Sowerby	—	—
„ <i>ibex</i> (J. de C. Sowerby)	—	*
BRACHIOPODA.		
<i>Atrypa reticularis</i> (Linn.)	*	*
<i>Camaratœchia nucula</i> (J. de C. Sowerby)		
[<i>Rhynchonella</i>]	*	*
<i>Chonetes striatella</i> (Dalm.)	—	*
<i>Dalmanella elegantula</i> (Dalm.) [<i>Orthis</i>] ..	*	*
„ <i>lunata</i> (J. de C. Sowerby) [<i>Orthis</i>] ..	—	*
<i>Leptæna rhomboidalis</i> (Wilck.) [<i>Strophomena</i>]		
<i>Rhynchotreta borealis</i> (Schloth.) [<i>Rhynchonella</i>]		
<i>Spirifer elevatus</i> (Dalm.)	—	*
<i>Stropheodonta filosa</i> (J. de C. Sowerby) [<i>Stroph-</i>		
<i>omena</i>]	—	*
<i>Strophonella euglypha</i> (His.) [<i>Strophomena</i>] ..	*	*
<i>Wilsonia wilsoni</i> (J. de C. Sowerby) [<i>Rhynchon-</i>		
<i>ella</i>]	*	—
TRILOBITA.		
<i>Calymene blumenbachii</i> , Brong.	*	*
<i>Dalmanites caudatus</i> (Brunn.) [<i>Phacops</i>] ..	*	*
<i>Phacopidella downingiae</i> (Mrch.) [<i>Phacops</i>] ..	*	—
<i>Homalonotus knightii</i> , Konig.	—	*
ANTHOZOA.		
<i>Syringopora bifurcata</i> , Lonsd.	*	*

A large number of the fossils in the foregoing list occur also in the Wenlock Shale and Wenlock Limestone of other localities, but certain forms *e.g.*, *Homalonotus knightii*, *Murchisonia lloydi*,

† The generic names in square brackets are those employed by Professor Sollas in his 1879 paper.

Stropheodonta filosa, *Chonetes striatella*, *Cyclonema turbinatum*, etc., are particularly characteristic of the Ludlow beds of this area, and have not as yet been found in the local Wenlock beds. Such forms as *Atrypa reticularis*, *Dalmanella elegantula*, *Camarotoechia nucula* and *Calymene blumenbachii* which occur in both Wenlock and Ludlow beds in the Cardiff district, are particularly long-ranged species, and are of little or no value in determining the horizon of the beds in which they occur.

On palæontological grounds the beds must be regarded as of Ludlow age, and the stratigraphical evidence is in accordance with this conclusion ; for, while the grit bed at the base of the Old Red Sandstone probably indicates a non-sequence, there is no reason for supposing that there is any pronounced unconformity between the Old Red Sandstone and the Silurian rocks in the immediate neighbourhood of Cardiff.

V. THE SOUTHERN BOUNDARY OF THE CARDIFF-RUMNEY SILURIAN INLIER. †

The Cardiff-Rumney Silurian inlier is an elongate-oval area lying to the north and north-east of Cardiff. The prevailing dip of the beds is towards the north, in which direction they pass with apparent conformity beneath the Red Marls of the Old Red Sandstone. Structurally the inlier is an anticline, only the northern portion of which is exposed. The southern boundary between the Silurian and Old Red rocks is concealed by the mantle of newer strata, but in a general way its direction can now be inferred from the following evidence :—

1. In a boring by the side of the Rhymney Railway, south of the Fair oak Road bridge (see B on the accompanying map) the Trias rests upon Silurian beds.
2. In the Cardiff Brick Company's pit at Maendy (C on the map) the Trias rests upon Old Red Sandstone.

† The name of the river and of the railway is spelt Rhymney, but that of the village at the eastern extremity of the inlier is spelt Rumney.

3. In the present boring (A on the map) the Trias rests upon Old Red Sandstone.

The boundary occurs, therefore, north of a line from A to C and south of B ; its approximate position is indicated on the map. The southernmost exposures at Pen-y-lan* have a southerly dip, and the anticlinal axis probably occurs near the line where the Silurian rocks emerge from beneath the Trias.

VI. NOTE ON THE UNDERGROUND STRUCTURE OF THE PRE-TRIASSIC ROCKS OF THE VICINITY.

Silurian rocks have been met with in at least three other borings in and near Cardiff.

1. In a boring (the site of which is indicated by " E " on the accompanying map) at the Crown Fuel Works, Roath Dock,|| the base of the Trias is believed to have been reached at a depth of about 416 feet. Beneath it was a series of red, blue and grey marls, with sandstone, about 460 feet in thickness, and a series of shales with thin limestones 189 feet in thickness, the whole being regarded as of Silurian age. It is probable, however, that some of the marls below the Keuper belonged to the Old Red Sandstone series, and that the shales with limestone were Silurian, although the only fossils recorded were " encrinites " in a sandstone at a depth of 1,065 feet.

2. Professor Boulton recorded Silurian rocks immediately beneath the Trias at a depth of 395 feet in a boring at Crawshay Street † (see " D " on the map). Fossils (brachiopods and encrinites) were found in a calcareous sandstone at a depth of 455 feet.

3. Grey and red and grey rock was met with beneath the Trias at a depth of 143 feet at Ely (Ely Paper Mills) ‡ (see " F " on the map). *Atrypa reticularis* and lamellibranchs were found

* Locally spelt Penylan.

|| " The Country around Cardiff," 1912, p. 99.

† Boulton, 1910, pp. 32-35.

‡ " The Country around Cardiff," 1912, p. 98.

at a depth of 284 feet, but the whole series from the commencement of the grey and red and grey rock was considered to be of Silurian age.

CONCLUSIONS.

The interest and importance of this boring lies in the fact that the presence of the Old Red Sandstone under Roath proves that the records of Silurian rocks beneath the surface at Roath Dock, Crawshay Street and Ely, indicate not one large Silurian area continuous with the exposed Cardiff-Rumney mass, and extending at least as far southward as the Bristol Channel and as far westward as Ely, but two or more smaller areas. These resulted from earth movements which threw the pre-Triassic rocks into a number of small folds, trending in an east-to-west direction, from the crests of which the Old Red Sandstone was removed by denudation, exposing the underlying Silurian rocks. One small fold, in the Old Red Sandstone which did not result in the exposure of Silurian Strata was recorded by Professor Sollas near Llanishen, while a small anticlinal fold in the Silurian beds at Rumney was described in 1913 by Professor Boulton.

The whole district was then covered by Triassic and later deposits, which have since been removed from a large part of one of the Silurian patches—the Cardiff-Rumney inlier. That the Trias once covered the now exposed portion of that inlier is inferred from the red staining of many of the Silurian beds, and from the presence of a small outlier of Trias south of the Heath.

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1915. North, F. J.—“The Silurian Inlier near Cardiff,” *Geol. Mag.*, Sept., 1915, pp. 385-7.

PLATE.

Geological Map of the country around Cardiff, based upon the 1-inch map of the Geological Survey.

LAND MOLLUSCA IN THE VALE OF GLAMORGAN.

By J. DAVY DEAN.

The vast strides which have been made in recent years in Geology and Botany have impressed upon the Naturalist in other spheres the absolute necessity for systematic collecting and observation. The desire to-day is not so much to amass a collection as to seek out truths whereby our knowledge of a species is increased. It has long been recognised that the nature of rock and soil, whether calcareous or non-calcareous, has a distinct influence on the plant fauna and thus directly or indirectly on the well-being of a snail. We plant a garden and then wonder at the number of slugs. In scientific words, we have disturbed the natural distribution in both fauna and flora, and from an ecological point of view we have provided an ideal habitat for *Limax maximus* or *Agriolimax agrestis*. Notwithstanding, the occurrence of a species within such an area has a certain bearing on the taxonomic rank of the species, and of this I can give an illustration. *Testacella maugei*, a species of carnivorous slug, well known to gardeners as "the slug with its tail housed," was found in 1897 by Mr. A. Pike at Windsor Place. Mr. F. W. Wotton also recorded it in 1889 from Lord Bute's gardens in North Road and Earl of Plymouth's at St. Fagans. Most of the known records for this species are of similar character, and by this we infer, knowing the species to be one driven westward by competing species, that it is pre-eminently a western type which will be eventually exterminated, except in sheltered habitats free from natural competition.

Perhaps the most important movement of recent years which can have a bearing on the study of distribution is that promulgated by Dr. W. G. Smith, assisted by his brother, the late

R. Smith, and a number of other workers. The aim of these scientists was to distinguish and classify the different plant associations and place these in relation to the geological formations. The woodlands, the pastures or grasslands, and the marshes or marshlands, are each brought into prominence and made to serve as types. The woodlands and grasslands, by virtue of their deep or shallow soils, are further relegated to the damp or dry types. The woodlands are again classified according to the type of tree, and the distinction between natural woodland and plantation is here the chief difficulty in many districts. However, taking the native types we have (1) the Alder and Willow series of extremely damp soils ; (2) the Oak and Birch series of non-calcareous soils ; (3) the Beech and Ash of the calcareous soils. It will at once be seen that herein lies a very important point, the calcareous or non-calcareous nature of the soil. It is no less important in the case of the pastureland or marshland. When we get the Oak and the Ash occurring together, as is so often the case, we have to distinguish as Oak-Ashwood association. On all highly calcareous soils we have one of three series : the Ashwood, the Ash-Oakwood, or, as on the downs of the South-east of England, the Beechwood. It is the transitional type called the Oak-Ashwood which is accountable for the very rich and varied fauna in the south of this County. The rarest species in the land mollusca are the denizens of the forests and marshes. The cutting down of the trees and the draining and cultivation of the marshes has left only isolated spots where such shells as *Acicula lineata* or *Succinea oblonga* can find suitable habitats. This is very apparent in the case of those districts surrounding a rapidly-growing city such as Cardiff.

As the purpose of this paper is not so much an epitome of the mollusca of the district as a selection of a few of the most characteristic or new species with some outstanding points of interest to the general naturalist, I want now to turn for a moment to the question of dominancy, and, with the assistance of the facts before us, to see whether it is worth while to study

the distribution of a snail. In Glamorganshire the three most highly organised Helices are *Helix aspersa*, *Helix nemoralis*, and *Helix hortensis*. *Helix aspersa*, known as the common garden snail, is seldom a dominant in the open country, and therefore can only take a place as an associated species. Although morphologically a strong species it is distinctly a south-west European type. Of the others, *Helix nemoralis* is dominant to *Helix hortensis*, subdominant. Subdominant to both is a fourth species *Helicigona arbustorum*.

In this district *Helix hortensis* is the dominant throughout the Lias, except on the coast and on the Garth Hills. It is a species which is favoured by the formations and soils of the Oak-Ashwood series to non-calcareous pasture or soils with only a small percentage of calcareous matter, and is in profusion in the Rhymney Valley. *Helix nemoralis*, on the other hand, occurs only in isolated colonies inland, is common on the Garth Limestone, and is dominant only along the coast to Porthcawl, its great local metropolis. The subsoil on the Leckwith Hill, as evidenced by the examination of the quarries there, is full of specimens of this species, although no trace of it occurs to-day. Its place is in the dry Ashwood series merging on calcareous pasture. *Helicigona arbustorum* occurs only locally on particularly damp soil, and it is quite possible that these localities would show an additional percentage of lime to the average. To see this species one needs to visit the beautiful Derbyshire dales, when, after rain, the snails come out to feed. The species is characteristic of the pure Ashwood of damp soils, where it is the dominant.

The distribution of these three Helices gives us the key to the localization of the whole snail-fauna. The presence of *Helix hortensis* as a dominant over so big an area shows us that in all the low-lying districts there is not a large percentage of calcareous matter with the clays, and that to the east in the Rhymney Valley where we do not find *Helicigona arbustorum*, the soil is of an even less calcareous nature. The abundance of the Ash is connected with one or two factors, either a high

water-content or a high lime-content of the soil. Perhaps one of the rarest species in our land mollusca is *Acicula lineata*. So far I have only found this in one locality near Taffs Well, in an Oak-wood, in which there is a certain admixture of Beech. The fungoid growths prevalent under the carpet of leaves provides this and other true woodland species with the necessary habitat. This wood has also given me *Punctum pygmaeum*, our smallest Helicoid, which lives on the underside of the damp leaves. The high water-content of the shallow soil is shown by the dominance of *Carychium minimum*, another minute species, and our only inland representative of a race of shells characteristic of the mangrove swamps of the tropics.

To the conchologist perhaps the most interesting species in the county is *Hyalinia lucida*. Exceedingly rare in most districts, it is the chief prize of a day's collecting. Knowing it to be a characteristic species of the dry Ash-Oakwood association and following up as our clue the known distribution of *Helix nemoralis*, we find it on the Leckwith Hill and towards Dinas Powis, and again at Sully. It has been found at Fonmon by Mr. Hallett, at Penarth, and is probably common in most gardens in Cardiff. It is an abundant species in the neighbourhood of Clifton, near Bristol, and extends westward as far as Pembroke.

Two other interesting species occur within the *Helix nemoralis* region. One, which is characteristic of the low shrub-growth on the slopes of the Leckwith Hill and along the coast past Rhoose, is the well-known operculate *Cyclostoma elegans*. The other, *Helicigona lapicida*, is not quite in its characteristic habitat. This is the vertical cliff-face of a limestone scar. It was recorded by Mr. Wotton at Sully, where it occurred on the walls of the Church. I have taken it on walls at Aberthaw and at Llantwit Major. It is possibly an introduction. It is common and characteristic at Weston-super-Mare and at Lynton.

A characteristic species of calcareous pasture near the coast is *Pupa muscorum*. This occurs at Sully at the roots of *Thymus serpyllum*, the wild Thyme. It is interesting to note that this same

bank is the locality for the new British Ant *Myrmica scheneki*, Em., found by Mr. Hallett and recorded by Mr. Horace Donisthorpe in the "Entomologist's Record," for December, 1915.

Porthcawl may become famous, conchologically, for it is found to be the habitat of *Helix pisana*, Müll. This fact does not seem to have been noted by earlier workers. Jeffreys made two unsuccessful attempts to introduce it at Swansea. On the dunes at Newton it may be found in the late autumn covering the low shrub-growth as at Tenby, so long famous as a locality for this snail. The shells are rather different from those at Tenby, considerably larger, more depressed, and more delicate in the pencilling of the bands. There are very few really good localities for this species in the British Isles, and any new station is of interest. It is sub-dominant to *Helix hortensis*, and thus occupies a south-western position. The occurrence of this species in Glamorganshire was noted in October, 1915, and placed on record in November.

A full list of the species of Land Mollusca of the County is appended. As far as possible it is up-to-date, and I hope, reliable. A few species are recorded only for the Swansea area, and most of these are due to the exertions of other workers. I have no personal confirmation. I give them because there is no reason at all why they should not ultimately turn up within the Vale of Glamorgan.

LIST OF SPECIES FOR GLAMORGANSHIRE.

- Testacella maugei**, Fer. In several gardens in Cardiff and district.
- Testacella scutulum** Sowb. Specimens in the National Museum of Wales labelled "Cardiff."
- Limax maximus**, L. Generally distributed.
- Limax flavus**, L. Brit. Assoc. Handbk. 1891.
- Limax arborum**, Bouchard-Chantereaux. Brit. Assoc. Handbk., 1891.
- Agriolimax agrestis**, L. Generally distributed.
- Agriolimax lævis**, Muller. Ely, St. Fagans, Llandaff; records by F. W. Wotton.
- Milax sowerbyi**, Fer. River Taff, Llandaff, and Cardiff, F. W. Wotton.

- Vitrina pellucida, Muller.** General, but not an abundant species.
- Hyalinia crystallina, Muller.** Local, in woods.
- Hyalinia lucida, Drap.** In several Cardiff gardens, at Penarth, Lavernock Point, Leckwith, and Dinas Powis. At Fonmon the rare white variety was found by Mr. H. M. Hallett.
- Hyalinia cellaria, Muller.** Generally distributed.
- Hyalinia helvetica, Auett.** Swansea district, Chas. Oldham.
- Hyalinia alliaria, Miller.** Generally distributed.
- Hyalinia nitidula, Drap.** Generally distributed.
- Hyalinia pura, Alder.** Taffs Well, under oak.
- Hyalinia radiatula, Alder.** Castell Coch, under oak.
- Zonitoides nitidus, Muller.** Specimens in the National Museum of Wales, labelled "Cardiff."
- Zonitoides excavatus, Bean.** Wood at Pen-y-lan, Cardiff, T. W. Proger; Gellygron, near Swansea, Gwyn Jeffreys.
- Euconulus fulvus, Muller.** General, but not an abundant species.
- Arion ater, Fer.** General. The characteristic form on the limestone of the Garth Hills is the var. **castanea Dum. & Mort.** Colour from chocolate brown to a dull Indian red; an important local feature.
- Arion subfuscus, Drap.** Ely, St. Fagans; F. W. Wotton.
- Arion intermedius, Normand.** E. J. Lowe, 1885.
- Arion hortensis, Fer.** Generally distributed.
- Arion circumscriptus, Johnston.** St. Fagans, F. W. Wotton.
- Punctum pygmæum, Drap.** Specimens of this, the smallest British Helicoid shell, were found in the Oak Woods at Taffs Well in 1914, and were afterwards duly confirmed by Mr. J. W. Taylor. It was taken years ago in Cooper's Fields, Cardiff Castle Grounds, by Mr. T. W. Proger, but not recorded.
- Pyramidula rupestris, Drap.** Not uncommon on walls near the coast.
- Pyramidula rotundata, Muller.** General and of very fine size. I have never collected bigger examples of this species. Specimens of the albino variety labelled "Cardiff," are in the Wotton Collection in the National Museum of Wales.

- Helicella virgata, Da Costa.** While not exactly maritime, this species is most abundant near the coast. The albino variety used to occur on the East Moors, and may still do so at Llandaff. The pretty rich brown shell, var. **leucozona, Taylor**, may be taken at Porthcawl. In point of size, a small race throughout the County.
- Helicella itala, L.** Specimens from the Flat Holm are in the Wotton Collection, National Museum of Wales. A legend on the box reads "Also at Porthkerry." I have not been able to confirm this, but the species is an extraordinary one as far as distribution goes. It is often confined to a few yards, and may not be taken elsewhere in a whole district. Also at Rhoose and Gileston, T. W. Proger. Porthcawl, H. M. Hallett.
- Helicella caperata, Mont.** Very general throughout with the vars. **ornata Pic.** and **fulva, Moq.**
- Helicella barbara, L.** This is the "*Bulimus acutus*" of old lists. Most abundant at Porthcawl on the dunes; a maritime species.
- Helicella cantiana, Mont.** Common in the lanes about St. Fagans and at Aberthaw; extremely local, but abundant where it occurs. The white variety plentiful at St. Fagans.
- Helicella cartusiana, Muller.** Occurring at one time on the East Moors, probably introduced with ballast, this is not now a recognised local species. Its home is on the South Downs.
- Hygromia fusca, Mont.** Llandaff, 1897, Wotton Collection, National Museum of Wales.
- Hygromia granulata, Alder.** F. W. Wotton. Specimens in the National Museum of Wales, labelled "Cardiff."
- Hygromia hispida, L.** Generally distributed. Frequent specimens of the var. **albida** Jeff., coast..... districts, T. W. Proger.
- Hygromia striolata, Pfr. (= rufescens, Penn.)** Very abundant, with the albino variety, in most localities.
- Acanthinula aculeata, Muller.** Oak woods at Castell Coch.
- Vallonia pulchella, Muller.** Castell Coch.
- Vallonia costata, Muller.** Common at Sully and Lavernock Point.
- Helicigona lapicida, L.** Local. At Sully, Aberthaw, and Llantwit Major.
- Helicigona arbustorum, L.** The finest examples come from Castell Coch. Also at Leckwith, Llantrisant, Wenvoe, and Llantrithyd. The pale variety, var. **flavescens, Moq.**, very rarely found.

Helix aspersa, Mull. Generally distributed. At Llantwit Major, the vars. **grisea** and **exalbida, Menke**, occur. This locality has also produced one of the smallest examples known.

Helix nemoralis, L. var. **castanea, Moq.** Wenvoe and Aberthaw; var. **citrinazonata, Cockerell**, Aberthaw; the commoner varieties general with the type. On the coast at Rhoose and Aberthaw the band formula 00(345) is characteristic. On the dunes at Porthcawl var. **libellula** 00300 prevails, but this is rare anywhere else. One shell from Aberthaw has the third band translucent (var. **citrinazonata**) and bands four and five heavily pigmented and coalesced; a remarkable example. There is, however, really no end to the possible variation in this species in a rich district.

Helix hortensis, Muller. While not so protean as the last, a species showing considerable variation in the many localities for it. Var. **arenicola Maegill**. At Leckwith, St. Fagans, and Llantrithyd.

Helix pisana, Muller. Abundant on the dunes at Porthcawl, where it is very variable, and in certain parts of the dunes of very fine size. All examples have a brilliant rose-coloured lip, which character is generally taken as evidence of the sunny nature of a locality.

Buliminus obscurus, Muller. Sparingly throughout the district.

Opeas goodallii, Miller. On **Eucharis amazonica** in Mr. Chapman's greenhouse, F. W. Wotton. Not a true British species.

Cochlicopa lubrica, Muller. Common throughout.

Azeca tridens, Pult. Specimens in the National Museum of Wales, labelled "Cardiff."

Cæcilioides acicula, Muller. Llandaff and Caerphilly Castle. East Moors, 1914.

Pupa secale, Drap. Cliffs at Porthkerry, T. W. Proger.

Pupa cylindracea, Da Costa. Abundant on walls and rocks in most places. The beautiful white variety is common at Rhoose, and there are also specimens in the National Museum of Wales from the Flat Holm.

Pupa muscorum, L. Not recorded for the County until 1914, when a few specimens were found at Sully with the rare var. **elongata Glessin**. Also at Llantwit Major, T. W. Proger; Flat Holm, F. W. Wotton; Penarth, A. D. R. Bacchus.

Vertigo antivertigo, Drap. Marsh at Lisvane, a fine series taken in May, 1914.

Vertigo pygmæa, Drap. The commonest of the vertigines. Occurs with the last at Lisvane, and Mr. H. M. Hallett has brought it to me from Sully and Sully Island. Mr. F. W. Wotton records it from Leckwith and East Moors.

- Vertigo edentula, Drap.** Recorded for the Feeder and St. Mellons (which is Monmouthshire), and I have had it from Rhoose. Specimens in Mr. T. W. Proger's collection from the Cooper's Fields, Cardiff.
- Vertigo angustior, Jeff.** Singleton, near Swansea. Jeffreys' "Brit. Conch."
- Balea perversa, L.** Scarce; odd examples in many places. The best locality is round and about St. Nicholas.
- Clausilia laminata, Mont.** Local but not uncommon. Leckwith, Castell Coch, Wenvoe, and the limestone area. A beautiful specimen of the var. *albina* Moq. is in Mr. T. W. Proger's collection from Cwm George, Cwrt-yr-ala.
- Clausilia bidentata, Strom.** An abundant species everywhere. Very fine specimens about Llandaff.
- Succinea putris, L.** Llandaff, St. Fagans, F. W. Wotton.
- Succinea elegans, Risso.** East Moors, Leckwith, F. W. Wotton; in the ditches round about Aberthaw this species is perhaps as common as anywhere. Both this and the previous species seem to be local.
- Succinea oblonga, Drap.** Recorded for the Burrows at Crymlyn, near Swansea, Gwyn Jeffreys, "Brit. Conch."
- Carychium minimum, Mull.** Abundant in the damp oak woods in the Taff Valley. There is only one satisfactory way of collecting this species, and that is to bring a number of the leaves home, dry them, and pass through a sieve.
- Cyclostoma elegans, Muller.** There are colonies of this interesting operculate at Leckwith and elsewhere on the coast as far as Rhoose, at which place it is marvellously abundant.
- Acicula lineata, Drap.** This species was found among the leaf siftings from Castell Coch in 1914, and is an important record for the County. Mr. T. W. Proger has in his collection two specimens from Cefn Coed, Pwlldu (not to be confused with Cefn Coed, Brecknock) one dextral and one **sinistral**, the latter unique and likely to remain so, so far as this County is concerned.

REFERENCES:—Brit. Assoc. Handbk., Cardiff, 1891; Jeffrey's Brit. Conch., Vol. I.; J. of Conch., Vol. V., F. W. Wotton; Taylor's Monograph of Brit. L. & F. W. Mollusca, Vols. II. & III.; The New Phytologist, Vol. IX., Nos. 3 & 4.

ORNITHOLOGICAL NOTES.

 BY T. W. PROGER AND D. R. PATERSON.

WHITE WAGTAIL (*Molacilla alba*).—On March 20th we found a small flock of about a dozen birds of this species feeding on a freshly-turned ploughed field at Rhoose. They had possibly just arrived on migration. This bird is the Continental representative of our familiar Pied Wagtail (*M. lugubris*), with which it is easily confounded until one becomes acquainted with the two species. It appears to have been first recognised in England as far back as 1841. Since that date it has been noted in many parts of this country, and has been known to interbreed with our common Pied Wagtail. This species has nested in the locality.

FIRE-CRESTED WREN (*Regulus ignacapillus*).—We have known this little bird to be an occasional winter migrant to this locality for some time past, but until March of this year we were unable to obtain a specimen for close examination. The bird in question was taken in the Waycock Valley, near Barry, and has been added to the collection of local birds at the National Welsh Museum.

Howard Saunders says (*British Birds*, p. 59): "The Fire-crest has a much less extended range northward than the Golden-crested Wren. It is unknown in Scandinavia; barely reaches Denmark; and does not occur north-east of the Baltic Provinces of Germany; and although very local in its distribution, breeds in France, Spain, Italy, Switzerland, Central and Southern Germany, Greece, Turkey, and Southern Russia; while in the Taurus range in Asia Minor it is more abundant than the Gold-crest. It is also known to be resident throughout the year in the mountain forests of Algeria."

The adult male has a golden frontal band, which unites on each side with a white streak passing above and behind the eye, and separating a parallel black line from the broader and blacker upper bands, which enclose the rich orange crest.

This black line through the eye is one of the principal features which distinguish the Fire-crest from the Golden-crest, another important characteristic being the sulphur green tint on the sides of the neck and shoulders.

Length, 3·7 inches, wing 2·1 inches.

SHORT-EARED OWL (*Asio accipitrinus*).—On November 6th a bird of this species was flushed in a large field of rough grass at Rhoose. We have not happened upon this bird locally for some few years past, but considerable numbers in most years migrate from the Continent to us in autumn. It is known among sportsmen as the Woodcock Owl, due to the fact that the two species arrive about the same time. Unlike other Owls the Short-Eared Owl inhabits the open country, especially rushy moorlands, and we have disturbed it in some large turnip fields and from among the bracken on a hillside, but we have never seen it fly into a tree or rest anywhere but upon the ground. Some few remain in this country to breed where it nests on the ground among rushes in damp situations, and sometimes among the heather on moorlands. Mr. J. J. Neale has noted these Owls breeding on one of the islands off the Pembrokeshire Coast where, he says, that it feeds upon the little Stormy Petrels, which breed there also.

THE MERLIN (*Falco aesalon*).—We see this little falcon occasionally in our immediate locality from December to March. On December 6th we saw one at St. Fagans being chased by rooks, and another a few days later at Porthkerry. The Merlin is the smallest of our native falcons; it nests among the heather on the hills, and the nest has been found several times in Glamorgan.

GOOSANDER (*Mergus merganser*).—A male bird of this beautiful species was obtained locally on December 13th. The Goosander is the largest of the British Saw-billed Ducks. We had not handled one in the flesh for several years until now. The drake is a very handsome bird, the serrated bill and the irides are bright red, the legs and paddles orange red, head and neck deep glossy green, breast and under-parts white with a

beautiful salmon pink blush, which unfortunately soon fades after death. Extreme length 26 inches.

Goosanders swim rather deeply, not unlike a Cormorant, and feed upon fish. They frequent the estuaries of rivers and inland lakes, and visit us during the winter time. On the east and south-east coasts they appear more frequently than on the west. Thirty years ago wildfowlers often shot these birds, as well as Mergansers in the estuaries of the Taff and Rumney rivers during severe weather. Goosanders breed in Scandinavia and north of the Arctic circle, but a few nest in the Highlands of Scotland. The eggs are commonly laid in a hollow tree trunk, or among the water-worn roots of a tree on a river bank; a singular habit in a bird that spends the greater part of the year at sea.

GREAT SKUA or Bonxie (*Megalestris catarrhactes*).—This bird is a very unusual visitor to this locality, and we have to record that one was shot at Sully on December 31st. We noted the occurrence of a bird of the species in 1883, Cardiff Nat. Soc. Trans., Vol. XXXIII., 1900, but have never before had the pleasure of examining a specimen in the flesh. The only breeding place of the Great Skua in the British Islands is on Unst and Foula, where the few pairs now remaining are strictly preserved during the nesting season. It is probable that the appearance of this bird in our district is due to the very severe gales which prevailed all through December.

Howard Saunders says that it seldom visits the Orkneys or the Outer Hebrides, and that it is decidedly scarce along the west side of Scotland, though occasionally met with on the east during the colder months; the same may be said of Wales and England, down to and through the Channel. The Great Skua is the largest of the Parasitic Gulls, and obtains its food chiefly by attacking and robbing the other gulls of their prey. It also kills and devours many of the smaller species of sea fowl, so its position among sea-birds may be compared with that of a pirate among men. In appearance the bird is gull-like, but the beak has a decided raptorial hook, and the claws are very strong

and curved. As in other species of Skuas the two central tail feathers of this one are longer than the others, and not of equal length as in the Gulls. In general colouration this bird is sooty-brown with a slight rufous tinge; upper parts dark brown, the quill feathers are deep brown with white bases; bill, legs, and feet black, with several livid patches. The nesting season is in May, and the site selected is among the heather and moss on the highest parts of the island. Only two eggs are laid, and the birds are said to fiercely attack all who approach the neighbourhood of the nest.

We are indebted to a well-known Wildfowler, Mr. L. Purcell, Framilode, Stonehouse, Glos., for the following notes. Although the birds were obtained on the other side of the present Welsh Border, they occurred so near to it, and are of such great interest, that we think they may be recorded here.

SNOW GOOSE (*Chen hyperboreus*).—Shot at Berkeley, by Charles Nicholls, the Decoy Keeper, September, 1915, and now preserved at Berkeley Castle. The Snow Goose is a rare wanderer from Arctic America, where two forms are found differing in size only.

According to Howard Saunders, it has been recorded three or four times in Ireland—In 1884, and again in the severe winter of 1890-91, small flocks appeared, and were recognised by well-known Naturalists in Cumberland, Northumberland and Yorkshire, while three birds appear to have visited Berkeley-on-Severn, but no examples were then obtained. The larger variety nests in the Hudson Bay region, migrating Southward. Chiefly along the Atlantic Coast—in winter—we saw the specimen referred to at Berkeley in June last, and consider it to be of the smaller variety, which breeds in Western Arctic America and Alaska, visiting the Country between the Pacific and the Mississippi Valley in the cold season.

THE KING-EIDER (*Somateria spectabilis*).—Shot by Mr. L. Purcell, at the Count Rocks, Shepperdine, in November, 1912. This handsome Duck is also an inhabitant of the Arctic regions, and is a rare visitor to our Coasts. It has been recorded thrice in Norfolk, and a few times in Scotland and Ireland.

SUMMER MIGRANTS, 1915.

ARRIVALS.

A late and cold springtime, east winds, and a succession of sunless days.

- Mar. 20. WHITE WAGTAIL. Several seen at Rhoose, near Cardiff.
- April 2. (Good Friday). WILLOW WREN. Several birds in Gwaun-y-to Wood, near Penmark.
- „ 3. CHIFF-CHAFF. About half a dozen just arrived Gwaun-y-to Wood.
- „ 15. SWALLOW. A single bird at Porthkerry, and at St. Fagans on April 26th.
- „ 24. TREE PIPIT. A single bird at Cwmciddy.
- „ 24. CUCKOO. Cwmciddy, and at St. Fagans on the 29th.
- „ 27. HOUSE MARTIN. At St. Fagans.
- „ 27. SAND MARTIN. At St. Fagans.
- „ 30. NIGHTINGALE. At Cwmciddy.
- May 1. SWIFT. At St. Fagans.
- „ 20. GOLDFINCHES. At St. Fagans, still in small flocks about the meadow and garden. No nests found this season until the second week in June—a late season

DEPARTURES.

- Oct. 27. General H. H. Lee sends us a note of quite a large flight of House Martins and Sand Martins at Dinas Powis on this date. The weather was cold and dull, with some rain.
- „ 30 & 31. HOUSE MARTINS. Several flying about on Penarth Head on these dates. Note by J. L. Proger.
- Nov. 6. HOUSE MARTINS. Six birds seen on Penarth Head. Note by J. L. Proger.

SUMMER MIGRANTS, 1915.

 By GEOFFREY C. S. INGRAM.

ARRIVALS.

Mar.	25.	CHIFF CHAFF.
April	14.	TREE PIPIT.
„	16.	WILLOW WARBLER.
„	16.	GRASSHOPPER WARBLER.
„	24.	SWALLOW.
„	24.	BLACKCAP WARBLER.
„	28.	SANDPIPER.
„	29.	CUCKOO.
May	1.	WHITETHROAT.
„	1.	SWIFT.
„	2.	SEDGE WARBLER.
„	6.	GARDEN WARBLER.
„	6.	SAND MARTIN.
„	10.	HOUSE MARTIN.
„	21.	NIGHTJAR.

 DEPARTURES.

Aug.	21.	SWIFT.
Sept.	9.	SPOTTED FLYCATCHER.
Oct.	4.	SWALLOWS.
„	10.	REDSTART ♀
„	10.	CHIFF CHAFFS.
„	10.	HOUSE MARTINS.



♀ NIGHTJAR.

UNCHARACTERISTIC BUT NOT UNUSUAL PERCHING ATTITUDE.

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Geoffrey C. S. Ingram.

SOME FIELD NOTES ON THE NIGHTJAR.

(Caprimulgus europæus).

By GEOFFREY C. S. INGRAM.

One of the last of the migratory birds to arrive, the Nightjar, reaches this district about the third week in May; my records for the last four years, 1912-15, giving May 16th, May 28th, May 21st, and May 21st., as the dates upon which birds were first observed. Nesting operations begin about a fortnight or three weeks later; my earliest record of eggs being June 4th. The two eggs appear to be laid on alternate days, thus, in 1914 the first egg was laid on June 4th, and on the 5th there was still only one egg, the second being laid on the 6th; while in 1915, June 12th was the date on which the first egg was laid, and the second on June 14th. Personally, I am inclined to think that the birds in this district are double brooded, as they have been proved to be in other parts, viz., Hampshire, where Miss E. M. Imrie, writing in November, 1915, number of *British Birds*, records finding near Beaulieu, on August 2nd, 1915, "a hen Nightjar sitting on two eggs, and about three feet away the cock bird brooding a young one not quite in full feather." Regarding this record the Rev. F. C. R. Jourdain, M.A., M.B.O.U., writes, "The above note is the more welcome as it furnishes absolute proof that late nests are in some cases second broods, and not late layings of birds which have lost their first nests." Looking at these late nests from this point of view, my records are of interest, as they very easily divide into early and late nests, viz., early nests, June 22nd, 1912, two young about seven days old; June 14th, 1913, two eggs; June 6th, 1914, two eggs; and June 14th, 1915, two eggs; while the late nests are August 11th, 1909, two nearly fledged young; July 3rd, 1910, fresh eggs; and July 27th, 1911, two newly-hatched young. It is very probable that these late nests were really second broods.

The young birds, even when only a day old, can move about quite readily, and the two chicks found in 1911 served me a particularly shabby trick. They were found early one morning, and were about one day old. In order to get some photographs of the parent bird, a small hiding tent was erected in front of them and disguised as one of the birch bushes growing around. At about 2 p.m., the same day I returned with my camera, and found the female covering the family, and quite at home with the tent, so after sending her off, I got inside and carefully focussed the camera on the spot the two chicks were occupying. In about half an hour the female returned, but in the meantime the youngsters had crawled away into shelter from the sun, among some long grass growing about two feet away.

Instead of alighting at the original spot the female came down in the shade of my tent, to the right of it, and only about a foot from the canvas, and then called to the youngsters who emerged with many welcoming squeaks and scrambled to her, and there she brooded them, out of sight and range of my camera.

The two nearly fledged young ones found in 1909, had their home amidst a great bed of bracken fern growing on the top of a hill. Having no camera with me when I found them I had to put off taking their portraits until the day following, when I spent a good twenty minutes searching for them, and eventually rediscovered them about thirty yards away from the place they were in on the previous day.

Two young ones found in 1913 moved regularly every day. In the early morning they occupied a little clearing on the western side of a low birch bush, and in the afternoon were always to be found on the eastern side, evidently moving to take advantage of the shade the bush offered from the hot sun.

This last season, 1915, I spent some little time watching the movements of these birds of an evening and looking for and examining the remains of the moths they feed on. My observations lead me to think that when a moth is captured it is carried to some bare patch of ground, such as a path, or clear space at

the foot of a tree, and there dismembered and devoured. I picked up a great number of wings of moths from two or three favourite patches of ground, and twice put up a bird from one of these places, who left behind the wings of a freshly-killed moth. A careful search under dead branches of trees which were used as perching places failed to give any result, but there was nearly always something to be found on the patches of ground I have mentioned. The moths identified from the remains picked up were Buff Tips, White Ermines, Buff Ermines, Cream Spot Tigers, Engrailed Clay, Pale Tussock, etc., the heaviest toll being taken of the Buff Tips and White Ermines. It will be noticed that all the moths are either light in colour, or have large light patches on their wings, which possibly render them more easily seen by the hunting birds.

The following accounts taken from my notebook of two evenings in June last, spent watching these birds may be of interest. The place visited is a favourite one, and last season held three pairs of birds. It is a wood, the trees of which have nearly all been cut down during the last five years, leaving just a few scattered oaks, and a quantity of birch bushes which are now fairly large. The dead limbs of the oak trees are greatly used by the birds, as also are the old dead stumps scattered about.

June 21st, 1915—Went up to the Nightjar wood arriving about 7.15 p.m. Picked up on one of the feeding grounds the remains of several moths, Buff Tips, Cream Spot Tiger, Buff and White Ermine; at 8.35, I heard a bird churring. It did not keep it up very long, and finished with a sharp "coo-wick," a call which is generally used when the bird takes to flight or is flying, and a moment later I caught sight of it flying past. It alighted on a dead branch of an oak tree and started churring again, to be answered immediately by another bird. In a minute or so No. 1 bird took to flight again, with a "coo-wick," and made off uttering this call as it went. I made my way across toward the old main drive, and just as I got to the edge of it a male nightjar got up from some dead sticks about

six feet to my left, and began to flap around me uttering a sharp "guck guck" note. Although it was now past nine o'clock the white wing and tail spots of the bird were very plainly visible. I stood quite still, watching, and the bird settled down on a dead branch quite close to me, about ten feet, but out of sight behind a bush, so I moved to get a view of him. He was sitting quite motionless along a dead stick, but as I approached he flapped up again and fluttered around me like a great brown butterfly, flapping up and down and sailing with wings held stiff and high above his back. After fluttering around and coming within four feet of me, he sailed off on wide spread wings, and settled on a dead oak branch some way off. Taking to flight again with a "coo-wick" he made for a group of tall trees growing at the edge of the wood, and through my glasses I could see him hawking around these. Sitting down on a stump in the middle of the drive, I waited, and bye-and-bye heard a bird approaching uttering a "coo-wick" every now and then. It alighted some way off, where, I could not see, and started to churr, so I pulled out my watch to time it, and as I did so another bird appeared, and hovered around me, alighting later on an oak tree quite close, about ten yards, and also started to churr. Its effort was spasmodic, however, and not sustained like the other bird's, who was still at it, and kept going for a few seconds over the six minutes, without once pausing.

It was now nearly 9.30, so I got up and walked a little way down the drive, coming suddenly on the bird which had churred so long. It was sitting on the very tip of an upright stick, and I walked past, within three feet of it. Only when I stopped and made directly for it, did it fly off uttering a succession of "guck, guck, gucks." It alighted in a tree and remained there, and another bird suddenly appeared, and started flying around me, sometimes hovering with rapidly-beating wings, within four to five feet of me, constantly calling "guck, guck, guck." It alighted on the ground somewhere near me, but it was now too dark to see where, and my attention was taken by the appear-



♂ NIGHTJAR ON ROOSTING PLACE.

THE ♀ WAS SITTING ABOUT FOUR YARDS AWAY ON TWO EGGS.

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Geoffrey C. S. Ingram.

ance of a barn owl flying over the open wood and coming in my direction. I kept quite still, and it crossed the drive about twenty feet away without a sound, and looking like a great white moth. When it had gone I walked a little way up the drive to look for the Nightjar that had alighted. It rose from the path in front of me, and fluttered a few feet further on and alighted again. This action was repeated half-a-dozen times, and I am pretty certain that the bird was feeding, and was loath to leave what it had caught, but it was too dark to see. Eventually it flew off with a "guck, guck, guck," and passing the tree where the other bird was still sitting, this latter bird made off as well. I made a move for my bicycle and home, it now being nearly 10.30. Grasshopper Warblers were reeling and another Nightjar churring. Passed quite close to a bush where a hidden Grasshopper Warbler was singing. Heard close at hand in the quiet of the night the sound is more like a clatter, and of surprising volume.

June 23rd, 1915.—Arrived at the Nightjar wood at about 6.30 p.m. Picked up several more moth remains, and also put up a male Nightjar who was roosting on an old tree stump. Later on, about 7.45, another male flew up from the ground, at the foot of an oak tree, leaving behind him the wings of a freshly-killed and dismembered Buff Tip moth. At 8.5 a bird started to churr, and later on I caught sight of one perched at the end of a dead branch. I watched it for nearly ten minutes through my glasses, and it appeared to be performing its toilet. It took flight silently, and I moved away, but had not gone far before a female bird, who had been resting on the ground close to a birch bush flew up quite quietly and settled in an oak tree near at hand. I walked slowly toward her, and as I did so a male flew by and alighted on a tree about thirty yards from the female, and within six of me. He immediately started churring, and was answered by a Grasshopper Warbler, from a bush just below the branch he was perched along, and then another Grasshopper Warbler struck up in a small bush about six feet from me. I could see this latter bird quite plainly

for it hopped up along an upright stick growing from the centre of the bush, and sang from the top of it. The noise these three birds made was quite astonishingly loud. After churring spasmodically for a couple of minutes, the male Nightjar took flight in the middle of one of his efforts, with a great wing clapping; the churr giving place to a queer bubbling noise, as he flew off. The female followed him, and later on three birds passed me flying together, and as far as I could see one was a female and the other two males. One male passed quite close to me, and his white spots showed up very plainly in the dusk. Later on I heard another bird on the wing giving vent to the queer bubbling churr and clapping its wings very vigorously. I noticed particularly that when flying the female goes at a very businesslike pace, with an even wing movement and straight and silent flight, but the males indulge in a great deal of wing clapping, flicking themselves up and down as though suspended on an elastic thread, holding their wings high above their back, at other times planing with outstretched wings, and constantly calling "coo-wick, coo-wick."

ENTOMOLOGICAL NOTES.

 BY H. M. HALLETT, F.E.S.

One of the features of the year has been the extraordinary abundance of certain insects, especially undesirable species, in fact, it may be called a year of plagues.

The HOLLY BLUE BUTTERFLY (*Cyaniris argiolus*, L.) occurred in great numbers in the early spring; the second brood was also numerous.

The CABBAGE WHITE BUTTERFLY (*Pieris brassicæ*, L.) was only too plentiful, its larvæ worked havoc amongst the cabbage, cauliflower, etc., crops. I find these larvæ are extremely partial to the garden "Nasturtium;" it is astonishing to see the rapidity with which a bed of this plant will disappear under their attacks.

The BLACK BLIGHT (*Aphis rumicis*) practically destroyed the crop of Broad Beans in this district. I noticed that they also attacked the Scarlet Runner Beans, but that this plant seemed to quickly outgrow the attack and suffered very little, if any, harm. Other species of blight were very plentiful, and attracted unusually large numbers of Lady Birds (*Coccinellidæ*).

The DADDY LONGLEGS (*Tipula*) appeared in enormous numbers in the autumn. Wasps seem very partial to these flies, and appeared to do great execution among them.

LEPIDOPTERA.

Acherontia atropos, L. Mr. H. R. Wakefield, of Swansea, advises me that two specimens of the "Death's Head" have been brought to him this summer, having been caught in his district.

Dilina tilisæ, L. Mr. E. U. David tells me this moth has been taken at Merthyr Mawr. I had not previously been able to find a record of the Lime Hawk Moth in Glamorgan.

Plusia festucæ, L. Mr. E. U. David has taken this beautiful moth in numbers in the Gower.

COLEOPTERA.

Acanthocinus ædilis, L. The Timberman Beetle has turned up in some numbers at the Docks this year, and a specimen was sent in to the Museum from Radyr.

HYMENOPTERA ACULEATA.

The list of additions to the County records is considerably smaller than last year, but includes several rare and interesting species.

A fortnight spent at Porthcawl during the second half of June produced very interesting results, considering the weather, and no doubt this district, if well worked, would prove a rival to the Gower.

Besides the new records, the following interesting species have been noted :—

Donisthorpea (Lasius) fuliginosa, Latr. This Ant was found in great numbers near Penarth, attending the Aphis attached to Dogwood (*Cornus sanguinea*), and with them occurred the interesting *Hemipteron, Pilophorus perplexus, Scott.*

Donisthorpea (Lasius) nigra, L. The annual marriage flight of this Ant took place on the 8th August, and Cardiff and district experienced a remarkable and uncomfortable plague of these insects, far exceeding in numbers the flights noticed in previous years. This unusual abundance was noticed in other parts of the country on the same day. (See Crawley and Donisthorpe in "Ent. Record," Sept., 1915, pp. 205 and 231.)

Methoca ichneumonides, Latr. This rare and interesting Thynnid occurred in abundance at Rest Bay, Porthcawl, on 13th and 24th June, about the burrows of *Cicindela campestris*; at least fifty females could have been taken, but no males were seen.

Myrmosa melanocephala, Fab. A dead female was found on 14th November, under the bark of a fallen ash tree at Sully.

Pompilus consobrinus, Dbm. Two females were taken at Porthcawl in June.

Pompilus chalybeatus, Schiodte. Not uncommon in both sexes at Porthcawl

Pompilus pectinipes, V. d. Lind. A few females were taken at Porthcawl.

Ceropales maculatus, Fab. Occurred at Porthcawl in abundance, especially at the flowers of *Euphorbia paralias*.

Astutus stigma, Panz. Both sexes were taken at Porthcawl, and, had the weather been more favourable, I think it would have proved to be not uncommon.

- Tachysphex unicolor, Panz.** Abundant at Porthcawl in both sexes.
- Psen unicolor, Panz.** One female and five males were taken at Porthcawl, it is probably not uncommon there.
- Oxybelus mucronatus, Fab.** Very abundant at Porthcawl, especially the males, which frequented the flowers of the Sea spurge (*Euphorbia paralias*). This species was really more abundant at Porthcawl than the usually much commoner *Oxybelus uniglumis*, and the males were less fastidious about the weather than any other Fossor I have met with. One of the most interesting features of collecting at Porthcawl was the extraordinary abundance of several species which are usually very scarce.
- Vespa norvegica, Fab.** The claim of this wasp to inclusion in the County list depended on one or two workers which had been brought to me. This year a nest occurred in a Penarth garden, built on some bean sticks leaning against the wall; and another nest was sent in to the Museum in September from Llanishen. This wasp is probably not rare, but I have never caught it away from the nest.
- Colletes marginatus, Sm.** The males began to appear in some numbers at Porthcawl at the end of June, and frequented the flowers of the Sea Spurge and Ragwort.
- Prosopis dilatata, K.** One male was taken at Sully on 4th July.
- Sphecodes hyalinatus, Schk.** Three males and a female occurred at Cwrt-yr-ala in August.
- Andrena rosæ, Panz.** One female occurred at Lavernock on 15th August.
- Andrena bucephala, Steph.** Both sexes were obtained at Cwrt-yr-ala in May; the male had not previously been taken in the County.
- Epeolus productus, Th. Epeolus rufipes, Th.** Both these interesting bees were taken at Porthcawl in June.
- Cœlixys mandibularis, Nyl.** Not uncommon in both sexes at Porthcawl, apparently associated with *Megachile maritima*.
- Osmia leucomelana, K.** Both sexes occurred at Porthcawl, the males being not uncommon.

Additions to the Glamorgan records of *Hymenoptera aculeata*:—

- Myrmica schencki, Em.** A colony of this ant, which was described as a sub-species of *Myrmica scabrinodis, Nyl.*, was found at Sully on 30th May, 1915; it had not previously been recorded as British. The nest was situated in a bank of stiff marly soil, the entrance being a small round hole like those made by the smaller bees, such as *Halictus*, etc. For full description of this ant see Donisthorpe, "Ent. Record," XXVII., 1915, p. 265.

- Pompilus wesmaeli, Thoms.** A few males of this rare species were taken at Porthcawl on 24th June.
- Tachysphex pectinipes, L.** Two females at Porthcawl in June.
- Diodontus tristis, V.d. Lind.** Both sexes at Porthcawl and Candleston, in June.
- Gorytes tumidus, Panz.** Two females at Porthcawl on 29th June.
- Oxybelus mandibularis, Dhlb.** Two females of this rare wasp were taken at Porthcawl on 29th June.
- Thyreopus peltarius, Schreb.** Not uncommon at Porthcawl and Candleston in June.
- Lindenijs albilabris, Fab.** One female was taken at Horton, Gower, on 30th July, 1915.
- Odynerus melanocephalus, Gmel.** Two females and a male occurred at Sully on 30th May.
- Prosopis pictipes, Nyl.** One male was taken at Sully on 18th July.
- Sphecodes ferruginatus, Schk.** Three females occurred at Sully in July.
- Halictus xanthopus, K.** Females occurred in abundance at Sully on 9th May, and males equally commonly on 5th September.
- Andrena cingulata, Fab.** One female at Dinas Powis on 23rd May, and a male at Sully on 30th May.
- Nomada furva, Panz.** Males were not uncommon at Sully in May.
- Bombus soroensis, Fab.** One female occurred at Sully on 25th July, 1915.
- Bombus muscorum, Linn.** Two females occurred at Sully on 15th August, 1915.

CHRYSIDIDÆ.

- Hedychridium minutum, Lep.** Two females were taken at Porthcawl on 29th June on the flowers of *Leontodon*.
- Chrysis neglecta, Shuck.** One female at Sully on 6th June.

PROCTOTRYPIDÆ.

- Gonatopus distinguendus, Kieff.** One female of this curious Jassid-parasite was taken on the Porthcawl sandhills on 29th June.

METEOROLOGICAL OBSERVATIONS IN THE SOCIETY'S DISTRICT, 1915.

By E. WALFORD, M.D., F.R.MET.SOC.

The average monthly rainfall over the whole of the Society's district (comprised within the semi-circular area, having the Beacons as its northernmost point, its base the coastline from Neath to Chepstow, and with a mean height of 605 feet above the sea level) was as follows:—

January	5·24 inches.
February	7·75 ..
March	1·65 ..
April	1·99 ..
May	3·30 ..
June	1·36 ..
July	6·11 ..
August	2·58 ..
September	1·43 ..
October	4·92 ..
November	3·57 ..
December	11·62 ..
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	51·52 ..
Total in 1914	59·77 ..
„ 1913	57·17 ..
„ 1912	68·20 ..
„ 1911	50·95 ..
„ 1910	59·27 ..
„ 1909	50·83 ..
„ 1908	45·60 ..
„ 1907	52·37 ..
„ 1906	48·29 ..
„ 1905	39·98 ..
„ 1904	50·02 ..
„ 1903	67·90 ..
„ 1902	41·72 ..

OBSERVERS.		FEET ABOVE MEAN SEA LEVEL.	INCHES OF RAIN.
C. H. PRIESTLEY,	Summit of Tyle Brith, Brecknockshire	2350	73·36
„	Nant Penig	2000	76·21
„	Nant Ddu	1560	67·64
„	Storey Arms	1430	75·80
„	Beacons Reservoir	1340	77·95
„	Nant Gwineu	1275	53·33
ERNEST W. TERREY, C.E., F.G.S.,	Pontlluestwen Reservoir, Mardy	1225	85·97
H. C. STEEL,	Blaenavon Estate Office, Mon.	1150	59·54
C. H. PRIESTLEY,	Pentwyn Uchaf Farm	1143	61·64
„	Cantrefi Reservoir	1120	69·88
„	Garw-nant	1100	67·34
R. C. HARRISON,	Gwernllwyn, Dowlais	1071	48·53
EBBW VALE STEEL, IRON, AND COAL CO.,	Ebbw Vale	902	57·78
C. H. PRIESTLEY,	Llwynon Reservoir, Brecknockshire	860	59·19
„	Pont-ar-daf	850	64·99
GLYNCORRWG COLLIERY CO.,	Glyncorwg	725	75·26
THE UNITED NATIONAL COLLIERIES, LTD.,	Treherbert	670	91·08
NEWPORT CORPORATION,	Newchurch, Wentwood, Mon.	525	42·37
„	Nantyridd, Wentwood, Mon.	500	41·21
„	Llanvaches Embankment	456	37·55
„	Pant-yr-eos Reservoir, Mon.	435	52·62
EDWARD CURRE,	Itton Court, Chepstow	390	35·39
E. TUDOR OWEN,	Ash Hall, Cowbridge	315	45·83
HENRY CLAY,	Piercefield Park, Chepstow	300	36·16
ERNEST W. TERREY, C.E., F.G.S.,	Lan Wood Reservoir, Pontypridd	300	54·03
GODFREY L. CLARK, J.P.,	Talygarn, Glam.	250	55·72
JAMES WILLIAMS,	Wern House, Ystalyfera	240	65·09
SIR HENRY MATHER JACKSON, Bart.,	Llantilio Court, Mon.	230	35·37
E. WALFORD, M.D.,	Meteorological Station, Penylan, Cardiff	204	40·89
Rev. Canon HARDING,	Pentwyn, Rockfield, Mon.	191	35·18
J. F. MATHYSSSENS,	Witla Court, Rumney	177	37·67
Lord LLANGATOCK,	The Hendre, Monmouth	176	31·58
C. H. PRIESTLEY,	Llanishen Reservoir, Glam.	155	37·79
„	Lisvane Reservoir, Glam.	150	36·71
Mrs. LYSAGHT,	Castleford, Chepstow	146	34·64
C. H. PRIESTLEY,	The Heath Filter Beds, Cardiff	132	40·25
O. H. JONES, J.P.,	Fonmon Castle, Glam.	130	33·19
NEWPORT CORPORATION,	Ynis-y-fro Reservoir, Mon.	130	41·11
C. H. PRIESTLEY,	Cogan Pumping Station, Glam.	121	37·42
„	Ely Pumping Station, Glam.	53	40·47
A. A. PETTIGREW,	Roath Park, Cardiff	52	38·90
C. H. PRIESTLEY,	Trade Street Depot, Cardiff	45	39·18
NEWPORT CORPORATION,	Friars Street Depot, Newport	33	39·86
T. E. FRANKLIN,	Biglis Pumping Station, Cadoxton, Barry	20	35·28

CARDIFF METEOROLOGICAL STATION.

This Station is situated about two miles from the centre of the town upon Penylan Hill on land belonging to the Waterworks Department of the Cardiff Corporation at an elevation of 203 feet above sea level, Latitude $51^{\circ} 30'$ N., Longitude $3^{\circ} 10'$ W. Observations are made at 9 a.m. and 9 p.m. daily by Mr. F. Glover and Mr. W. J. Mellings under the direction of the Medical Officer of Health of Cardiff.

The instruments comprise a Phillips' maximum thermometer mounted horizontally, a Rutherford's spirit minimum thermometer also mounted horizontally, a hygrometer consisting of dry-bulb and wet-bulb thermometers mounted vertically, all placed in a double louvred Stevenson screen of the pattern approved by the Royal Meteorological Society, four feet above the ground with the door opening to the north. On the land adjoining the screen and fenced in with railings are other instruments. Two thermometers for taking earth temperatures placed at one foot and four feet respectively below the surface. A solar radiation thermometer mounted on a post four feet above the ground, a grass minimum thermometer, and a rain gauge (Snowdon pattern). In a separate building on the same ground is placed a barometer (Kew pattern), provided with an attached thermometer and a double scale and vernier, divided on one side into inches, $\cdot 10$, $\cdot 05$ and $\cdot 002$ inches, and the other side into millimetres, &c.

A Campbell-Stokes Sunshine Recorder is placed on the parapet of the Water Reservoir in a position that the sun can shine on it the whole time it is above the horizon. The instruments have all been verified at the Kew Observatory, and the necessary instrumental corrections are duly made. Weekly and monthly reports on the weather are sent to the Meteorological Office, South Kensington, which are included in the returns issued by that office.

Up to the present no self-recording instruments have been provided at this Station, but the matter is now under consideration. Much valuable information may be obtained from self-recording barometers, thermometers, and rain-gauges, by measuring the time, duration and intensity of various meteorological phenomena. A further development of the equipment of the Station in this direction is much to be desired.

The most recent acquisition consists in the seismograph, presented to the Station by the Naturalists' Society in 1909, which is suitably housed in a detached building erected specially for the purpose. A full description of this interesting and valuable instrument is given in Vol. XLIV. of the Transactions of the Society.

TABLE I.

BAROMETRIC PRESSURE AND RELATIVE HUMIDITY.

1915.	Mean Barometric Pressure.*		Hygrometer.*		
	Uncorrected.	At M.S.L. and 32° F.	Dry Bulb (Mean).	Wet Bulb (Mean).	Mean Relative Humidity.
	in.	in.	° F.	° F.	%
January ..	29·454	29·666	40·0	38·6	88
February ..	29·383	29·593	39·6	38·1	87
March ..	30·074	30·392	41·1	39·0	83
April ..	29·936	30·133	46·4	43·5	78
May ..	29·850	30·025	52·2	48·3	74
June ..	29·882	30·043	57·8	53·6	75
July ..	29·765	29·924	58·0	54·7	80
August ..	29·835	30·043	59·4	56·7	83
September ..	29·899	30·061	55·3	52·7	83
October ..	29·828	30·013	48·3	47·0	89
November ..	29·425	29·634	37·7	35·9	86
December ..	29·416	29·624	43·2	41·8	88
Means ..	29·733	29·929	48·3	45·8	83

* From observations at 9 a.m. and 9 p.m.

TABLE II.

TEMPERATURE.

1915.	Maximum.	Minimum.	Mean of Maximum.	Mean of Minimum.	Mean Temperature.	Difference from Average (26 years).
	° F.	° F.	° F.	° F.	° F.	° F.
January ..	50	26	44·1	36·1	40·1	+ 1·3
February ..	51	26	45·9	35·0	40·4	+ 0·2
March ..	58	27	48·0	35·0	41·5	- 1·0
April ..	68	32	54·0	39·6	46·8	+ 0·4
May ..	73	34	61·4	44·5	52·9	+ 0·4
June ..	74	40	66·9	49·6	58·1	+ 0·7
July ..	71	47	64·8	51·6	58·2	- 2·5
August ..	72	42	66·8	53·3	60·0	- 0·2
September ..	75	38	64·9	48·7	56·8	+ 0·4
October ..	64	31	54·3	44·0	49·1	- 1·1
November ..	53	22	44·6	32·5	38·5	- 5·9
December ..	55	30	48·0	38·8	43·4	+ 2·6
	Max.	Min.	Mean	Mean	Mean	
	75	22	55·3	42·4	48·8	- 4·7

TABLE III.

SOLAR AND TERRESTRIAL RADIATION, UNDERGROUND TEMPERATURE, AND SUNSHINE.

1915.	TEMPERATURE.				Bright Sunshine.	Bright Sunshine— Difference from Average (7 years).
	Solar Maximum (Mean).	Grass Minimum (Mean).	Underground (Mean).			
			1ft.	4ft.		
	° F.	° F.	° F.	° F.	hrs.	
January ..	62.2	32.0	39.5	42.5	48.4	— 6.2
February ..	79.4	30.3	39.2	42.6	83.8	+ 3.5
March ..	85.4	30.7	41.8	43.4	129.2	+17.7
April ..	99.8	34.2	45.8	45.4	136.8	—40.6
May ..	111.5	40.0	54.3	50.1	258.1	+37.5
June ..	117.0	45.1	60.2	55.4	226.6	+ 7.9
July ..	118.2	47.3	60.6	57.7	211.9	+ 3.9
August ..	115.4	51.6	61.9	58.5	166.5	—25.9
September ..	107.8	45.6	58.8	58.2	182.1	+29.1
October ..	—	41.2	51.6	54.9	62.1	—36.2
November ..	—	28.7	41.3	47.7	102.8	+29.8
December ..	—	35.0	41.5	45.0	35.9	—15.4
		Mean 38.5	Mean 49.7	Mean 50.1	Total 1644.2	+ 5.1

TABLE IV.

RAINFALL.

1915.	Amount.	Difference from Average (26 years).	*Greatest Fall in 24 hours.	†Date of Greatest Fall.	*No. of Days with Rain (0.01 in. or more).
	ins.	ins.	ins.		
January ..	3.87	+ 0.31	.50	1st	22
February ..	5.00	+ 2.24	1.30	16th	22
March ..	1.38	— 1.82	.42	2nd	8
April ..	1.31	— 1.44	.31	6th	14
May ..	2.77	+ 0.48	.71	13th	11
June ..	1.23	— 1.61	.50	25th	8
July ..	5.08	+ 2.49	1.52	16th	20
August ..	2.27	— 1.89	.62	2nd	18
September ..	1.27	— 1.39	.41	28th	12
October ..	5.12	+ 0.38	.97	23rd	17
November ..	2.55	— 0.96	1.29	11th	8
December ..	9.04	+ 4.35	1.52	14th	27
	Total. 40.89	+ 1.14	1.52	16th July 14th Dec.	Total 187

* 24 hours ending 9 a.m. next day.

MAIN FEATURES OF THE MONTHS.

1915.

JANUARY.

During the greater part of the month rough and rainy conditions prevailed with westerly and south-westerly winds, amounting at times to gales of considerable intensity. Towards the end of the month easterly and north-easterly winds arose, and the weather became finer and drier. The barometric pressure for the month was below the average, during the early part of the month considerable depressions occurred with gales and heavy rains. The mean temperature of the month was 40.1 degrees Fah., and 1.3 degrees above the average of the past twenty-six years. The maximum temperature of 50.0 degrees was recorded on the 15th, the minimum, 26.0 degrees, on the 30th. Frost occurred on five days, from the 18th to the 30th. The rainfall for the month amounted to 3.87 inches, and was 0.31 inches above the average for twenty-six years. Rain fell on twenty-two days, the greatest fall in twenty-four hours was 0.50 inches on the 1st inst. There was a deficiency of bright sunshine. The total amount recorded was 48.4 hours, being 6.2 hours below the average for seven years.

FEBRUARY.

February was a very wet and stormy month. Southerly winds, storms, and a comparatively high temperature with unusual rain prevailed during the greater part of the month. Towards the end of the month a short period of fine dry weather occurred, accompanied with a lower temperature. The barometric pressure for the month was below the average; depressions and gales from the south-west were of frequent occurrence. The mean temperature of the month was 40.4 degrees or 0.2 degrees above the average of the past twenty-six years. The maximum temperature of 51.0 degrees was recorded on the 3rd, the minimum, 26.0 degrees, on the 25th.

Frosty nights were by no means frequent, for February, and no very low temperatures were registered. The total rainfall for the month amounted to 5.00 inches ; rain fell on twenty-two days, the greatest fall in twenty-four hours, 1.30 inches, occurred on the 16th. The fall was 2.24 inches above the average of the past twenty-six years. The bright sunshine recorded amounted to a total for the month of 83.8 hours, or 3.5 hours above the average for seven years. A snow-storm occurred on the 23rd, and a severe hailstorm on the 28th.

MARCH.

March was a fine and dry month with northerly and north-easterly winds of no great velocity and plenty of sunny days. The early part of the month was milder than the latter part, when a cold spell was experienced towards quite the end of the month. The barometric pressure was a little above the average, and no considerable or continued depressions were recorded. The weather during the month was generally quiet and fine. The mean temperature was 41.5 degrees, or 1.0 degrees below the average for the past twenty-six years. The maximum temperature, 58.0 degrees, occurred on the 13th ; the minimum 27.0 degrees, on the 27th. Snow fell on two days. The rainfall amounted to 1.38 inches for the month, and was 1.82 inches below the average for twenty-six years, with eight rainy days. The greatest fall in twenty-four hours was 0.42 inches on the 2nd. The amount of bright sunshine recorded was abnormally high for this month, being 128 hours, or 17 hours above the average for seven years.

APRIL.

During the early part of April the weather was unsettled, the wind chiefly from the west and south-west blew at times with considerable force, amounting occasionally to gales. Rain and high winds were experienced daily during this period. This was followed by quieter weather, and towards the end of the month by cold and dry winds from the east and north-east.

The barometric pressure, although low during the early part of the month, was above the average. The mean temperature was slightly above the average, being 46.8 degrees. The maximum, 68.0 degrees, on the 28th and 29th. The minimum, 22.0 degrees, on the 2nd. Frost was recorded on ten days. The rainfall amounted to 1.31 inches, being 1.44 inches below the average. Rain fell on fourteen days, the greatest fall being .31 inches on the 6th. Bright sunshine was deficient, a total of 136.8 hours being recorded for the month. This was 40.6 hours below the average for seven years.

MAY.

The weather was fine and dry during the greater part of the month. North and north-easterly winds prevailed throughout the whole period with many sunny days. The barometric pressure was slightly below the average. The mean temperature for the month was 52.9 degrees or 0.4 degrees above the average. The maximum of 73.0 degrees was registered on 26th, an unusually high temperature for this month. The minimum, 34.0 degrees, occurred on the 14th and 15th. Frost occurred on five days. The total rainfall in the month amounted to 2.77 inches, being 0.48 inches above the average for twenty-six years. Rain fell on eleven days, the greatest fall, .71 inches, occurred on the 13th. The bright sunshine recorded amounted to 258 hours, or 37.5 hours above the average for seven years.

JUNE.

The weather continued to be fine and dry during this month. East and north-easterly winds, with normal barometric pressure and deficient rainfall being the prevailing conditions. The mean temperature for the month was 58.1 degrees, or 0.7 degrees above the average. The maximum 74.0 degrees was registered on the 13th, the minimum, 40.0 degrees, on the 1st and 2nd. Frost was recorded on three days. The rainfall was exceedingly small, the total for the month being 1.23 inches and 1.61 inches below the average for twenty-six years. Rain fell on eight

days, the greatest fall being 0.50 inches on the 25th. The amount of bright sunshine recorded was eight hours above the average for seven years. On eight days more than twelve hours sunshine were recorded, the total for the month amounting to 226.6 hours. A thunderstorm occurred on the 27th of this month.

JULY.

The weather during July was comparatively cool for the time of the year and extremely changeable. This variability of the conditions was due to frequent cyclonic disturbances passing mostly in a north-easterly direction across the country. Several severe thunderstorms with heavy rain occurred during this month. The average barometric pressure for the month was almost normal, no very high readings were recorded, so that the range of pressure was small. The mean temperature for the month was 58.2 degrees, which was 2.5 degrees below the average of the past twenty-six years. No very high temperatures were recorded, 71.0 degrees being the maximum on the 6th, and 47.0 degrees the minimum on 13th and 25th. The highest readings were all during the first week in the month. The rainfall was above the average for twenty-six years by 2.49 inches. Rain fell on twenty days, the total being 5.08 inches. The greatest fall in twenty-four hours was 1.52 inches on the 16th. A plentiful supply of bright sunshine was recorded, amounting to a total for the month of 211.9 hours, or 3.9 hours above the average for seven years. Thunderstorms with heavy rain occurred on the 4th and 16th.

AUGUST.

The weather was unusually cool for the time of the year, and no very high temperatures were recorded. Occasional thunderstorms were experienced, but no heavy falls of rain accompanied these storms. The barometric pressure was, excepting during the early part of month, slightly above the normal. North-westerly and south-westerly winds prevailed during the greater

part of the month. The mean temperature was 60 degrees, which was the average for the past twenty-six years. The maximum temperature recorded was 72.0 degrees on the 26th, and the minimum 42.0 degrees on the 30th. The rainfall was below the average for the past twenty-six years by 1.89 inches. The total for the month was 2.27 inches ; rain fell on eighteen days, the greatest fall being .62 inches on the 2nd. The month was cloudy during the earlier half, and the amount of bright sunshine recorded was deficient. The total for the month being 166.5 hours or 25.9 hours below the average for seven years.

SEPTEMBER.

September was a bright and dry month and generally mild. The direction of the wind was variable, but easterly winds prevailed during the greater part of the month. The mean level of the barometer was slightly above the normal, but no very high readings were recorded, the range of pressure was comparatively small. The mean temperature, 56.8 degrees, corresponded with the average for the past twenty-six years. The maximum of 75.0 degrees was reached on the 17th, which was the hottest day in the year. The minimum of 38.0 degrees occurred on the 5th. The rainfall was below the average by 1.39 inches. The total for the month being 1.27 inches, the greatest fall .41 occurred on the 28th. Rain fell on eighteen days. A peculiarity of the rainfall in this month was that the total was larger in the east than in the west of Great Britain. The amount of bright sunshine recorded amounted to 182 hours, being 29 hours above the average of seven years.

OCTOBER.

The weather was generally dry during the earlier part of the month, but dull and rainy in the later part. North-easterly and south-easterly winds prevailed. The mean height of the barometer was above the normal, the lowest readings being recorded towards the end of the month. The mean temperature

of the month was 49.1 degrees, being 1.1 degrees below the average. The maximum, 64.0 degrees, was reached on the 13th, and the minimum, 31.0 degrees, on the 30th. A ground frost occurred on three days. The total rainfall for the month was 5.12 inches, being 0.38 inches above the average for twenty-six years. Rain fell on seventeen days, the greatest fall was .97 inches on the 23rd. Bright sunshine was deficient, the total amount recorded being 62.1 hours, or 36.2 hours below the average of seven years. Heavy fogs occurred on the mornings of the 17th and 18th.

NOVEMBER.

November was a very cold and abnormally quiet month, and for the most part fine and dry, especially during the middle and latter part. The barometric pressure was generally high and quite above the average. The range of pressure was small. The wind was generally from a northerly and north-easterly direction with no unusual velocities. This November was, throughout the country, one of the coldest on record. The mean temperature for the month was 38.5 degrees, or 5.8 degrees below the average for the past twenty-six years. The maximum temperature recorded was 53.0 degrees on the 8th, the minimum 22.0 degrees, on the 27th. There was a ground frost on twenty-three days. The total rainfall was 2.55 inches, which was 0.96 inches below the average. The greatest fall was 1.29 inches on the 11th. The amount of bright sunshine was excessive for the time of the year, a total of 102.8 hours was recorded for the month, being 29.8 hours above the average for seven years.

DECEMBER.

The atmospheric conditions of December were entirely different to those of the immediately preceding month. In November dry, cold and settled weather was experienced. In the early part of December wet and unsettled weather commenced and continued during the month. Storms and rain prevailed generally. Marked and numerous depressions

with winds from the south-west often amounting to gales were the chief characteristics of this month. The mean barometric pressure was considerably below the normal. The mean temperature for the month, 43.4 degrees, was above the average for the past twenty-six years by 2.6 degrees. The maximum temperature of 55.0 degrees was recorded on the 10th, the minimum, 30.0 degrees, on the 17th. Frosts were infrequent for the time of the year and of short duration. This month was one of the wettest on record, the total rainfall amounting to 9.04 inches, which was 4.35 inches above the average for twenty-six years. Rain fell on twenty-one days. The amount of bright sunshine recorded was deficient, the total being 35.9 hours, or 15.4 hours below the average.

EXTREMES.

June was the driest month, with a rainfall of 1.61 inches below the average. December was the wettest, the rainfall amounting to 9.04 inches. February, July and October were also wet months with more than 5.0 inches of rainfall in each month. The wettest days were July 16th and December 14th, with rainfalls of 1.52 inches on each day. The total rainfall for the year was 40.89 inches, or 1.14 inches above the average for twenty-six years. Rain fell on 187 days. No very high temperatures were recorded. The hottest day was on September 17th when a temperature of 75.0 degrees was recorded. The coldest day was November 22nd with a minimum temperature of 22 degrees. The total number of hours of sunshine recorded was 1644.2 hours, being 5.1 hours above the average for seven years.

GENERAL NOTES.

The Table of "Rainfall in the District" was compiled by Mr. Gilbert D. Shepherd, Honorary Assistant Secretary of the Society. This compilation involves a considerable amount of work, as the Table comprises the returns of rainfall from a large number of observers. The Society is much indebted to these observers for their voluntary co-operation, which renders the preparation of the meteorological report possible.

Some observers have written regretting their inability to continue supplying annual returns of rainfall, owing to a variety of unavoidable circumstances, especially war service.

Regarded as a whole, the year 1915 was a wet year, yet the rainfall was below the average. In the Society's district it varied from 91 inches at the United National Colliery, Treherbert, to 31.58 at the Hendre, Monmouth. Average for 13 years, 53.23. Rainfall for 1915, 51.52, being 1.71 below average for 13 years.

The conditions in 1915 were, on the whole, favourable to the public health. No prolonged or excessive heat waves were experienced in the summer, therefore the mortality amongst infants and young children was low.

The winter was by no means severe, and no extremely low temperatures were recorded, the mortality from lung diseases amongst the old and feeble was not high.

The general death-rate in Cardiff for the year was 14.1 per 1,000. This rate, and particularly the rate of infant mortality, are much influenced by the meteorological conditions which prevail in the summer and autumn, as will be seen from the following Table. A high death-rate is the invariable accompaniment of a hot and dry summer, and a low rate of a cool and wet summer.

CARDIFF.

Month.	Annual death-rate per 1,000.				Deaths under 1 year per 1,000 births.			
	1912.	1913.	1914.	1915.	1912.	1913.	1914.	1915.
July	10.7	8.1	10.1	10.5	67	48	78	62
August	9.5	10.7	10.1	10.7	70	195	89	44
September ..	10.1	14.9	12.7	13.6	79	294	162	201

The following interesting note has been supplied by O. H. Jones, Esq., J.P. :—

“Total rainfall 3.24 inches below the average for 31 years. Heaviest rainfall in December, which was the only very wet month in the year. December was wet throughout, and on the 26th was one of the heaviest westerly gales I ever remember.

The smallest rainfall was in June. February was a wet month, but from March 1st to September 30th the rainfall was light, except in July, and the springs in the middle of October were very low. Heaviest fall in 24 hours, 1.20 inches on July 16th.”

The insular and temperate climate enjoyed by the inhabitants of the British Isles is associated with a humidity of the atmosphere which at times and in certain localities exceeds that which is generally considered agreeable or beneficial.

The western coasts being exposed to the influence of westerly and south-westerly winds charged with moisture from the Atlantic have of course a more humid climate than the Midland and Eastern Counties.

The position of Cardiff is removed from either extreme, the climate has not the humidity of many places further west, nor can it claim the dryness of the eastern districts. The attached table may be of interest as showing roughly the relative position of this City in this respect.

Exact observations upon the effect of excessive humidity on the public health are by no means complete. It is certain that there are few climatic factors which influence our sensations more strongly than humidity. The most agreeable and probably the most desirable amount being that which is represented by a relative humidity of between 70 and 80 per cent. of complete saturation. Excessive humidity prevents free evaporation from the skin, and causes a rise in the surface temperature of the body. A moderately moist atmosphere appears to be suitable for those suffering from chronic lung affections, such as bronchitis, whereas still dry and cold climates are usually beneficial in cases of tuberculosis.

The unpleasant effects of an excessively moist atmosphere are chiefly due to the interference with the free evaporation from the skin, the evaporating power of the atmosphere being also influenced by the temperature. The evaporating power of an atmosphere which contains 75 per cent. of saturation is very different according as the temperature of the air is 40 degrees or 80 degrees. As the temperature rises the evaporative power increases faster than the rise in the thermometer. The degree and intensity of terrestrial radiation and to some extent of solar radiation depend upon the presence of watery vapour in the air which acts as a screen hindering the passage of heat from the earth, and in this way exerting a very direct and powerful influence upon climate.

RELATIVE HUMIDITY, 9 A.M., 1915.

		Greenwich.	Cardiff.	St. Anne's Head, Pembroke.	Llangam- march, Brecknock.
January	..	89	88—	87	91
February	..	86	90 +	84	92
March	..	81	86 +	90	88
April ..	..	73	80 +	88	82
May ..	..	72	73 +	89	73
June ..	..	69	73 +	95	74
July ..	..	74	76 +	90	82
August	..	75	81 +	92	88
September	..	75	81 +	92	88
October	..	87	91 +	92	95
November	..	87	85—	92	92
December	..	88	89 +	94	93

RAINFALL IN THE DISTRICT, 1915.

	Feet above sea level	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Summit of Tyle Brith ...	2350	7·90	10·96	2·07	3·19	4·14	1·78	7·89	3·77	1·73	7·72	4·39	17·82	73·36	Readings taken weekly and at end of each month.	
||Average ...	...	6·61	5·18	5·86	4·48	4·24	4·35	4·93	7·07	5·06	8·12	7·54	9·25	72·69		
Nant Penig ...	2000	7·77	7·36	2·93	4·03	3·98	2·00	10·57	4·43	1·66	5·78	5·94	19·76	76·21	Readings taken weekly and at end of each month.	
‡Average ...	...	8·30	6·32	7·88	5·68	4·13	5·01	4·93	8·31	4·95	8·72	7·97	11·44	83·64		
Nant Ddu ...	1560	7·83	10·51	2·50	3·25	3·39	1·66	7·53	3·32	1·54	5·46	4·73	15·92	67·64	Readings taken weekly and at end of each month.	
Storey Arms ...	1430	5·79	13·48	1·87	2·82	4·64	1·78	8·72	3·88	1·47	7·38	5·98	17·99	75·80	Readings taken weekly and at end of each month.	
‡Average ...	...	6·20	5·03	6·17	4·62	3·74	4·44	3·86	7·07	4·09	7·94	6·74	9·64	69·54		
Beacons Reservoir ...	1340	9·60	12·15	2·24	3·39	4·42	1·62	9·00	4·13	1·77	6·53	6·10	17·00	77·95	218	2·06 { Feb. 16th.
||Average ...	...	7·84	5·94	6·82	5·04	4·14	4·51	5·01	7·96	4·57	8·54	7·89	10·16	78·72	...	
Nant Gwineu ...	1275	6·59	8·49	1·48	2·02	3·30	1·28	5·42	2·45	1·17	5·33	4·16	11·64	53·33	Readings taken weekly and at end of each month.	
Pontlluestwen Reservoir ...	1225	10·06	14·07	3·25	3·27	4·09	2·78	11·24	4·70	2·21	5·03	5·26	20·01	85·97	Readings taken weekly and at end of each month.	
||Average ...	...	6·15	4·57	5·24	4·15	3·53	3·80	4·00	6·89	4·10	7·13	6·05	8·53	64·74		
Blaenavon ...	1150	5·45	11·62	1·43	1·45	5·91	1·00	6·68	2·60	1·03	4·29	6·02	12·06	59·54	Readings taken weekly and at end of each month.	
‡Average ...	...	5·01	4·65	6·07	4·13	3·23	3·57	2·99	4·82	3·06	6·37	5·13	7·68	50·71		
Pentwyn Uchaf Farm ...	1143	6·81	9·20	1·96	2·74	2·76	1·65	6·90	2·93	1·35	4·87	4·43	16·04	61·64	Readings taken weekly and at end of each month.	
||Average ...	...	5·97	4·84	5·52	3·96	3·45	3·55	4·10	5·89	4·30	6·97	6·96	8·41	63·92		
Cantref Reservoir ...	1120	8·19	11·49	2·62	3·31	3·74	1·70	7·48	3·30	1·44	5·34	4·97	16·30	69·88	211	1·72 { Dec. 9th.
§Average ...	...	7·01	5·40	6·05	4·48	3·74	3·90	4·04	6·82	3·91	7·55	6·72	9·17	68·79	...	

RAINFALL IN THE DISTRICT, 1915.

	Feet above sea level	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Garw-pant...	1100	8·08	10·78	2·26	2·96	3·77	1·72	7·44	3·00	1·52	5·38	5·05	15·38	67·34	Readings taken weekly and at end of each month.	
Dowlais, Gwernllwyn Average	1071	4·08 5·00	7·75 3·93	0·77 4·31	1·07 3·30	1·97 2·79	1·51 3·01	5·69 3·20	2·65 5·02	1·23 3·09	4·63 5·95	3·96 5·18	13·22 6·78	48·53 51·56	178	{ 1·75 { Dec. 5th.
Ebbw Vale j Average	902	5·12 5·35	11·08 5·71	1·08 5·52	2·20 3·87	3·89 3·25	1·23 3·62	5·60 3·56	2·36 5·02	1·08 2·42	6·60 7·27	3·55 5·32	13·99 9·64	57·78 60·55	181	{ 2·10 { Nov. 1st.
Llwynon Reservoir	860	6·86	9·72	1·78	2·19	3·40	1·39	7·24	3·14	1·25	5·03	4·32	12·87	59·19	210	{ 1·47 { Feb. 16th.
Pont-ar-daf	850	7·90	11·15	2·03	2·60	3·50	1·41	7·15	2·74	1·32	5·17	4·90	15·12	64·99	208	{ 1·52 { Dec. 5th.
Glyncorrrwg Colliery Average	725	8·20 8·46	12·97 6·51	2·92 7·22	3·90 5·20	3·71 4·70	3·05 4·95	8·90 5·40	5·41 8·60	2·36 5·35	3·78 8·85	3·70 8·36	16·36 11·15	75·26 84·61	174	{ 2·86 { Nov. 14th.
Treherbert, United Nat. Coll.] Average	670	8·68 8·28	15·89 6·13	3·13 7·09	3·75 5·04	4·68 4·18	3·58 4·38	11·28 4·76	5·92 8·52	2·39 4·73	6·30 8·76	5·74 8·21	19·74 11·42	91·08 81·50	216	{ 3·51 { Feb. 16th.
Newchurch, Wentwood, Mon.	525	2·96	6·39	1·14	1·63	3·51	0·88	5·06	2·46	1·39	4·69	2·91	9·35	42·37	184	{ 1·59 { Dec. 14th.
Nantyridd, Wentwood, Mon.	500	3·00	5·54	1·10	1·49	3·62	0·83	5·19	2·44	1·47	4·58	2·79	9·16	41·21	185	{ 1·62 { Dec. 14th.
Llanvaches Embankment, Mon.	456	2·90	4·76	1·07	1·48	3·16	0·85	4·37	2·25	1·53	4·14	2·52	8·52	37·55	192	{ 1·30 { Dec. 14th.

RAINFALL IN THE DISTRICT, 1915.

	Feet above sea level	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Pant-yr-eos Reservoir, Mon.	435	5·31	7·91	1·49	1·90	3·15	0·96	7·14	2·39	1·34	5·50	3·08	12·45	52·62	205	{ 2·08 { Dec. 14th.
Chepstow, Itton Court	390	3·52	5·05	0·97	1·31	2·60	0·88	4·21	1·73	1·14	3·64	2·20	8·14	35·39	169	{ 1·30 { Dec. 14th.
*Average	...	3·33	2·08	2·93	2·34	2·24	2·55	2·61	4·13	2·53	4·51	3·55	4·55	37·95	...	
Cowbridge, Ash Hall	315	4·83	7·76	1·82	2·00	2·76	1·41	5·74	1·15	2·33	4·66	3·20	8·17	45·83	151	{ 2·15 { Feb. 16th.
Average	...	3·95	2·98	3·61	2·78	2·46	2·70	3·09	4·59	3·15	5·15	4·31	5·49	44·26	...	
Chepstow, Piercefield Park	300	2·98	4·90	1·16	1·34	2·97	0·61	4·37	1·70	1·07	4·00	2·68	8·38	36·16	159	{ 1·30 { Nov. 11th.
Average	...	2·98	2·38	2·79	2·23	2·19	2·47	2·52	3·62	2·26	4·00	3·19	4·03	34·66	...	
Pontypridd, Lan Wood Reserv.	300	5·88	9·12	1·69	1·98	3·03	1·46	6·28	2·53	1·60	4·20	3·49	12·77	54·03	197	{ 2·02 { Dec. 15th.
*Average	...	5·55	4·44	4·39	3·39	2·57	3·06	3·03	5·41	3·53	6·24	5·41	7·23	54·28	...	
Talygarn	250	6·55	8·69	2·13	2·50	2·88	1·85	5·57	2·38	2·17	5·38	3·99	11·63	55·72	194	{ 2·18 { Feb. 16th.
†Average	...	6·37	4·35	5·15	3·63	2·70	3·00	3·25	5·02	3·92	6·37	5·64	8·35	57·75	...	
Ystalyfera, Wern House	240	7·71	11·10	2·00	3·37	3·18	1·78	8·86	2·87	1·39	4·58	4·74	13·51	65·09	200	{ 2·39 { Feb. 16th.
†Average	...	6·51	5·31	6·34	4·37	3·78	4·33	3·85	6·68	3·64	7·27	6·45	9·07	67·60	...	
Llantilio Court, Mon.	280	2·56	6·02	0·74	0·70	3·81	0·46	4·88	1·27	0·86	4·24	2·64	7·19	35·37	145	{ 1·40 { July 6th.
‡Average	...	2·83	2·18	3·28	2·23	2·11	2·27	2·23	3·37	2·26	4·09	2·79	4·22	33·86	...	
Cardiff Meteorological Station, Penylan	204	3·87	5·00	1·38	1·31	2·77	1·23	5·08	2·27	1·27	5·12	2·55	9·04	40·89	187	{ 1·52 { July 16th. { Dec. 14th.
Pentwyn, Rockfield, Mon.	191	2·57	5·42	0·86	0·95	3·97	0·65	4·15	1·69	1·06	4·81	2·17	6·88	35·18	163	{ 1·35 { May 13th.

RAINFALL IN THE DISTRICT, 1915.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Rumney, Witla Court ...	3·62	4·31	1·44	1·09	2·66	0·84	4·66	2·82	1·39	3·91	2·91	8·02	37·67	143	{ 1·35 { Dec. 15th.
Monmouth, The Hendre ...	2·23	4·53	0·78	1·04	4·03	0·63	3·90	1·47	0·93	3·83	2·03	6·18	31·58	171	{ 1·37 { May 13th.
**Average	2·48	2·05	2·25	1·85	1·96	2·13	1·85	2·88	1·90	3·63	2·64	3·58	29·20	...	
Llanishen Reservoir ...	3·88	4·69	1·40	1·22	2·55	1·12	4·19	2·17	1·18	4·60	2·40	8·39	37·79	177	{ 1·36 { Dec. 14th.
Average	3·37	2·60	3·11	2·45	2·22	2·49	2·79	4·30	2·63	4·57	3·67	4·78	38·98	...	
Lisvane Reservoir ...	3·84	4·64	1·46	0·99	2·49	1·16	3·92	2·10	1·11	4·42	2·23	8·35	36·71	174	{ 1·43 { Dec. 14th.
Average	3·17	2·45	2·90	2·36	2·13	2·33	2·59	3·86	2·44	4·18	3·32	4·34	36·07	...	
Chepstow, Castleford ...	3·29	4·37	1·19	1·34	2·94	0·73	4·16	2·01	1·17	4·10	2·29	7·05	34·64	167	{ 1·00 { Oct. 23rd.
Average	2·83	2·49	2·88	1·84	2·14	2·67	2·64	3·43	1·85	4·44	3·08	4·83	35·12	...	
Cardiff Heath Filters ...	4·01	5·24	1·46	1·40	2·53	1·09	4·61	1·92	1·42	5·03	2·47	9·07	40·25	191	{ 1·45 { July 16th.
Average	3·67	2·73	3·33	2·48	2·26	2·45	2·73	4·23	2·76	4·61	3·87	5·05	40·17	...	
Fonmon Castle ...	3·52	4·02	1·28	1·26	2·12	1·24	3·55	1·36	1·38	4·33	2·27	6·86	33·19	174	{ 1·20 { July 16th.
Average	3·05	2·46	2·87	2·21	1·97	2·03	2·51	3·85	2·87	4·57	3·71	4·44	36·54	...	
Ynisyfro Reservoir, Mon.	3·46	5·39	1·33	1·25	2·89	0·79	5·28	1·94	1·22	4·90	2·57	10·09	41·11	192	{ 1·61 { July 16th. { Dec. 14th.
Cogan Pumping Station ...	4·12	4·37	1·56	1·38	2·60	1·42	4·80	1·40	1·33	4·10	2·19	8·15	37·42	171	{ 1·38 { Dec. 14th.
Average	3·08	2·48	2·98	2·26	2·03	2·32	2·81	3·99	2·64	4·30	3·55	4·45	36·89	...	
Ely Pumping Station ...	4·10	5·48	1·44	1·79	2·62	1·25	4·75	1·66	1·10	4·69	3·04	8·55	40·47	238	{ 1·44 { July 16th. { Dec. 14th.
Average	3·71	2·78	3·41	2·56	2·31	2·52	3·00	4·55	2·88	4·79	3·98	5·14	41·63	...	

RAINFALL IN THE DISTRICT, 1915.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Feet above sea level															
Cardiff, Roath Park ...	383	487	137	120	264	113	458	173	133	475	262	885	3890	169	{ 151 Dec. 14th.
Cardiff, Trade St. Depot... †Average ...	402 362	472 282	148 351	137 259	265 213	101 276	522 252	150 415	132 231	460 474	253 368	876 508	3918 3991	183 ...	{ 170 Dec. 14th.
Newport, Friars St. Depot	377	450	118	120	309	101	507	215	115	469	279	926	3986	176	{ 153 Dec. 14th.
Cadoxton, Biglis Pmg. Stn. §Average ...	320 271	342 222	156 258	111 210	277 166	136 218	448 255	136 382	190 252	419 405	249 307	742 405	3528 3351	171 ...	{ 129 Nov. 11th.

NOTE.—Average Rainfall is for the 27 years 1888—1914, unless otherwise indicated.

* 25 years 1890—1914. † 20 years 1895—1914.

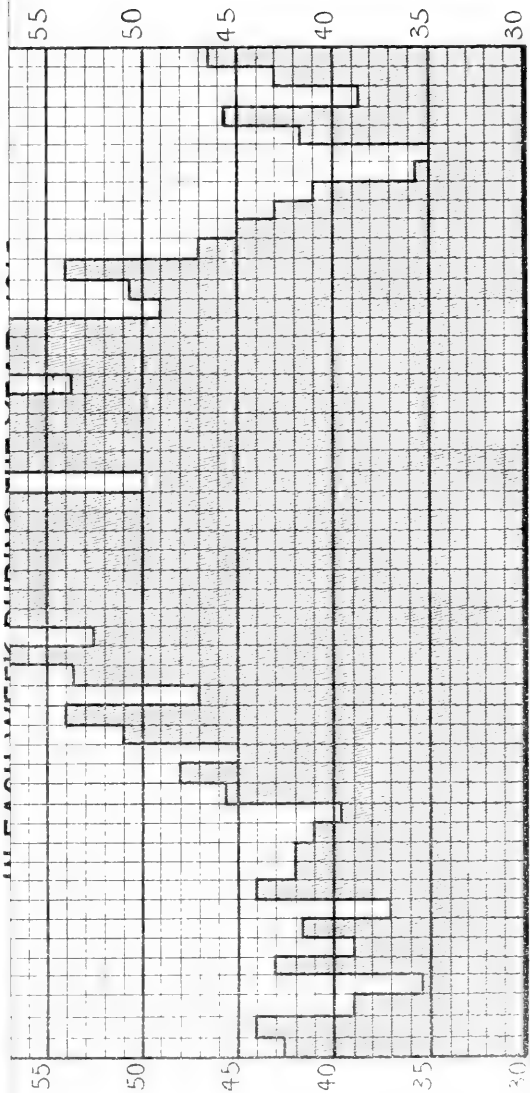
‡ 30 years 1885—1914.
§ 15 years 1900—1914.

¶ 28 years 1887—1914.
‡ 11 years 1901—1913.

§ 26 years 1889—1914.
j 10 years 1905—1914.

Chart

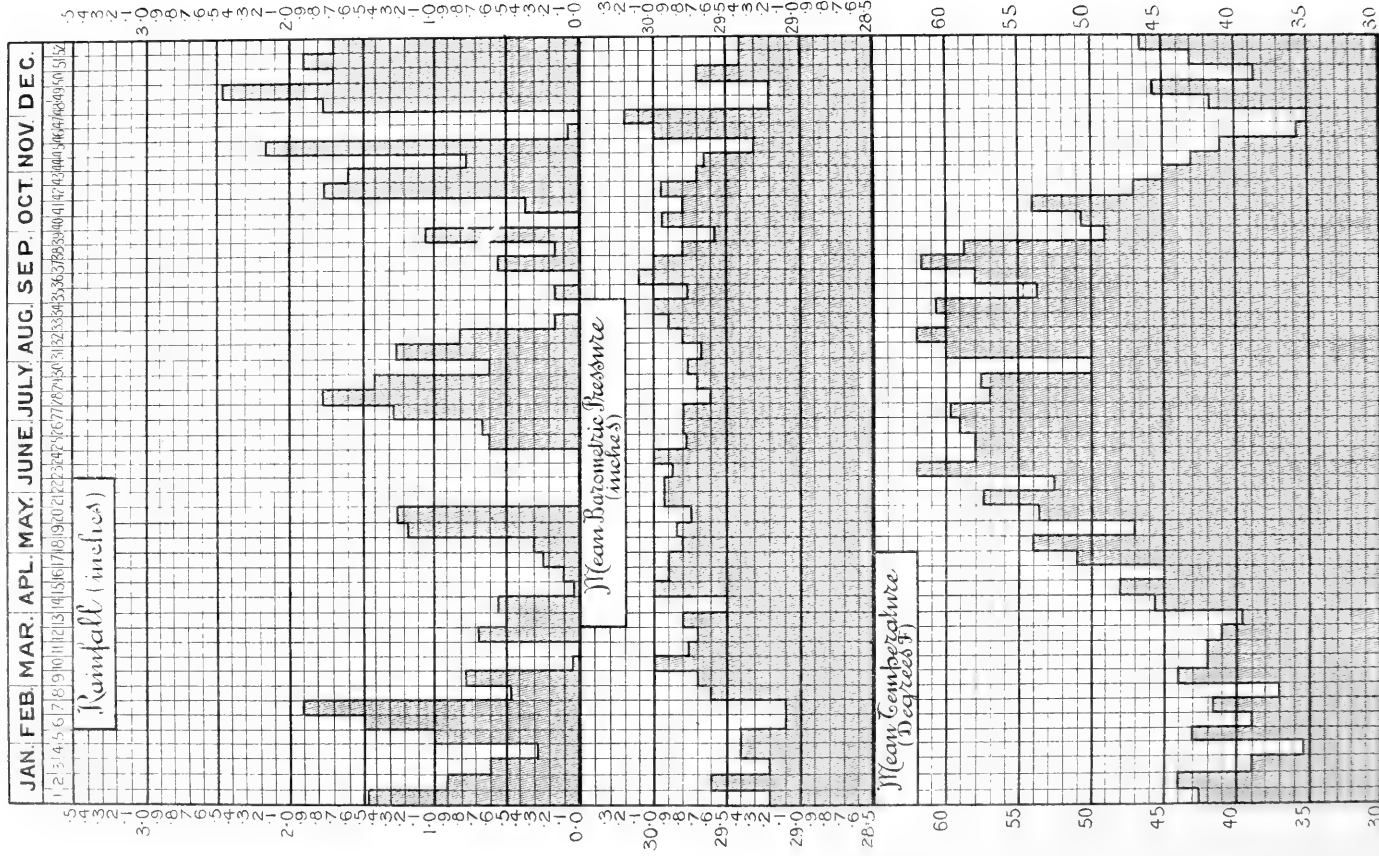
SHOWING RAINFALL, MEAN BAROMETRIC PRESSURE, AND MEAN TEMPERATURE
RECORDED AT THE METEOROLOGICAL STATION, PENYLAN, CARDIFF,



96

Cliff

SHOWING RAINFALL, MEAN BAROMETRIC PRESSURE, AND MEAN TEMPERATURE,
RECORDED AT THE METEOROLOGICAL STATION, PENYLAN, CARDIFF,
IN EACH WEEK DURING THE YEAR 1915.



96

BIOLOGICAL AND GEOLOGICAL SECTION.

 REPORT FOR THE 28TH SESSION, 1914-15.

COMMITTEE.

THE PRESIDENT and HON. SECRETARY OF THE C.N.S. (*ex-officio*).W. N. PARKER, Ph.D., F.Z.S. (*President*).T. H. THOMAS, R.C.A. (*Vice-President*).

G. E. GAMMON.

H. E. SALMON.

H. M. SALMON.

J. J. NEALE, J.P.,

ERNEST HEATH, F.R.M.S. } *Hon. Secretaries for Field Walks.*R. W. A. SOUTHERN, *Hon. Treasurer.*H. M. HALLETT, F.E.S. *Hon. Secretary.*

The number of members on the books is 90.

Five Ordinary Meetings and the Annual Meeting (July 22nd, 1915) have been held in the course of the Session; the contributions to the proceedings have been of an interesting and important nature.

The following is a list of the papers read:—

- Nov. 19, 1914. H. M. HALLETT, F.E.S. "Entomological Notes for 1914, with a list of Additions to the Glamorgan *Hymenoptera aculeata*."
- Jan. 21, 1915. J. R. LE B. TOMLIN, M.A., F.E.S. "The Coleoptera of Glamorgan, Part 3, *Lamellicornia* to *Phytophaga*." (Communicated.)
- G. C. S. INGRAM. "The Loan Collection of Slides from the Nature Photographic Society."
- Feb. 18, 1915. MARGARET LATARCHE, M.Sc. "Variation in Animals and Plants."

- Mar. 18, 1915. J. DAVY DEAN. "Land Molluscs in the Vale of Glamorgan."
- April 15, 1915. F. J. NORTH, B.Sc., F.G.S. "Fossils."
- July 22, 1915. ARTHUR LOVERIDGE. "Natural History Notes from British East Africa." (Communicated).

The following exhibits were made and commented on:—

- Nov. 19, 1914. G. C. S. INGRAM. A pale variety of the Fritillary (*Brenthis euphrosyne*).
- Jan. 21, 1915. T. BUTT EKINS. A specimen of the Map Butterfly (*Araschnia levana*) taken at Symond's Yat on 28th May, 1913. See Entomological Notes, Vol. XLVII., p. 54.
- H. M. HALLETT, F.E.S. Specimens of the Beetles, *Notiophilus hypocrita*, from Ardross; *Creophilus maxillosus* var. *ciliaris*, from Cloghane; *Dasytes flavipes* var. *nigripes*, from Great Ganilly; and *Ceuthorrhynchus pilosellus*, from Tubney and Candleston; these had been sent by Mr. J. R. le B. Tomlin as additions to the Welsh National Museum Collection.
- Mar. 18, 1915. G. R. BROOK, F.Z.S. A wax and glass model of a Colonial Hydroid Polyp, prepared by him for the Welsh National Museum.
- W. EVANS HOYLE, M.A., D.Sc. Skeleton of the Dodo, and preparations representing this bird and the Great Auk as they appeared in the flesh.
- T. W. PROGER. Skin of a Fire-crested Wren (*Regulus ignicapillus*) obtained locally.

July 22, 1915. ERNEST HEATH, F.R.M.S. Two Robin's nests which had been built on cisterns at his house.

JOHN GRIMES. A branch of a variegated Ash tree found as a seedling at Raglan; a plant of the Ribwort Plantain, in which the flower heads had become modified into a bunch of leaves, various plants from the ballast, including *Lepidium perfoliatum*.

The second part of Mr. Tomlin's paper on the Coleoptera of Glamorgan, published in Vol. XLVI. of the Transactions, was favourably reviewed in the "Entomologist's Monthly Magazine" and in the "Entomologist's Record."

During the Session the Section has sustained an irreparable loss by the death of Mr. T. H. Thomas, R.C.A., Vice-President of the Section, who had held the office of President for a consecutive period of seventeen years from 1890 to 1906, and had both during that long period and since, rendered immense service to the Section, and had contributed largely to its successful career by means of prepared papers, by exhibits, and by the encouragement he gave to other contributors to the proceedings of the Section.

The Accounts for the Session have been audited, and show a balance in hand of £64 3s. 7d., of which £50 is being invested in the 4½ per cent. War Loan.

H. M. HALLETT,
Hon. Secretary.

ARCHÆOLOGICAL SECTION.

 ANNUAL REPORT. SESSION 1914-15.

OFFICERS AND COMMITTEE.

President - - - - J. S. CORBETT.
Hon. Sec. and Treasurer - JOHN W. RODGER.

Vice-Presidents.

T. H. THOMAS, R.C.A. W. EVANS HOYLE, M.A., D.Sc.

Committee.

J. WARD, F.S.A.	W. CLARKE.
J. H. WESTYR EVANS.	C. MORGAN, B.A.
C. H. FARNSWORTH.	J. W. LONGSTAFF.
Professor O. L. RICHMOND.	

FINANCIAL STATEMENT.

The Accounts have been audited and show a credit balance of £7 6s. 6d.

MEMBERSHIP.

The Membership is 58, a decrease of 11 since last year.

PAPERS.

No papers have been read before the Section during this Session.

FIELD MEETINGS.

By the kind permission of Lord Bute, the Members visited Castell Coch on July 24th, 1915. A short paper giving the history of the Castle so far as it is known was read by Mr. J. S. Corbett, President.

RESEARCH WORK.

The Committee voted the necessary funds for completing the investigations on the site of the presumed "Prehistoric Cooking Hearth" at Radyr, but owing to the difficulty of obtaining sufficiently skilled workmen the work on this site has been postponed.

The Committee regrets to report the death of Mr. T. H. Thomas, R.C.A. during this Session.

Mr. Thomas was the oldest remaining member of the Section, and his loss will be greatly felt.

JOHN STUART CORBETT,
President.
 JOHN W. RODGER,
Hon. Sec.

CARDIFF NATURALISTS' SOCIETY.

ARCHÆOLOGICAL SECTION.

Dr.

Cash Account for the 1914-15 Session.

Cr.

	£	s.	d.		£	s.	d.
To Balance in hand, September 30th, 1914	7	18	2	By Postages and General Expenses	0	16	1
„ Subscriptions	6	2	6	„ Donation to Radyr Hearth Excavation Fund	5	18	1
				„ Balance in hand, September 30th, 1915	7	6	6
	£14	0	8		£14	0	8

Audited and found correct,

JOHN W. RODGER,

Hon. Secretary.

C. H. FARNSWORTH.

14th January, 1916.

PHOTOGRAPHIC SECTION.

REPORT FOR THE FOURTH SESSION, 1914-15.

OFFICERS AND COMMITTEE.

President.

Mr. GILBERT D. SHEPHERD.

Vice-Presidents.

Mr. S. W. ALLEN.

Mr. E. W. M. CORBETT, J.P.

Mr. EDGAR G. C. DOWN.

Mr. T. MANSEL FRANKLEN.

Dr. P. RHYS GRIFFITHS.

Hon. Treasurer.

Mr. ARCHIBALD BROWN.

Hon. Lanternist.

Mr. B. LEWIS HOPKINS.

Committee.

Miss MARY H. GIBSON, Ph.D., M.A., B.Litt.

Mr. G. T. FLOOK.

Mr. GEOFFREY C. S. INGRAM.

Mr. ARCH. H. LEE.

Mr. J. PETREE.

Mr. HARRY STORM.

Together with the President and Hon. Secretary of the Cardiff Naturalists' Society (*ex-officio*).

Hon. Secretary.

Mr. ARTHUR MORGAN.

The Committee has pleasure in presenting its Fourth Annual Report dealing with the work of the Photographic Section for the 1914-15 Session. Thanks are due to the members who have contributed in various ways towards making the Section so successful, more especially in view of the disastrous effect that the War has had on so many Societies.

Interest in the Section has been well maintained. The winter meetings were well attended, and the membership is steadily increasing. The Session started with a membership of 80, and ends with 89.

The Section has unfortunately sustained a serious loss during the past Session in the death of Mr. Edgar G. C. Down, who passed away after a painful illness. Mr. Down was largely instrumental in building up the Section, and always took a very keen interest in its work. He was President during the 1913-14 Session and was a Vice-President at the time of his death. As a mark of appreciation of Mr. Down's many and valued services to the Section the Committee has unanimously decided to elect Mrs. Down as an Honorary Associate (under Rule 3).

The Section has also lost two other members by death—Mr. T. H. Thomas, R.C.A., and Mr. S. L. Davies.

The Committee regrets to lose the services of Miss Mary H. Gibson, M.A., Ph.D., B.Litt., on her leaving Cardiff for an appointment in the North of England. Miss Gibson had been a member of the Committee from the formation of the Section in 1911.

During the winter a series of "One Man Shows," Demonstrations and Lectures were given by members. The "One Man Shows" held during the past two winters have proved so popular and instructive that it is intended to make them a permanent feature of the Sectional Programme each year.

The full list of meetings held is as follows :—

1914.

Oct. 13. Annual General Meeting. *Lecture, "Pictorial Photography."

Nov. 10. *"Amateur Photographer" Prize Slides.

„ 24. *Lecture "Belgium" Mr. J. STUTTARD.
One Man Show—Mr. S. J. MILNER.

Dec. 8. *Lecture "The Telecentric Lens for General Photography." Mr. GILBERT D. SHEPHERD.

1915.

Jan. 12. *Lecture "Record Photography." Mr. J. PETREE.
One Man Show—Mr. ARTHUR MORGAN.

Feb. 9. Demonstration on Bromoil. Mr. HARRY STORM.
One Man Show—Mr. H. S. WHITLEY.

Feb. 23. *Members' Lantern Slide Evening.

Mar. 9, 10, 11. Members' Annual Exhibition.

„ 22. *Lecture "Museum Photography." Dr. W. EVANS
HOYLE, M.A.

One Man Show—Mr. R. J. SULLY.

The Lectures marked * were illustrated by lantern slides.

Owing to the War, it was thought advisable to discontinue the Summer Field Walks, but the Committee hopes that the Members have not been idle, and have obtained a good stock of negatives.

At the Members' Exhibition on March 9th, 10th, and 11th, 1915, nearly 150 pictures and 120 lantern slides were shown. The Judges were Mr. A. H. Blake, M.A., of London, for the Pictorial Classes, and Dr. W. Evans Hoyle, M.A., of Cardiff, for the Scientific and Natural History Classes. Both Judges spoke very highly of the class of work exhibited, and congratulated the Section on the success of the Exhibition. The Silver Rose Bowl presented by Dr. P. Rhys Griffiths for annual competition was awarded to Mr. Gilbert Shepherd for his picture "Majesty." Various other Members were awarded certificates of merit in the other classes.

In April, 1915, the first Welsh Salon of Photography was held in London and fifteen photographs by seven members of the Section were selected for exhibition there.

During the winter, Trimming and Mounting Competitions were held and created much interest amongst the Members. Mr. Ernest T. Bevan won first prize in the former, and Mr. Harry Storm in the latter. Mr. R. Child Bayley, London, Editor of "Photography and Focus," kindly acted as Adjudicator for both Competitions.

Fifteen members are on service with the Forces, and it is intended to keep a permanent record of the names of these Members. The Committee suggests that, during the War, no subscriptions should be regarded as due from the Members who are unable to attend the Sectional Meetings owing to their being on service with the Forces.

The Annual Statement of Accounts is presented herewith.

CARDIFF NATURALISTS' SOCIETY.
PHOTOGRAPHIC SECTION.

Dr.

Hon. Treasurer's Cash Account for the 1914-15 Session.

Cr.

	£	s.	d.		£	s.	d.
To Balance from 1913-14 Session ..	..	4	6	0			
„ Members' Subscriptions ..	..	13	2	6			
„ Entry Fees for Exhibition ..	..	1	6	6			
„ Catalogues sold at Exhibition ..	..	0	8	7			
By Printing and Stationery ..					2	7	6
„ Gas for Lantern ..					0	9	4
„ Rent of Room for Meetings ..					2	15	0
„ Affiliation Subscription, Wales and Monmouthshire Photographic Federation					0	10	0
„ Special Expenses <i>re</i> Exhibi- tion :							
Certificates ..	1	1	6				
Invitation Cards ..	0	15	0				
Catalogues ..	1	10	0				
Gummed Labels ..	0	5	0				
Travelling Expenses and Sundries ..	2	8	7				
					6	0	1
„ Postages and Incidentals ..					3	11	9
„ Balance carried forward to 1915-16 Session ..					3	9	11
					<u>£19</u>	<u>3</u>	<u>7</u>

Examined with Vouchers and found correct,

A. BROWN,
Hon. Treasurer.

JOHN GRIMES.
GEO. B. LOYNS.

19th October, 1915.

REPORT OF THE COUNCIL

For the Year ending September 30th, 1915.

The Council has pleasure in submitting to the members the Forty-eighth Annual Report of the Society.

The number of members at the close of last

Session was	..	..	..	..	497
Elected during 1914-15	..	..	..	..	67
					<hr/> 564
Deaths	..	..	..	..	12
Removals	..	..	..	..	14
Resignations	..	..	..	..	18
					<hr/> 44
					<hr/> 520
					<hr/> <hr/>

The members are distributed thus :—

Honorary Members	..	..	..	..	7
Ordinary Members	..	..	..	..	485
Life Members	..	..	..	..	17
Non-Resident Members	..	..	..	..	3
Corresponding Members	..	..	..	..	7
Associates	..	..	..	..	1
					<hr/> 520
					<hr/> <hr/>

The Society has unfortunately suffered serious loss during the year by the death of the following members :—Mr. M. W. Aisbitt, Mr. S. L. Davies, Mr. Henry Deacon, Mr. Edgar G. C. Down, A.R.I.B.A., Dr. W. T. Edwards, J.P., Mr. C. H. James, J.P., Mr. W. Lester Jones, J.P., Mr. Frank Reynolds, M.A., Mr. J. Y. Strawson, Mr. T. H. Thomas, R.C.A., Miss Watkins, and Mr. E. J. Whitley.

Mr. C. H. James and Mr. T. H. Thomas were Past-Presidents of the Society and served on the Council for many years. An

obituary notice of Mr. James has appeared in Volume XLVII. of the Transactions, and an obituary notice of Mr. Thomas will appear in the next volume. Mr. Edgar Down was an active member of the Council for several years up to the date of his death, and was specially interested in the formation and development of the Photographic Section.

The following is a list of Papers read at Members' Meetings, viz. :—

1914.

- Oct. 22nd. Annual Meeting. Presidential Address by Mr. H. M. Hallett, F.E.S.—“Ants, Wasps and Bees.”
- Nov. 12th. Mr. H. Avray Tipping, M.A., F.S.A.—“Gardens, Old and New.”
- Dec. 17th. Mr. Geoffrey C. S. Ingram—“Some Photographic Studies of the Wild Life of the District.”

1915.

- Jan. 14th. Mr. Evan W. Small, M.A., B.Sc.—“Some Florentine Churches and Palaces.”
- Feb. 11th. Professor T. Franklin Sibly, D.Sc., F.G.S.—“The British Coasts.”
- Mar. 11th. Professor Frederic Bacon, M.A., A.M.I.Mech.E.—“How Metals Break.”

The following Public Lectures have been delivered during the year :—

1914.

- Oct. 30th. Mr. Hilaire Belloc—“The Great War.”
- Nov. 26th. Dr. Marie C. Stopes, D.Sc., Ph.D., F.L.S.—“A Scientist's Journey through Japan.”
- Dec. 10th. Professor F. C. de Sumichrast—“Belgium, the Cockpit of Europe.”

1915.

- Jan. 28th. Rev. T. T. Norgate, F.R.G.S.—“The War Drama up-to-date.”
- Feb. 25th. Mr. T. Sheppard, F.G.S., F.S.A.Scot.—“Lost Towns of the Yorkshire Coast.”

Mar. 25th. Professor W. J. Sollas, LL.D., F.R.S.—“The Paviland Caves.”

The whole of the meetings were held in the Cory Hall.

The thanks of the Society are due to members who have read Papers, and also to those who entertained the Lecturers.

The First Summer Meeting was held on Wednesday, May 19th, 1915, at Fonmon Castle, and was attended by over seventy members. In the unavoidable absence of Mr. O. H. Jones, J.P., the party was met by Mrs. Jones, who explained the principal features of the building and gave an interesting resumé of the history of the house and estate. The members were much interested in the paintings, furniture and china. Tea was taken at Rhose before returning to Cardiff.

The Annual Field Meeting (Ladies' Day) was held at Tintern and Moun-ton on Saturday, July 10th, 1915, and was attended by over a hundred members. On account of the War, it was decided to have a shorter Field Meeting than usual, and the members left Cardiff at one o'clock in motor chars-à-bancs. Tintern was reached soon after three o'clock, and after a short inspection of the Abbey, the party proceeded to Moun-ton House, near Chepstow, where they were met by Mr. H. Avray Tipping, M.A., F.S.A., the owner of the property. Tea was taken in the grounds, after which the house and gardens were inspected under the guidance of Mr. Tipping. The visit proved of particular interest to the members owing to the fact that the house was of recent erection and incorporated many features of an original character. The gardens also showed that the best possible use had been made of a somewhat unique site. A meeting of members was held at Moun-ton, when Mr. John Grimes was elected President for the 1915-16 session. The chars-à-bancs left soon after seven o'clock, and reached Cardiff about nine p.m.

The Third Summer Meeting was held on Saturday, September 25th, 1915, at the National Museum Buildings now in course of erection in the Cathays Park, Cardiff. The members were met by Dr. W. Evans Hoyle, M.A., the Director of the Museum,

and by representatives of the Contractors for the building. Sufficient progress had been made to enable the members to gain a fairly definite idea of the Museum as it will ultimately appear, and much admiration was expressed for the general arrangements and design. The party was also much interested in the stone-working machinery, which was of a very complete character. Over 120 members attended.

During the year steps have been taken towards the provision of a Memorial to the late Dr. Charles Tanfield Vachell, which would perpetuate his long connection with the Society. It was decided that this should take the form of a Memorial Tablet to be placed in a prominent position at the National Museum of Wales (by kind consent of the Council of the Museum), and Sir W. Goscombe John, R.A., generously expressed his readiness to design and execute the tablet. A fund has been raised amongst the members to cover the cost of materials and erection, and any surplus will be handed over to the General Fund being collected to defray the cost of a Memorial East Window in St. John's Church, Cardiff. The Council is greatly indebted to Sir Goscombe John for his kindness in preparing the model for the tablet.

A new Statute enacted by the Court of Governors of the National Museum of Wales, has received the approval of the Privy Council, by which the Society and other representative bodies became entitled to appoint representatives upon the Court of Governors. Mr. H. M. Hallett, F.E.S., has been appointed the Society's representative for the ensuing three years.

In accordance with the amendment of Rule No. 22, passed at the last Annual Meeting, the Council has appointed Lloyds Bank, Ltd., Trustee for the Society, and the investments of the Society have been transferred to the Bank accordingly.

It is intended to place on record the names of all members serving with the Forces, and at the Annual Meeting a resolution will be submitted approving of the action of the Council in deciding that no subscription should be regarded as due, during

the period of the War, from members who are unable to avail themselves of the privileges of membership through service away from Cardiff.

The Council regrets to report that Mr. William Sheen, who had so ably edited the Society's Transactions for ten years, felt it necessary to resign that post, chiefly on account of his leaving Cardiff to command the Welsh Hospital. Dr. D. R. Paterson, at the request of the Council, kindly undertook the position, and Volume XLVII. of the Transactions has been issued during the year under his editorship.

The Council desires to express its thanks to Dr. E. Walford, D.P.H., for again kindly editing the Meteorological Report.

The three Sections of the Society, viz. :—Biological and Geological, Archæological, and Photographic, have been maintained during the year, although their activities have been necessarily restricted to a large extent owing to the continuance of the War.

The Annual Statement of Accounts is presented herewith.

CARDIFF NATURALISTS' SOCIETY.

Dr. Revenue Account for the Year ending 30th September, 1915.

Cr.

	£	s.	d.		£	s.	d.
To Reports and Transactions	53	7	10				
„ Members' Meetings	36	15	9				
„ Stationery, Printing, and Advertising	28	9	6				
„ General Expenses	60	4	4				
„ Field Meetings	58	5	2				
„ Less Tickets sold	52	17	0				
	5	8	2				
„ Lectures	106	17	7				
„ Less Receipts	13	7	6				
	93	10	1				
„ Depreciation of Furniture	1	6	0				
„ Conversazione Reserve	23	2	0				
„ Balance to next Year's Account	485	15	8				
	488	27	8				
				By Balance from last year's Account	419	16	5
				„ Subscriptions—Ordinary	354	6	3
				„ Dividends and Interest	13	14	8
				„ “Birds of Glamorgan”	0	0	0

£787 19 4

£787 19 4

CARDIFF NATURALISTS' SOCIETY.

Balance Sheet, 30th September, 1915.

LIABILITIES.

	£	s. d.
Sundry Creditors .. .. .	.. 15	3 8
Subscriptions paid in advance .. .. .	.. .. .	4 5 0
Gelligaer Excavations Account .. .. .	.. .. .	16 3 0
Extended Exchanges List Account .. .. .	.. .. .	1 3 6
Conversazione Reserve Account .. .. .	.. .. .	92 1 0
Reserve Account .. .. .	.. .. .	2 5 6
Balance, being Excess of Assets over Liabilities ..	485	15 8

£616 17 4

(Signed) ARCHIBALD BROWN, Hon. Treasurer.
CARDIFF, 13th October, 1915.

ASSETS.

	£	s. d.
Value of Furniture .. .. .	.. .. .	11 14 0
Library .. .. .	.. .. .	22 19 10
Reports unsold .. .. .	.. .. .	5 0 0
" Cardiff Flora " unsold .. .. .	.. .. .	0 1 0
" Glamorgan Flora " unsold .. .. .	.. .. .	0 7 2
£200 Barry Railway Company 4 per cent. Preference Stock (at 92½), including the amount of the Life Subscriptions .. .. .	.. .. .	185 0 0
Cash at Lloyds Bank, Limited, viz.:—	.. .. .	259 6 6
Deposit Account .. .. .	.. .. .	132 8 10
Current Account .. .. .	.. .. .	391 15 4

£616 17 4

(Signed) T. W. PROGER, Hon. Auditor.
CARDIFF, 13th October, 1915.

LIST OF MEMBERS OF THE SOCIETY, AND OF
THE SECTIONS, ON SERVICE WITH HIS MAJESTY'S
FORCES AT THE 1ST JANUARY, 1916.

-
- EDWARD JAMES AUGUST, Lieutenant and Quartermaster, R.A.M.C. (T.),
The Welsh General Hospital, Netley.
- ARCHIBALD CAMPBELL BROWN, Lieutenant, 3rd Battalion, Welsh
Regiment.
- JAMES HENESDON CROSS, 2nd Lieutenant, 14th Infantry Brigade.
- ARTHUR CHARLES CULLEY, Lieutenant, R.A.M.C. (T.), and O.C. Adminis-
trative Centre, 2nd Welsh Field, Ambulance (T.).
- HERBERT CYRIL DAVID, Lieutenant, 3rd Battalion Welsh Regiment.
- TANNAT WILLIAM EDGEWORTH DAVID, Major, Australian Mining Corps,
A.I.F.
- ENOCH THOMAS DAVIES, Chaplain, 68th (Welsh) Division.
- JOHN OWEN DAVIS, Lieutenant, 53rd Welsh Divisional Signal Company,
R.E. (T.).
- ARTHUR C. DEVEREUX, F.R.C.S., Captain, R.A.M.C. (T.), 53rd Welsh
Casualty Clearing Station.
- FRANK DIXEY, Sapper, 1/4th E.L. Company, Glam. (F.) R.E. (T.).
- HAROLD CORBETT DOWNING, Captain, 1/6th Battalion Welsh Regiment
(T.).
- HENRY J. DUNBAR, M.D., F.R.C.S. (Edin.), Captain (Temporary Major),
R.A.M.C. (T.), 2nd Welsh Field Ambulance.
- EDWARD EMRYS-ROBERTS, M.D., Captain, R.A.M.C., Welsh Army Corps.
- JOHN H. ENGLAND, Captain, Royal Garrison Artillery (T.).
- CHARLES E. EVANS, Sub-Lieutenant, R.N.R.
- HERBERT WILLIAM CRESSWELL EVANS, Lance-Corporal, Motor Cyclist,
7th Battalion Welsh Regiment.
- FRANK RONALD FIFOOT, 2nd Lieutenant, Royal Garrison Artillery (T.).
- HENRY THOMAS GILLING, Lieutenant-Colonel, 1/2nd Welsh Brigade,
R.F.A.
- GRIFFITH GREENWAY, Lieutenant, R.G.A. (T.).
- PHILIP RHYS GRIFFITHS, Lieutenant-Colonel, R.A.M.C. (T.), 3rd Western
General Hospital.
- FRANK GUNN, Lieutenant, 3/5th Welsh Regiment (T.).
- GEOFFREY C. S. INGRAM, Private, Army Reserve.
- ARTHUR P. JAMES, Lieutenant-Colonel and Hon. Colonel, formerly O.C.
2/5th Battalion Welsh Regiment (T.).
- JOHN GRIFFITH JONES, Major, 51st Provisional Battalion.
- ARCHIBALD HENRY LEE, Captain, 2/5th Welsh Regiment (T.).
- HAROLD MORGAN LEWIS, Lance-Corporal, 21st Service Battalion Royal
Fusiliers.
- HENRY LEWIS, Captain, R.F.A.
- JOSEPH HENRY LLOYD, Private, A.S.C. (Horse Transport).

EWEN JOHN MACLEAN, Major, R.A.M.C. (T.), Registrar and Adjutant,
3rd Western General Hospital.

ANDREW DOWNING MEIN, Private, Honourable Artillery Company.

DONALD R. PATERSON, M.D., Major, R.A.M.C. (T.), 3rd Western General
Hospital.

OWEN LEWELLIN RHYS, M.D., R.A.M.C. (T.), Lieutenant-Colonel,
Commanding 2/2nd Welsh Field Ambulance.

WILLIAM ASIHTON RODGER, 2nd Lieutenant, 1st Battalion Welsh Regiment.

WILLIAM ROWE, Engineer Commander, H.M.S. "Tipperary."

ARTHUR HOWE SALMON, Private, 2nd Battalion, Honourable Artillery
Company.

EDGAR STRIGUIL SALMON, Private, Seaforth Highlanders.

HARRY MORREY SALMON, 2nd Lieutenant, 3rd Battalion Welsh Regiment.

HOWARD THURSTAN SALMON, Private, 21st Battalion Royal Fusiliers
(4th N.P.S.).

HAROLD A. SCHÖLBERG, Captain, R.A.M.C. (T.).

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HERBERT REDWOOD VACHELL, Lieutenant-Colonel, R.A.M.C. (T.), 3rd
Western General Hospital, Cardiff.

* Died of wounds in France.

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TRANSACTIONS OF THE
CARDIFF NATURALISTS' SOCIETY

VOL. XLIX

1916



Cardiff Naturalists' Society

**REPORT
AND TRANSACTIONS**

VOL. XLIX

1916

The Price of the Transactions is Ten Shillings and Sixpence



PRINTED FOR THE SOCIETY BY
WILLIAM LEWIS (PRINTERS), LTD., CARDIFF

1917

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TO THE MEMORY OF
CHARLES STANFIELD VACHELL M.D.

BORN 1848 OF CARDIFF. DIED 1914

ONE OF THE EARLIEST ADVOCATES
OF A NATIONAL MUSEUM FOR WALES
AND AN ORIGINAL MEMBER OF
THE MUSEUM COUNCIL

THIS TABLET HAS BEEN PLACED HERE BY HIS
FELLOW MEMBERS OF THE CARDIFF
NATURALISTS SOCIETY

CONTENTS

VOL. XLIX. 1916

	PAGE
Frontispiece—Bust of the late CHARLES TANFIELD VACHELL, M.D.	
Meteorological Observations in the Society's District, 1916. E. WALFORD, M.D., F.R.Met.Soc. - -	1
The Minerals of Glamorgan. F. J. NORTH, B.Sc., F.G.S.	18
The Hemiptera of Glamorgan. H. M. HALLETT, F.E.S.	52
Entomological Notes. H. M. HALLETT, F.E.S. - -	64
Ornithological Notes, 1916. T. W. PROGER and D. R. PATERSON - - - - -	67
Biological and Geological Section. Report and Statement of Accounts for the Twenty-Ninth Session 1915-16 - - - - -	70
Archæological Section. Report and Statement of Accounts for the Session 1915-16 - - - -	73
Photographic Section. Report and Statement of Accounts for the Fifth Session, 1915-16 - -	75
Report of the Council, 1915-16 - - - - -	79
Statement of Accounts for the Year ending September 30th, 1916 - - - - -	83
List of Past Presidents of the Society - - -	85
Officers and Council of the Society, 1916-17 - -	86



METEOROLOGICAL OBSERVATIONS IN THE SOCIETY'S DISTRICT, 1916.

BY E. WALFORD, M.D., F.R.MET.SOC.

The average monthly rainfall over the whole of the Society's district (comprised within the semi-circular area, having the Beacons as its northernmost point, its base the coastline from Neath to Chepstow, and with a mean height of 632 feet above the sea level) was as follows:—

January	5·98 inches.
February	7·85 ..
March	3·90 ..
April	2·89 ..
May	4·28 ..
June	3·93 ..
July	2·63 ..
August	4·99 ..
September	3·25 ..
October	11·98 ..
November	5·61 ..
December	4·83 ..
	<hr style="width: 10%; margin: 0 auto;"/>
	62·12 ..
	<hr style="width: 10%; margin: 0 auto;"/>
Total in 1915	51·52 ..
„ 1914	59·77 ..
„ 1913	57·17 ..
„ 1912	68·20 ..
„ 1911	50·95 ..
„ 1910	59·27 ..
„ 1909	50·83 ..
„ 1908	45·60 ..
„ 1907	52·37 ..
„ 1906	49·29 ..
„ 1905	39·98 ..
„ 1904	50·02 ..
„ 1903	67·90 ..
„ 1902	41·72 ..

OBSERVERS.		FEET ABOVE MEAN SEA LEVEL.	INCHES OF RAIN.
C. H. PRIESTLEY,	Summit of Tyle Brith, Brecknockshire	2350	75·46
"	Nant Penig	2000	99·97
"	Nant Ddu	1560	79·83
"	Storey Arms	1430	73·79
"	Beacons Reservoir	1340	88·20
"	Nant Gwineu	1275	54·95
ERNEST W. TERREY, C.E., F.G.S.,	Pontlluestwen		
	Reservoir, Maerdy, No. 1 Gauge	1250	103·27
"	" No. 2 Gauge	1225	67·54
"	" No. 3 Gauge	1200	93·66
H. C. STEEL, Blaenavon Estate Office, Mon.		1150	58·03
C. H. PRIESTLEY, Pentwyn Uchaf Farm		1143	70·43
"	Cantreff Reservoir	1120	81·60
"	Garw-nant	1100	76·10
R. C. HARRISON, Gwernllwyn, Dowlais		1071	56·72
EBBW VALE STEEL, IRON, AND COAL CO., Ebbw Vale		902	62·77
C. H. PRIESTLEY, Llwynon Reservoir, Brecknockshire		860	64·86
"	Pont-ar-daf	850	71·71
GLYNCORRWG COLLIERY COMPANY, Glyncoerwg		725	92·99
THE UNITED NATIONAL COLLIERIES, LTD., Treherbert		670	97·24
NEWPORT CORPORATION, Newchurch, Wentwood, Mon.		525	47·38
"	Nantypridd, Wentwood, Mon.	500	45·71
"	Llanvaches Embankment	456	44·50
"	Pant-yr-eos Reservoir, Mon.	435	59·85
EDWARD CURRE, Itton Court, Chepstow		390	40·11
E. TUDOR OWEN, Ash Hall, Cowbridge		315	54·25
HENRY CLAY, Piercefield Park, Chepstow		300	40·36
ERNEST W. TERREY, C.E., F.G.S., Lan Wood Reservoir,	Pontypridd	300	62·98
GODFREY L. CLARK, J.P., Talygarn, Glam.		250	65·44
JAMES WILLIAMS, Wern House, Ystalyfera		240	72·90
Sir HENRY MATHER JACKSON, Bart., Llantilio Court, Mon.		230	29·79
E. WALFORD, M.D., Meteorological Station, Penylan,	Cardiff	204	47·36
Rev. Canon HARDING, Pentwyn, Rockfield, Mon.		191	36·09
J. F. MATTHYSSENS, Witla Court, Rumney		177	43·97
The Hon. LADY SHELLEY, The Hendre, Monmouth		176	31·62
C. H. PRIESTLEY, Llanishen Reservoir, Glam.		155	44·70
"	Lisvane Reservoir, Glam.	150	41·95
Mrs. LYSAGHT, Castleford, Chepstow		146	39·37
C. H. PRIESTLEY, The Heath Filter Beds, Cardiff		132	47·75
O. H. JONES, J.P., Fonmon Castle, Glam.		130	40·29
NEWPORT CORPORATION, Ynis-y-fro Reservoir, Mon.		130	46·57
C. H. PRIESTLEY, Cogan Pumping Station, Glam.		121	41·41
"	Ely Pumping Station, Glam.	53	48·03
A. A. PETTIGREW, Roath Park, Cardiff		52	46·97
C. H. PRIESTLEY, Trade Street Depot, Cardiff		45	46·90
NEWPORT CORPORATION, Friars Street Depot, Newport		33	47·58
T. E. FRANKLIN, Biglis Pumping Station, Cadoxton, Barry		20	43·56

CARDIFF METEOROLOGICAL STATION.

The situation and equipment of this Station has been fully described in previous reports, and no change in either has taken place during the year. In view of the necessity of economising the expenditure in printing at the present time, it has been considered desirable to limit the volume of the Meteorological Report to the statistical tables and a short summary of the main features in each month.

TABLE I.
BAROMETRIC PRESSURE AND RELATIVE HUMIDITY.

1916.	Mean Barometric Pressure.*		Hygrometer.*		
	Uncorrected.	At M.S.L. and 32° F.	Dry Bulb (Mean).	Wet Bulb (Mean).	Mean Relative Humidity.
	in.	in.	°F.	°F.	%
January ..	29.992	30.196	46.5	44.7	87
February ..	29.566	29.766	38.9	37.3	87
March ..	29.461	29.681	38.5	36.8	86
April ..	30.064	30.268	46.8	43.5	76
May ..	29.746	29.926	52.0	49.3	82
June ..	29.788	29.963	53.0	49.6	79
July ..	29.817	30.064	60.1	57.6	84
August ..	29.759	30.046	61.5	58.9	84
September ..	29.907	30.065	55.9	53.6	86
October ..	29.678	29.850	52.8	50.6	86
November ..	29.559	29.606	44.2	42.7	87
December ..	29.444	29.667	35.9	35.1	93
Means ..	28.881	29.925	48.8	46.6	84

* From observations at 9 a.m. and 9 p.m.

TABLE II.
TEMPERATURE.

1916.	Maximum.	Minimum.	Mean of Maximum.	Mean of Minimum.	Mean Temperature.	Difference from Average (27 years).
	° F.	° F.	° F.	° F.	° F.	° F.
January ..	57.1	35.0	50.6	42.0	46.5	+ 7.5
February ..	51.2	26.2	43.8	34.6	39.2	- 1.0
March ..	55.1	26.7	44.1	34.0	39.0	+ 3.4
April ..	70.6	32.3	54.8	39.6	47.2	+ 0.8
May ..	75.3	36.0	60.3	45.4	52.8	+ 0.4
June ..	67.1	39.6	67.1	46.7	53.4	- 3.8
July ..	76.4	48.8	68.0	52.9	60.4	- 0.3
August ..	78.9	49.0	69.7	56.6	63.1	+ 2.8
September ..	72.0	40.0	63.0	50.2	56.5	+ 0.2
October ..	64.8	36.9	57.6	48.3	53.0	+ 2.7
November ..	55.5	30.0	49.1	40.0	44.5	+ 0.1
December ..	54.9	20.9	41.2	31.8	36.6	- 4.1
	Max.	Min.	Mean	Mean	Mean	+ 1.9
	78.9	20.9	55.8	43.5	49.4	

TABLE III.

SOLAR AND TERRESTRIAL RADIATION, UNDERGROUND TEMPERATURE, AND SUNSHINE.

1916.	TEMPERATURE.			Bright Sunshine.	Bright Sunshine— Difference from Average (8 years).
	Grass Minimum (Mean).	Underground (Mean.)			
		1ft.	4ft.		
	° F.	° F.	° F.	hrs.	
January ..	38.4	44.8	45.8	41.4	— 11.5
February ..	32.2	41.2	45.2	78.8	— 1.3
March ..	30.3	39.4	42.7	85.8	— 22.5
April ..	33.6	46.2	44.8	228.0	+ 44.3
May ..	40.6	54.6	49.5	195.5	— 21.9
June ..	41.2	56.5	53.4	181.5	— 33.1
July ..	50.6	61.9	56.4	246.1	+ 33.5
August ..	51.2	64.2	60.1	214.2	+ 19.0
September ..	46.7	58.8	58.5	138.0	— 13.1
October ..	45.3	54.6	56.3	83.2	— 13.2
November ..	36.6	46.1	51.4	46.7	— 23.0
December ..	27.2	37.6	45.4	43.7	— 10.5
	Mean	Mean	Mean	Total	
	39.5	50.5	50.8	1582.9	— 53.5

TABLE IV.

RAINFALL.

1916.	Amount.	Difference from Average (27 years).	*Greatest Fall in 24 hours.	*Date of Greatest Fall.	*No. of Days with Rain (0.01 in. or more).
	ins.	ins.	ins.		
January ..	3.16	— 0.76	.91	2nd	21
February ..	5.72	+ 2.85	.60	14th	27
March ..	3.21	+ .01	.91	19th	19
April ..	1.75	— .96	.35	16th	12
May ..	4.68	+ 2.30	1.40	24th	20
June ..	4.62	+ 1.71	1.22	27th	17
July ..	2.21	— .37	1.02	6th	8
August ..	3.55	— .59	1.06	25th	15
September ..	2.20	— .45	.82	26th	9
October ..	9.04	+ 4.14	1.35	2nd	27
November ..	3.39	— .11	.76	6th	18
December ..	3.83	— .83	.76	28th	16
	Total				Total
	47.36	+ 6.94	1.40	24th May	209

* 24 hours ending 9 a.m. next day.

MAIN FEATURES OF THE MONTHS.

1916.

JANUARY.

Weather. Dull and mild. Wind chiefly N.W.

Barometric Pressure. Above the average, being 29.992.

Sunshine. Deficient 41.4 hours. 11.5 below average of eight years.

Rainfall. Total, 3.16 in. .76 in. below average for 27 years.

Rain fell on 21 days; greatest fall, .91 in. in 24 hours on the 2nd.

Mean Temperatures. Abnormally high. 46.5, or 7.5 above average. Maximum, 57.1 on the 1st. Minimum, 35.0 on the 14th. Minimum on the grass, 27.0 on the 14th and 29.0 on the 23rd. Frost, 2 days.

FEBRUARY.

Weather. Wet and cold. Wind chiefly N.W. A severe hail-storm on the 3rd. On the 15th an unusually hard north-west wind sprang up. On the 23rd to the 26th heavy falls of snow occurred.

Barometric Pressure. Average.

Sunshine. Slightly deficient, 78.8 hours. 1.3 below average.

Rainfall. Above average by 2.85 in. Rain fell on 27 days. Total, 5.72 in.; greatest fall in 24 hours, .60 in. on the 14th.

Temperatures. Mean, 39.2. Normal, or 1.0 above average. Maximum, 51.2 on the 6th, 13th, and 16th. Minimum, 26.2 on the 25th. Frost recorded on eight days. Grass Minimum, 24.0 on the 28th. Frost recorded, 15 days.

MARCH.

Weather. Generally dull. Wind chiefly N.E. and N.W. Blizzard, 27th and 28th. Heavy fall of snow with gale of wind. (See note under heading of "Extremes.")

Barometric Pressure. Below average. Mean, 29.461.

Sunshine. Deficient. Total, 85.8 hours, being 22.5 below average for eight years.

Rainfall. Average, being only 0.01 below. Rain fell on 19 days. Total, 3.21; greatest fall, .91 in. on the 19th.

Temperatures. Mean, 39.0, below average by 3.4. Maximum, 55.1 on the 18th. Minimum, 26.7 on the 5th. Seven days of frost. Grass minimum, 22.0 on the 5th. 19 days of frost.

APRIL.

Weather. Bright and dry. Wind chiefly N.W.

Barometric Pressure. Above the average. Mean, 30.064.

Sunshine. Plenty. A total of 228.0 hours, being 44.3 above the average for eight years. The second sunniest month of the year; on the 29th, recorded 12.2 hours.

Rainfall. Below average by 0.96 in. Rain fell on 12 days. Total, 1.75 in.; greatest fall, .35 in. on the 16th.

Temperatures. Mean, 47.2. Maximum, 70.6 on the 26th. Minimum, 32.3 on the 6th; Grass minimum, 23.0 on the 8th. Eight days of frost recorded on the grass.

MAY.

Weather. Wet. Wind chiefly W. and N.W.

Barometric Pressure. Below normal.

Sunshine. Deficient. Total, 195.5 hours, being 21.9 below average.

Rainfall. Above average by 2.30 in. Rain fell on 20 days. Total, 4.68 in. Greatest fall, 1.40 in. on the 20th.

Temperatures. Mean, 52.8. Average temperature. Maximum, 75.3 on the 20th. Minimum, 36.0 on the 10th. Grass minimum, 29.0 on the 10th. Frost, one day.

JUNE.

Weather. Wet, dull. Wind chiefly N.W. and W.

Barometric Pressure. Normal. Mean, 29.788.

Sunshine. Deficient. Total, 181.5 hours, being 33.1 hours below average for eight years.

Rainfall. Above average by 1.71 in. Rain fell on 17 days.
Total, 4.62 in. Greatest fall, 1.22 in. on the 27th.

Temperatures. Mean, 53.4, below average by 3.8. Maximum,
67.1 on the 17th. Minimum, 39.6 on the 9th. Grass
minimum, 32.0 on the 3rd.

JULY.

Weather. Dry. Wind chiefly N.W. and N.E.

Barometric Pressure. Average.

Sunshine. Plenty. The sunniest month of the year. Total,
246.1 hours, being 33.5 above the average. On the 10th
recorded 14 hours, 24th, 13.00 hours, 25th, 13.3 hours,
30th, 13.9 hours.

Rainfall. Below average by .37 in. Rain fell on eight days.
Total, 2.21 in. Greatest fall, 1.02 in 24 hours, on the 6th.

Temperatures. Mean, 60.4. Average. Maximum, 76.4 on the
21st. Minimum, 48.8 on the 8th.

AUGUST.

Weather. Dry. Wind chiefly N.W. and N.E.

Barometric Pressure. Normal.

Sunshine. Plenty. Total, 214.2 hours, being 19.0 hours above
average.

Rainfall. Below average by .59 in. Rain fell on 15 days.
Total, 3.55 inches. Greatest fall, 1.06 on the 25th.

Temperatures. Mean, 63.1. Above average by 2.8. Maxi-
mum, 78.9 on the 3rd. Minimum, 49.0 on the 31st.

SEPTEMBER.

Weather. Dull. Dry. Wind, chiefly N.E. and N.W.

Barometric Pressure. Average.

Sunshine. Deficient. Total, 138.0 hours, being 13.1 hours
below average.

Rainfall. Below average by .45 in. for 27 years. Rain fell
on 9 days. Total, 2.20 in. Greatest fall, .82 in. on the
26th.

Temperatures. Mean, 56.5. Maximum, 72.0 on the 12th.
Minimum, 40.0 on the 15th.

OCTOBER.

Weather. Dull, wet. Wind chiefly N.W. and W.

Barometric Pressure. Average.

Sunshine. Deficient. Total, 83.2 hours, being 13.2 hours below average for eight years.

Rainfall. Above average by 4.14 in. for 27 years. Rain fell on 27 days. Total, 9.04 in., the wettest month of the year. Greatest fall in 24 hours, 1.35 in. on the 2nd.

Temperatures. Mean, 53.0, above average by 2.7. Maximum, 64.8 on the 3rd. Minimum, 37.0 on the 22nd.

NOVEMBER.

Weather. Dull. Dry. Wind chiefly N.W. and S.W.

Barometric Pressure. High.

Sunshine. Deficient. Total, 46.7 hours, being 23.0 below average.

Rainfall. Below average by .11 in. Rain fell on 18 days. Total, 3.39 in. Greatest fall in 24 hours, .76 in. on the 6th.

Temperatures. Mean, 44.5. Average. Maximum, 55.5 on the 24th. Minimum, 30.0 on the 17th and 18th. Grass minimum, 26.0 on the 27th.

DECEMBER.

Weather. Dull. Dry. Wind chiefly E. and N.E.

Barometric Pressure. Low.

Sunshine. Deficient. Total, 43.7 hours, being 10.5 below average.

Rainfall. Below average by 0.83 in. Rain fell on 16 days. Total, 3.83 in. Greatest fall in 24 hours, .76 on the 28th.

Temperatures. Mean, 36.6. Below average by 4.1. Maximum, 54.9 on the 29th. Minimum, 20.9 on the 14th. Frost, 16 days. Grass minimum, 15.0 on the 17th. Ground frost, 24 days. Snowstorm on the night of the 19th.

EXTREMES.

April the driest month. October the wettest.

Wettest months were October, with 9.04 in. of rain ; February, 5.72 in. ; May, 4.62 in. ; June, 4.60 in.

Wettest day, May 24th, 1.40 in.

Rain fell on 209 days. Total rainfall, 47.36 in., being 6.94 in. above average for 27 years.

Sunshine, 1,582.9 hours, being 53.5 below average for eight years.

The sunniest day was July 19th. 14.0 hours recorded.

Hottest day, 78.9 degrees on August 3rd.

Coldest day, 20.9 degrees on December 14th.

With reference to the storm which occurred on the night of the 27th-28th March, the Director of the Meteorological Office, London, in a circular letter to observers, states that " the violent storm and blizzard of March 27th-28th, 1916, was in some respects the most extraordinary one experienced in this country for many years, the most widespread damage occurred in the Midlands and Eastern Counties of England and in South Wales, but the storm was severe in nearly all parts of England and Wales south of a line from the Mersey to the Humber." In Cardiff the gale raged with great intensity through the night, snow fell heavily, accompanied by lightning, the result being very considerable damage to house property, telegraph and telephone poles, the communication with London, Bristol and other places was interrupted for some weeks, and the train service temporarily dislocated. The wind was chiefly from the North and North-East, and raged with great violence until the morning of the 28th, damaging the lines which were at the time laden with wet snow.

GENERAL NOTES.

The Table of "Rainfall in the District" was compiled by Mr. Gilbert D. Shepherd, Honorary Assistant Secretary of the Society. This compilation involves a considerable amount of work, as the Table comprises the returns of Rainfall from a large number of observers. The Society is much indebted to these observers for their voluntary co-operation, which renders the preparation of the meteorological report possible.

Some observers have written regretting their inability to continue supplying annual returns of rainfall, owing to a variety of unavoidable circumstances, especially war service.

Regarded as a whole, the year 1916 was a wet year, the rainfall being above the average.

In the Society's district it varied from 73 inches at Wern House, Ystalyfera, to 40.29 at Fonmon Castle, as compared with 47.36 at Penylan, Cardiff.

Average for 14 years, 53.11.

Rainfall for 1916, 53.70, being 0.59 above the average for 14 years.

The conditions in 1916 were, on the whole, favourable to the public health. No prolonged or excessive heat waves were experienced in the summer, therefore the mortality amongst infants and young children was low.

The winter was rather severe, low temperatures being recorded, the mortality from lung diseases amongst the old and feeble being somewhat high.

The general death-rate in Cardiff for the year was 13·7 per 1,000. This rate, and particularly the rate of infant mortality, are much influenced by the meteorological conditions which prevail in the summer and autumn, as will be seen from the following table. A high death-rate is the invariable accompaniment of a hot and dry summer, and a low rate of a cool and wet summer.

CARDIFF.

Month.	Annual death-rate per 1,000.				Deaths under 1 year per 1,000 births.			
	1913.	1914.	1915.	1916.	1913.	1914.	1915.	1916.
July	8·1	10·1	10·5	9·4	48	78	62	62
August	10·7	10·1	10·7	8·4	195	89	44	55
September ..	14·9	12·7	13·6	16·2	294	162	201	150

The following interesting note has been supplied by O. H. Jones, Esq., J.P. :—

“ Four inches over average, steady rainfall.

October the wettest, February next.

July smallest rainfall, exceptionally dry month.

Three falls over an inch in 24 hours, largest, 1·31.

Large number of wet days, great gale and snow blizzard on 27th March from the North, caused great damage. ”

RAINFALL IN THE DISTRICT, 1916.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Summit of Tyle Brith ||Average ...	9·37 6·65	8·46 5·37	2·45 5·74	3·96 4·44	4·46 4·23	4·73 4·27	3·09 5·02	5·59 6·96	3·88 4·96	16·65 8·11	7·71 7·44	5·11 9·52	75·46 72·71	Readings taken weekly and at end of each month.	
Nant Penig †Average ...	16·30 8·27	12·01 6·37	2·71 7·65	5·85 5·60	4·87 4·12	5·96 4·87	3·95 5·20	6·49 8·13	4·61 4·79	21·03 8·58	8·78 7·86	7·41 11·84	99·97 83·28	Readings taken weekly and at end of each month.	
Nant Ddu ...	10·15	10·67	3·38	4·33	4·22	4·69	2·64	5·60	3·94	16·70	7·10	6·41	79·83	Readings taken weekly and at end of each month.	
Storey Arms ‡Average ...	6·46 6·18	8·12 5·43	4·35 5·96	3·47 4·53	4·56 3·79	4·41 4·31	2·73 4·09	5·84 6·92	3·34 3·97	17·14 7·92	8·18 6·70	5·19 10·04	73·79 69·84	Readings taken weekly and at end of each month.	
Beacons Reservoir Average ...	11·56 7·90	11·86 6·16	5·08 6·65	4·93 4·98	4·39 4·16	4·97 4·40	3·16 5·16	5·88 7·83	3·95 4·47	17·77 8·47	8·28 7·83	6·37 10·69	88·20 78·70	218 ...	{ 2·06 { Feb. 10th.
Nant Gwineu ...	1275	673	218	322	380	269	168	498	333	1259	531	430	5495	Readings taken weekly and at end of each month.	
Pontllnestwen Reservoir (No. 1 Gauge)	1250	1344	345	534	393	655	373	718	592	1972	1065	782	10327		
Pontllnestwen Reservoir (No. 2 Gauge) Average ...	1225	723	286	318	357	417	294	571	479	1497	819	487	6754		
Pontllnestwen Reservoir (No. 3 Gauge)	1200	1164	343	514	393	605	333	675	550	1796	979	706	9366		
Blaenavon ... ‡Average ...	1150 5·04	696 5·11	529 5·76	178 3·95	444 3·41	266 3·40	164 3·24	441 4·67	229 2·93	1269 6·23	731 5·19	388 7·97	5803 5690		

RAINFALL IN THE DISTRICT, 1916.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 lb. or more rain.	Greatest fall in one day.
Pentwyn Uchaf Farm ||Average ...	9.36 6.00	9.47 4.98	2.13 5.41	3.72 3.92	3.89 3.42	4.03 3.49	2.14 4.19	4.63 5.80	3.97 4.21	15.35 6.90	6.66 6.88	5.08 8.65	70.43 63.85	Readings taken weekly and at end of each month.	70.43 63.85
Cantref Reservoir §Average ...	10.44 7.06	11.26 5.63	3.54 5.92	4.13 4.44	4.15 3.73	4.53 3.81	2.56 4.17	5.32 6.69	3.89 3.82	17.14 7.47	8.60 6.65	6.04 9.44	81.60 68.83	211 ...	{ 1.72 { Dec. 9th.
Garw-nant... ..	8.62	10.34	2.83	4.16	4.22	4.28	2.28	5.57	4.27	16.51	7.11	5.91	76.10	Readings taken weekly and at end of each month.	{ 1.75 { Dec. 5th.
Dowlais, Gwernllwyn Average ...	4.23 4.97	8.20 4.07	3.07 4.19	2.38 3.22	3.55 2.76	2.01 2.95	1.37 3.29	5.63 4.94	2.72 3.02	12.81 5.90	6.39 5.14	3.76 7.01	56.72 51.46	178 ...	{ 1.75 { Dec. 5th.
Ebbw Vale jAverage ...	5.04 5.35	8.43 5.71	4.86 5.52	2.58 3.87	4.34 3.25	2.73 3.62	1.78 3.56	6.84 5.02	2.39 2.42	12.82 7.27	6.81 5.32	4.15 9.64	62.77 60.55	181 ...	{ 2.10 { Nov. 1st.
Llwynon Reservoir ...	5.59	8.15	3.60	3.84	3.83	3.19	2.23	5.74	3.48	13.77	6.22	5.22	64.86	210	{ 1.47 { Feb. 16th.
Pont-ar-daf	7.44	9.57	2.78	3.77	3.90	4.04	2.08	5.29	3.67	15.83	7.27	6.07	71.71	208	{ 1.52 { Dec. 5th.
Glyncorrwg Colliery Average ...	13.74 8.45	11.21 6.60	3.12 7.07	5.80 5.15	4.09 4.67	4.50 4.88	3.98 5.53	5.80 8.48	8.88 5.24	16.73 8.67	8.40 8.20	6.74 11.34	92.99 84.28	174 ...	{ 2.86 { Nov. 14th.
Treherbert, United Nat. Coll.] Average ...	7.49 8.29	11.01 6.48	3.70 6.95	4.63 4.99	4.07 4.20	5.62 4.35	1.76 5.00	18.89 8.42	8.16 4.65	20.36 8.68	9.59 8.12	1.96 11.71	97.24 81.84	216 ...	{ 3.51 { Feb. 16th.
Newchurch, Wentwood, Mon.	3.06	6.03	5.44	1.24	4.07	3.24	2.94	3.90	1.35	8.20	4.08	3.83	47.38	184	{ 1.59 { Dec. 14th.

RAINFALL IN THE DISTRICT, 1916.

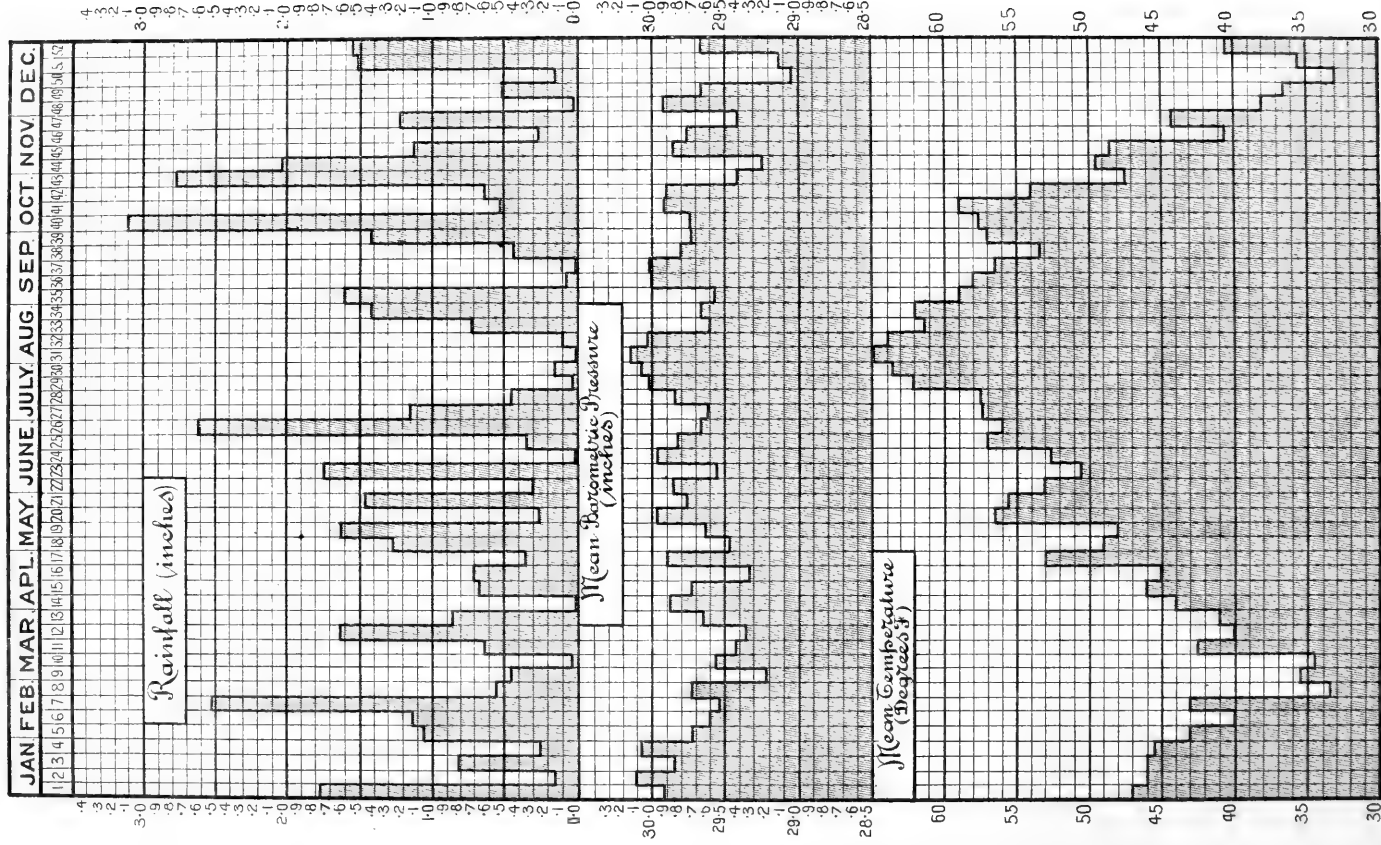
	Feet above sea level	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 in. or more rain.	Greatest fall in one day.
Nantyridd, Wentwood, Mon.	500	2.98	5.99	4.80	1.26	3.83	3.49	2.73	4.43	1.33	7.90	3.34	3.63	45.71	185	{ 1.62 { Dec. 14th.
Llanvaches Embankment, Mon.	456	3.20	5.58	4.87	1.48	3.63	3.62	2.27	4.02	1.20	7.47	3.43	3.73	44.50	192	{ 1.30 { Dec. 14th.
Pant-yr-eos Reservoir, Mon.	435	6.37	8.04	4.29	2.10	4.47	4.33	2.76	4.07	1.99	11.51	5.29	4.63	59.85	205	{ 2.08 { Dec. 14th.
Chepstow, Itton Court ...	390	3.18	5.39	3.33	1.43	3.32	2.67	2.71	4.05	1.13	6.97	2.78	3.15	40.11	169	{ 1.30 { Dec. 14th.
*Average ...	...	3.34	2.77	2.85	2.30	2.26	2.49	2.67	4.04	2.48	4.47	3.50	4.69	37.86	...	
Cowbridge, Ash Hall ...	315	4.03	7.49	3.61	2.92	4.32	3.35	2.20	3.76	3.54	9.73	4.26	5.04	54.25	151	{ 2.15 { Feb. 16th.
Average ...	...	3.99	3.15	3.55	2.75	2.47	2.66	3.18	4.47	3.12	5.13	4.27	5.58	44.32	...	
Chepstow, Piercefield Park	300	3.35	4.96	3.71	1.44	3.64	2.68	2.46	3.97	1.00	7.15	2.55	3.45	40.36	159	{ 1.30 { Nov. 11th.
Average ...	...	2.98	2.47	2.73	2.20	2.22	2.40	2.58	3.55	2.21	4.00	3.18	4.19	34.71	...	
Pontypridd, LanWood Reserv.	300	7.90	8.56	2.71	2.60	4.18	4.56	2.44	3.99	3.11	12.14	5.82	4.97	62.98	197	{ 2.02 { Dec. 15th.
*Average ...	...	5.56	4.61	4.28	3.34	2.59	3.00	3.16	5.30	3.46	6.16	5.37	7.44	54.27	...	
Talygarn ...	250	7.38	9.11	3.93	3.04	4.89	3.63	2.54	3.67	4.59	12.11	4.66	5.89	65.44	194	{ 2.18 { Feb. 16th.
†Average ...	...	6.38	4.55	5.01	3.58	2.71	2.94	3.36	4.90	3.84	6.32	5.57	8.50	57.66	...	
Ystalyfera, Wern House	240	7.91	9.43	2.37	4.25	3.61	5.04	3.15	4.78	4.62	15.38	7.71	5.37	72.90	200	{ 2.39 { Feb. 16th.
†Average ...	...	6.59	5.67	6.07	4.31	3.74	4.17	4.16	6.44	3.50	7.10	6.34	9.35	67.44	...	
Llantilio Court, Mon. ...	230	1.16	4.31	3.01	1.03	3.32	1.21	1.19	2.65	1.54	6.14	3.89	0.34	29.79	145	{ 1.40 { July 6th.
‡Average ...	...	2.81	2.43	3.11	2.13	2.22	2.15	2.41	3.23	2.17	4.10	2.78	4.42	33.96	...	

RAINFALL IN THE DISTRICT, 1916.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 in. or more rain.	Greatest fall in one day.
Cardiff Meteorological Station, Penylan	3.16	5.72	3.21	1.75	4.68	4.62	2.21	3.55	2.20	9.04	3.39	3.83	47.36	187	1.52 July 16th.
Pentwyn, Rockfield, Mon.	1.17	6.25	4.75	0.73	3.43	1.51	1.95	3.41	0.93	6.28	3.56	2.12	36.09	163	1.35 Dec. 14th. 1.35 May 13th.
Rumney, Witla Court ...	2.93	5.08	3.21	1.95	4.23	3.63	1.36	4.12	1.89	8.54	3.12	3.91	43.97	143	1.35 Dec. 15th.
Monmouth, The Hendre... **Average ...	1.07 2.47	4.02 2.16	4.41 2.19	0.62 1.82	3.46 2.04	1.52 2.07	1.98 1.93	3.26 2.82	0.95 1.86	5.68 3.64	2.72 2.61	1.93 3.69	31.62 29.30	171 ...	1.37 May 13th.
Llanishen Reservoir Average ...	3.17 3.39	5.34 2.67	3.38 3.05	1.64 2.40	4.09 2.24	4.09 2.45	2.49 2.84	3.07 4.22	2.05 2.58	8.35 4.57	3.12 3.62	3.91 4.91	44.70 38.94	177 ...	1.36 Dec. 14th.
Lisvane Reservoir Average ...	2.65 3.20	5.10 2.52	3.16 2.84	1.55 2.31	3.96 2.14	4.06 2.29	2.93 2.64	3.12 3.80	1.80 2.39	7.22 4.19	2.73 3.28	3.67 4.49	41.95 36.09	174 ...	1.43 Dec. 14th.
Chepstow, Castleford j Average ...	2.59 2.83	4.40 2.49	3.42 2.88	1.45 1.84	3.68 2.14	2.71 2.67	2.52 2.64	4.16 3.43	1.01 1.85	7.36 4.44	2.63 3.08	3.44 4.83	39.37 35.12	167 ...	1.00 Oct. 23rd.
Cardiff Heath Filter Beds || Average ...	3.43 3.68	5.98 2.81	3.44 3.27	1.71 2.44	4.45 2.27	4.30 2.40	2.25 2.79	3.48 4.16	2.32 2.72	8.78 4.62	3.37 3.82	4.24 5.19	47.75 40.17	191 ...	1.45 July 16th.
Fonmon Castle ... ||| Average ...	2.74 3.06	5.73 2.51	2.99 2.82	2.01 2.17	3.78 1.98	2.60 2.01	1.86 2.55	3.13 3.77	2.95 2.82	7.35 4.56	1.90 3.67	3.25 4.51	40.29 36.43	174 ...	1.20 July 16th.
Ynisfyo Reservoir, Mon.	3.47	5.49	4.20	1.60	4.61	3.36	1.84	4.16	1.68	8.75	3.73	3.68	46.57	192	1.61 July 16th. Dec. 14th.

Chart

SHOWING RAINFALL, MEAN BAROMETRIC PRESSURE, AND MEAN TEMPERATURE
 RECORDED AT THE METEOROLOGICAL STATION, PENYLAN, CARDIFF,
 IN EACH WEEK DURING THE YEAR 1916.



RAINFALL IN THE DISTRICT, 1916.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Cogan Pumping Station ...	2·89	5·39	3·06	1·75	4·01	3·04	1·72	3·64	2·63	7·35	2·66	3·27	41·41	171	1·38
Average ...	3·11	2·55	2·93	2·23	2·05	2·29	2·88	3·90	2·59	4·30	3·50	4·58	36·91	...	{ Dec. 14th.
Ely Pumping Station ...	3·50	5·88	3·71	1·96	4·01	4·28	2·43	3·15	3·16	8·98	3·18	3·79	48·03	238	1·44
Average ...	3·72	2·88	3·34	2·53	2·32	2·47	3·06	4·45	2·82	4·79	3·95	5·26	41·59	...	{ July 16th. { Dec. 14th.
Cardiff, Roath Park ...	3·08	5·88	4·08	1·61	4·46	4·52	2·13	3·29	2·36	8·55	3·17	3·84	46·97	169	1·51
															{ Dec. 14th.
Cardiff, Trade St. Depot ...	3·30	5·92	3·95	1·96	4·46	4·24	1·62	3·29	2·51	8·57	3·34	3·74	46·90	183	1·70
Average ...	3·65	2·94	3·38	2·52	2·16	2·65	2·69	3·98	2·25	4·73	3·60	5·31	39·86	...	{ Dec. 14th.
Newport, Friars St. Depot	3·65	6·23	4·61	1·38	4·48	3·41	1·59	4·34	1·69	8·67	3·51	4·02	47·58	176	1·53
															{ Dec. 14th.
Cadoxton, Biglis Pmg. Stn.	2·55	6·01	3·91	1·91	4·21	3·26	1·71	3·43	2·96	7·66	2·44	3·51	43·56	171	1·29
Average ...	2·72	2·26	2·54	2·06	1·71	2·15	2·63	3·73	2·50	4·06	3·04	4·17	33·57	...	{ Nov. 11th.

NOTE.—Average Rainfall is for the 28 years 1888—1915, unless otherwise indicated.

‡ 29 years 1887—1915. § 27 years 1889—1915.
 † 16 years 1900—1915. ‡ 15 years 1901—1915.
 * 24 years 1892—1915. † 10 years 1906—1915.

‡ 26 years 1890—1915.
 * 24 years 1892—1915.
 † 16 years 1900—1915.
 ‡ 15 years 1901—1915.
 § 27 years 1889—1915.
 † 10 years 1906—1915.

THE MINERALS OF GLAMORGAN.

BY F. J. NORTH, B.Sc., F.G.S.

Geological Department, National Museum of Wales.

(Read before the Biological and Geological Section on May 11th,

1916.

CONTENTS.

- I. Introduction.
- II. An enumeration of the minerals which have been recorded from Glamorgan, and an account of their distribution.
- III. Summary.
- IV. Bibliography.

I. INTRODUCTION.

Apart from its coal, which in a geological sense is a rock rather than a mineral, and is therefore outside the scope of the present paper, Glamorgan does not figure very prominently as a mineral producing County. The iron bearing minerals hæmatite and limonite were formerly worked on a large scale in a few localities, but the old workings have been abandoned for many years, and only one mine is now producing ore; while the impure form of chalybite known as clay ironstone which was at one time the principal source of iron in this Country, has long since fallen into disuse. The other minerals that occur in the County are not abundant, neither do they command attention because of their economic value, or their crystalline form, and, as a result, while the local animals and

plants are collected and studied by a number of workers, the Mineralogy of the district has received but scant attention.

An attempt has been made in this paper to present a more or less connected account of the minerals of Glamorgan, based upon information obtained from the isolated references which are scattered throughout the pages of the *Transactions of the Cardiff Naturalists' Society*, the *Memoirs of the Geological Survey*, the *Proceedings of the South Wales Institute of Engineers*, and many other publications, supplemented by the examination of specimens in the Collection of the National Museum of Wales, and of material collected by the writer. The majority of the local minerals in the National Museum were collected by the late W. Adams, and by Mr. G. H. Dutton.

Detailed descriptions of the chemical and physical properties of the minerals recorded are not given, as such information is to be found in any text book of Mineralogy.

II. THE MINERALS OF GLAMORGAN AND THEIR DISTRIBUTION.

In the following table, the minerals which are found, or have been found in the County, are arranged according to their chemical composition, and the geological horizons at which each occurs are indicated. Except in certain instances where it is convenient to do otherwise, the minerals are considered in the order in which they appear in the table.

	Silurian.	Old Red Sandstone.	Carboniferous Limestone.	Upper Carboniferous (Millstone Grit and Coal Measures).	Trias.	Rhætic.	Lower Lias.
ELEMENTS.							
Gold	—	—	—	—	* r	—	—
HALOIDS.							
Fluor	—	—	—	—	* r	—	—
OXIDES.							
Quartz	—	—	*	—	*	—	—
Chalcedony and Agate	—	—	*	—	*	—	—
Beekite	—	—	*	—	—	—	*
Hæmatite	—	—	* c	—	—	—	—
Limonite	—	—	c	—	—	—	—
Göthite	*	—	—	—	—	—	—
Pyrolusite	—	—	*	—	—	—	*
Psilomelane	—	—	*	—	—	—	—
Minium	—	—	r	—	—	—	—
SULPHIDES.							
Pyrites	—	—	—	*	—	*	—
Chalcopyrite	—	—	*	*	—	—	—
Millerite	—	—	—	*	—	—	—
Linnæite	—	—	—	* r	—	—	—
Galena	—	—	c	*	*	*	*
CARBONATES.							
Calcite	—	—	* c	—	—	*	*
Dolomite	—	—	*	*	*	—	—
Chalybite	—	—	* r	c	—	—	—
Cerussite	—	—	* r	—	—	—	—
Barytocalcite.. ..	—	—	?	—	—	—	—
SULPHATES.							
Barytes	—	—	* c	—	—	—	*
Celestite	—	—	* r	—	—	—	*
Barytocalcite	—	—	—	—	*	—	—
Gypsum (Alabaster)	—	—	—	—	* c	*	—
PHOSPHATES.							
Wavellite	—	—	—	*	—	—	—
SILICATES.							
Kaolinite	—	—	—	*	—	—	—
Mountain Leather (Asbestos)	—	—	* r	—	—	—	—
Glaucanite	—	—	—	—	—	—	*
HYDROCARBONS.							
Hatchettine	—	—	—	* r	—	—	—

"c" indicates that the mineral is abundant, and "r" that it is rare or of exceptional occurrence.

QUARTZ.

Crystals of quartz (dioxide of silicon) usually take the form of an hexagonal prism, capped by a six-sided pyramid. Such crystals are usually colourless and transparent, but they may be variously stained or tinted by impurities.

In Glamorgan quartz has been found associated with the iron ores at Taff's Well, and at the Mwyndy Mine, Llantrisant. Clear colourless crystals, some of them doubly-terminated, occur in cavities in the ore, and at the last mentioned place were found encrusting delicate stalactites of limonite. Here also, some of the specimens have an amethystine tint, while others which contain oxides of iron, exhibit delicate tints of yellow, amber, or red. Many of the crystals have a peculiar appearance, the interior being cloudy with rust coloured inclusions of limonite, while the outer layers are quite clear and colourless. Some interesting examples of quartz enclosing oxides of iron were described and illustrated by W. Vivian and J. H. Collins.*

Small, clear, doubly-terminated crystals of quartz have been found with other minerals in cavities in clay ironstone nodules, and were formerly known as "Merthyr diamonds."

CHALCEDONY, AGATE, AND POTATO-STONES.

Chalcedony is a variety of silica, which, although apparently quite devoid of crystalline structure, is, under the microscope, seen to be cryptocrystalline, *i.e.*, composed of an aggregate of very small crystalline particles.

Hollow nodules or geodes consisting of silica in the form of chalcedony, and lined with small crystals of quartz, are sometimes found in the Triassic rocks. They are usually round or ovoid in shape, are rough externally, and are often known as "potato-stones" from their resemblance to that tuber. The occurrence of such nodules in the Trias at Kenfig Point was noticed by de la Beche in 1846,† and they have also been

* Vivian & Collins (1876), p. 18.

† De la Beche (1846), pp. 243 and 246.

recorded from the neighbourhood of Llantrisant, *e.g.*, at Parc Gwyllt, where they are associated with similar but solid nodules of agate.*

Professor Sibly has found forms of silica which may be referred to chalcedony and agate in the Carboniferous Limestone at Coed Cefn Garw Quarry, near Tongwynlais.

The origin of "potato-stones" has been discussed by T. Rupert Jones,† who considered that they were due to the replacement by silica of fragments of limestone in the Triassic rocks. The alteration began from the outside, and may have continued sufficiently long for the whole of the limestone to have been replaced by silica, or more frequently has resulted in the replacement of the external layers only. In that case, percolating water subsequently removed in solution the central calcareous portion, leaving a hollow in which a lining of quartz crystals was deposited.

BEEKITE.

Beekite is a chalcedonic form of silica which occurs in dots or concentric rings upon, or rather replacing, fossil shells. Its mode of origin has given rise to much speculation, an interesting discussion of which was published in 1910 by W. H. Wickes.‡

Beekised fossils are of frequent occurrence in the Carboniferous Limestone of this district, *e.g.*, at Barry and Southern-down, where corals and brachiopods are to be found completely replaced by silica in the form of beekite.

The structure is also well shown in many fossils from the Lower Lias. As far back as 1822, W. D. Conybeare§ recorded of the Lias at Aberthaw and Dunraven, that "its fossil the gryphus [*i.e.*, *Gryphæa*] is coated with chalcedony." In a quarry at Pentrebanau, east of Llandaff, beekised specimens

* Pontypridd Memoir (1903), p. 96.

† Jones (1876), p. 454.

‡ Wickes (1910).

§ W. D. Conybeare (1822), p. 265.

of *Gryphæa* are common in a limestone containing an abundance of chert, and a fine specimen of *Plagiostoma gigantea* similarly affected, from the Lower Lias of St. George's, near Cardiff, is in the National Museum of Wales.

HÆMATITE AND LIMONITE.

Hæmatite and limonite are two important oxides of iron, and are very often found in association. The former is an anhydrous oxide, while the latter contains about 14 per cent. of combined water. Hæmatite may occur in platy crystals with brilliantly lustrous faces, or in a massive condition, when it frequently has a fibrous structure. The massive variety is usually dark blood red in colour and is fairly hard. Limonite, on the other hand, is a non-crystalline mineral, usually brown in colour, and although the massive varieties often resemble hæmatite in general appearance, it may be distinguished from that mineral by its rusty brown colour, and by its greatly inferior hardness.

The Hæmatite deposits of Glamorgan have been referred to in a considerable number of papers by J. J. Watson, S. Vivian, F. T. Howard, and others; and a short but comprehensive account of them was given by Mr. T. C. Cantrill in 1904.* References to these works are given elsewhere, and for the purposes of the present paper the following brief account will suffice.

Hæmatite and limonite are of frequent occurrence in the Carboniferous Limestone, and have been worked on a large scale in two districts, viz., around Llantrisant and Llanharry, and in the neighbourhood of Taff's Well.

In the western (Llantrisant) area, the ores have probably been worked since Roman times, for in 1762, Roman coins and fragments of pottery were found beneath a cinder heap at Bolston Gaer, near Miskin,† and Roman pottery has been found in old workings at Ty-isaf and at Llechau, near Llanharry.

* Bridgend Memoir (1904), pp. 107-112.

† Scrivenor (1854), p. 31.

Iron mines were also referred to as existing near Llantrisant in the sixteenth century by Leland in his "Itinerary,"* but they subsequently fell into disuse as the result of an Act of Parliament passed in 1558 prohibiting the felling of timber for use in iron smelting because of the feared exhaustion of the wood supply.

In 1852 the Bute Mine at Cefn-y-Parc was opened, and the working of the Mwyndy Mine was resumed in 1855. In the ensuing years, a very large quantity of ore was raised, and it is estimated that by the time the mines were finally abandoned, they had yielded about one and a half million tons of ore.

The ore consisted of earthy and compact forms of hæmatite and limonite, and contained from 30 to 40 per cent. of metallic iron. The variety of hæmatite with a fibrous structure and mammillated surface, known as "Kidney ore," which is so frequently found in the iron mines of Cumberland, appears to be absent in this district. Next to the iron oxide, the most important constituent of the ore was silica, which was present in varying proportions, frequently as crystals of quartz. The brown hydrated ores predominated, especially at the Trecastell Mine, Ty-du, and the silica was most abundant in the red anhydrous ores at Mwyndy. These siliceous ores were extremely hard, and having a peculiar purplish tint, were known to the miners as "blue ore." The amount of silica present decreased with the depth of the ore, and in the lower portions of the deposit, soft red earthy hæmatite and soft yellow limonite (ochre) were found, usually in contact with the limestone. Similar varieties of hæmatite and limonite, the latter often stalactitic, are now being obtained from the Cardiff Hæmatite Iron Ore Company's mine at Llanharry, and an interesting set of specimens, selected by Mr. R. W. Atkinson, has recently been presented by the Company, through its Secretary, Mr. J. Hutchinson, to the National Museum of Wales.

* Cited by Watson (1859), p. 254.

The published sections of the Mwyndy and other mines in the Llantrisant district,* show that the ore replaced in an irregular manner the topmost beds of the Carboniferous Limestone, where, at its junction with the shale of the Millstone Grit Series, it is covered by Triassic deposits.

It was formerly supposed that the ores constituted the lowest beds of the Triassic (then regarded as Permian) conglomerate, but it is now known that they have resulted from the replacement of Carboniferous Limestone by ferruginous matter carried down by percolating waters from the overlying Triassic Rocks. The evidence upon which this conclusion is based is fully discussed in the papers already alluded to, and need not be recapitulated here.†

Further east, similar iron ores occur in the Carboniferous Limestone on both sides of the River Taff, and have been worked in the Garth Wood, near Pentyrch; in Fforest Fawr, on the opposite side of the river; and also at Rudry about five miles to the E.N.E.

The Garth Mine was opened in the early part of the nineteenth century, and the ore was obtained for many years from open workings at the top of the hill, but about 1842 a level was driven into the northern face of the hill, and the immense pockets in which the ore occurred were more easily reached. It is estimated that over a million tons of ore had been removed when the mine was abandoned about 1885. The ore was in most respects like that at Mwyndy. Both hæmatite and limonite were represented, and in the upper levels much silica was present. The ore occurred in huge irregular pockets in the mass of the limestone, and to a certain extent followed the bedding of the rock, which here dips towards the north at a fairly high angle.

Some hæmatite mines in Fforest Fawr on the opposite side of the Taff are indicated on the 6-inch Geological map, and

* S. Vivian (1885), plates 24, 25, 26; see also Bridgend Memoir (1904), Figs. 9, 10, 11.

† See more especially Watson (1859), Iron Ore Memoir (1861), Wethered (1882), Howard (1894), and Thomas (1909).

about 2,000 tons of hæmatite were obtained, *circa* 1875, from the Rudry Iron Mine, but the ore was not present in sufficient quantity to make the undertaking pay. This was also the case with a mine opened at Maen-llwyd, about one third of a mile to the north-west of that at Rudry. Here the ore occurred at the base of the limestone, and contained from 40 to 50 per cent of iron, but it dipped rapidly beneath the surface, and much water was encountered in the mine, which was soon abandoned.*

In this district, as at Llantrisant and Llanharry, the ores have resulted from the replacement of the Carboniferous Limestone by ferruginous matter derived from the overlying rocks, which were in all probability Triassic deposits, although these have long since been removed by denudation. There is abundant evidence that the Trias formerly covered much larger areas in this district than at present, and its former extension is frequently indicated by the deep red stain imparted to the underlying rocks by the downwardly percolating ferruginous waters.

In the smaller inlier of Carboniferous Limestone at Cwrt-yr-ala the rocks are considerably iron-stained, and hæmatite was observed in a small fault at the northern end.† Here it is evident that the Triassic rocks which surround the inlier were, in geologically recent times, continuous over it. Similar red staining derived from Triassic rocks, now denuded, is seen in certain beds exposed in the Silurian inlier between Penylan and Rumney.

In addition to the occurrences already mentioned, hæmatite is found in veins in the Carboniferous Limestone beneath the Trias of Sully Island, and also in veins containing calcite in the Carboniferous Limestone near Swansea. The veins near Swansea vary in thickness from a few inches to several feet, and one of them near Broadslade (or Bracelet) Bay was worked for the ore about 1880, but was abandoned on reaching sea level.

* Adams (1870), p. 37.

† Cardiff Memoir (1912), p. 23.

GÖTHITE.

Göthite is a hydrated oxide of iron, with about 10 per cent. of combined water, which usually occurs in lustrous black or brown scaly crystals. The mineral has been found in the joint faces and bedding planes of the Wenlock Beds, and as thin strings in sandstones of Ludlow age at Rumney and Penylan.*

OXIDES OF MANGANESE: PYROLUSITE AND PSILOMELANE.

Oxides of manganese have been found in association with the iron ores at Trecastell, and also near Porthcawl. The occurrence of Manganese ore at Gwar Coch, near Porthcawl was recorded by J. J. Watson† and was mentioned in the "Iron Ores of South Wales,"‡ where it is stated to have yielded about 35 per cent. of manganese. The ore consisted of a band about four feet in thickness, between two beds of hæmatite, which, like that at Llantrisant, rested upon Carboniferous Limestone, and was covered by Triassic conglomerate, but which differed from the Llantrisant ores in the almost complete absence of silica, and in the presence of much calcite. The manganese ore was said to consist of psilomelane with a small amount of pyrolusite, and resembled the "grey manganese ore" of Upton Pyne and other localities in Devonshire. The name Gwar Coch does not appear on the present Survey maps, but there is a Ty Coch, about one mile N.N.E. of Newton Nottage, and Mr. T. C. Cantrill has very kindly provided the following information which serves to fix the position of Gwar Coch. Against Ty Coch on the MS. copy of the 6-in. geological map of the district preserved in the Geological Survey Office, the late Mr. Tiddeman had written "Manganese Mine," while the name "Gwar Coch" occurs on the Old Series 1-in. map in the same position as Ty Coch on the later maps, and the symbol indicating the presence of iron ore is engraved on the map at that place. Mr. Cantrill adds: "It is evident therefore that

* Sollas (1879), p. 39.

† Watson (1859), p. 255.

‡ Iron Ore Memoir (1861), p. 182.

the 'Gwar Coch' of the Iron Ore Memoir (p. 182) and of the Old Series 1-in. Map published in 1883, is identical with Ty Coch."

The section as described by Watson is not now visible, but specimens of the manganese ore, hæmatite, and of the overlying Triassic rock can be seen in a wall near Ty Coch. The first mentioned is a black structureless massive rock which yields an abundance of chlorine gas when treated with hydrochloric acid, and the iron ore is a somewhat soft and earthy variety of hæmatite. The presence of a local abundance of ferric iron oxide is indicated by the intense red staining of the soil and mud in the immediate vicinity, which fully justifies the place-name.

Pyrolusite frequently occurs in delicate dendritic or frond-like growths on the joint faces of the Carboniferous Limestone, having been deposited from solutions circulating through the joints in the rock, and examples now in the National Museum have been obtained from the limestone in the ridge south of Caerphilly, and from Barry.

Small quantities of manganese dioxide, associated with barytes have been found in fissures in the lower lias at the Penarth Cement Works.

PYRITES.

Pyrites, iron pyrites, or sulphide of iron, is a very widely distributed mineral, and in brassy yellow grains, masses, or crystals, is found in all manner of rocks. As a rule, it may be recognised by its colour, and also by its hardness, which is above that of the knife.

In the South Wales Coalfield pyrites occurs in many coal seams, and is familiar as the brassy-yellow specks or films, often regarded as gold, to be seen in pieces of coal. In addition to these thin films in the joints and partings of the coal, pyrites occur as nodules, and impersistent bands, or it may be disseminated through the rock. Crystals are of very rare occurrence in the Coal Measures, but perfect, though small, octahedral crystals have been found at Llanbradach.

In the Nine-feet Vein at Aberpergwm, pyrites is present as a hard black granular rock, bands of which, from one to five inches in thickness, are found discontinuously in the seam. It has been used locally for building walls and barns.*

A similar type of pyrites, associated with grains and threads of the yellow mineral, occurs in the Brass Vein at Onllwyn, and in the Big Vein and the Brass Vein at Ynyscedwyn. The foregoing examples of visible pyrites in coal seams may be taken as typical cases, and no useful purpose would be served by enumerating all the seams and localities from which the mineral has been recorded. It was formerly supposed that pyrites was more abundant in the coals of the Pennant Series than in those of the Lower Coal Series, but Dr. H. K. Jordan suggests that this opinion probably originated in the fact that in the former the pyrites is disseminated in the coal, and would therefore figure largely in an analysis, while in the latter, as in the instances cited, the mineral is segregated into lumps or bands and can be picked out from the coal before it goes to the market.

Lumps and nodules of pyrites are known to miners as "coal brasses," but the term has also been used to include certain iron bearing bands and nodules (*e.g.*, the Duffryn Brass) which consist principally of iron carbonate with subordinate amounts of the carbonates of calcium and magnesium, and with, at the most, only a trace of iron sulphide. This material differs from true clay ironstone in the absence of argillaceous matter.†

For certain industries, the presence of pyrites in coal is highly objectionable, and it is as far as possible removed before the coal is used. This is, of course, only possible when the mineral occurs as "coal brasses," and not when it is invisible, *i.e.*, scattered in a finely divided condition throughout the coal. The spontaneous combustion of coal stored in ships' holds was frequently due to the heat produced by the oxidation of

* Merthyr Memoir (1904), p. 75.

† Adams (1867), p. 190.

pyrites, and iron workers avoid coal containing pyrites, on account of the sulphur in its composition.

Pyrites is also removed from coal intended for maltsters, because the mineral often contains an appreciable amount of arsenic, and was, according to the evidence submitted to the Royal Commission on Arsenical Poisoning, responsible for the presence of arsenic in beer.* For this reason, coal containing invisible pyrites is unsuitable for malting, since the mineral cannot be removed by mechanical means. In this connection, it is interesting to note that at one time the presence of pyrites in malting coal was considered an advantage, because the sulphur dioxide resulting from its combustion partly bleached the malt. In his evidence before the Commission, Mr. Arthur Ling quoted from "The London and County Brewer," a book published in the eighteenth century, in which it was stated that no malting fuel "is so much in esteem as the golden streaked coal of Tenby, which is endowed with so much sulphur that in the ships that come from thence they can hardly bear the room it is burnt in."†

The sulphurous gases which result from the decomposition of pyrites have given their name to the "Stinking Veins" of various localities, *e.g.*, that which outcrops on the east side of the Taff about two miles above Taff's Well, whilst the colour of the mineral is responsible for the name "Brass Vein" applied to many seams.

The water from seams containing pyrites is frequently warm and corrosive. This was observed to be the case with the Brass Vein of Craig-yr-Allt, near Taff's Well. The vein is probably the source of the water of the spring from which Taff's Well takes its name, for a clay with coaly debris which was reached during the excavation of the bath erected to hold the water, is believed to have been the outcrop of the Brass Vein.

The pyrites of the Coal Measures owes its origin to the reducing action of decomposing organic matter upon circulating

* Roy. Comm. Arsenical Poisoning (1903), vol. 2.

† *op. cit.*, p. 101.

ferruginous waters. According to Bischof, the water with which the vegetable matter was soaked, contained carbonate of iron (held in solution by carbonic acid) and also other salts such as sulphate of lime and sulphate of magnesia. In the conversion of the woody tissue into coal, the sulphates were reduced to sulphides which re-acted upon the carbonate of iron and precipitated sulphide of iron. The formation of the pyrites was therefore contemporaneous with that of the coal in which it occurs, but the films lining joints and cracks are due to secondary redistribution.

W. Adams records that pyrites was found to a limited extent in the iron mines at Llantrisant, where, under the name of "mundic," it was "sold to the makers of sulphuric acid at the price of about fifteen shillings per ton, in wagons at the mines."*

Pyrites occurs in the Rhaetic "bone bed" at Penarth and Lavernock, and is a prominent constituent of similar beds in the Rhaetic Series on both sides of the Severn Estuary. Specimens of the bone-bed frequently show groups of crystals, which may be cubes, or a combination of cube and octahedron. Owing to oxidation the crystals are often coated with the brown oxide of iron, limonite, which masks the typical brassy-yellow colour.

CHALCOPYRITE.

Chalcopyrite, or copper pyrites, is a double sulphide of copper and iron, which differs from iron pyrites in the form of its crystals, and in its inferior hardness.

The mineral has been found at the Mwyndy Mine, and in the clay ironstone nodules of the Coal Measures, but is not common.

MILLERITE.

Millerite, or sulphide of nickel, usually occurs in hair-like tufts of capillary crystals, brassy-yellow or greenish-yellow in colour, and highly lustrous. Its occurrence in Glamorgan was first recorded in 1842, by W. H. Miller,† who found the mineral in cavities in clay-ironstone nodules in the Coal Measures

* Adams (1867), p. 194.

† After whom the mineral was named by Haidinger.

at Dowlais, and determined their specific gravity as 5.278.* Millerite has since been found in clay-ironstone at several places along the south-eastern margin of the coalfield. At the Brynna-gwynon Colliery, about a mile east of Pencoed Station, Dr. H. K. Jordan found the mineral in ironstone a little above the Bodor-fach seam †; at Llanbradach Colliery it occurs above the Four Feet Seam, and at Bedwelty, near Tredegar, a little above the Elled seam, ‡ while it has also been recorded from the Three-quarters or Elled " Mine Balls " at Ebbw Vale, § Nantyglo, and Blaenafon. ¶ It is interesting to note that in the instances cited the clay ironstone containing millerite occurs at horizons which, although not strictly comparable, are nevertheless very closely related, and it is highly probable that the mineral might be found at this horizon all round the eastern margin of the coalfield. The mineral has also been found in the Soap Vein ironstone at Blaina, Mon., || and in the Spotted Vein ironstone at Dowlais.**

Millerite is usually regarded as a very rare mineral, but it is really of more frequent occurrence than the specimens in museums and other collections would indicate. Owing to the extreme delicacy of the crystals, and the toughness of the clay ironstone, the shock caused by the blows necessary to break the nodule, more often than not dislodges the crystals, which are then scattered and lost; this is especially the case with the greenish-yellow crystals, which are as fine as unspun silk. Even when specimens have been successfully collected, great care is necessary for their successful preservation. Millerite possesses certain magnetic properties, and if pieces of ironstone bearing tufts of crystals are kept in glazed boxes, unless the specimens are placed at some little distance from the glass, the crystals are attracted to it when it is rubbed, as in cleaning, and the crystal group is spoilt.

* Miller (1842), p. 378.

† Jordan (1876), p. 270.

‡ Fine specimens from this locality, presented by the Tredegar Iron and Coal Co., Ltd., are now in the National Museum of Wales.

§ Jordan (1876), p. 270.

¶ Iron Ore Memoir (1861), p. 207.

|| *op. cit.*, p. 195.

** *op. cit.*, p. 209.

The source of the nickel is probably the pyrites which abounds in the Coal Measures, for pyrites has sometimes been found on an analysis to be nickeliferous, and A. Jorisen detected nickel in the soot obtained from flues where coal from Beyne, (near Liège, Belgium) had been burnt.*

LINNÆITE.

Linnæite (sulphide of cobalt), the *cobaltum pyriticosum* of Linnæus, was named after that naturalist by Haidinger in 1845.† It is a silvery white crystalline mineral with a specific gravity of 5.5. In the *Bulletin de la Société Minéralogique de France*, 1880, des Cloizeaux‡ recorded that linnæite had been found in the Coal Measures of the "Rhonda Valley" by a Mr. Terrill, of Swansea. The crystals were described as being very small, from $\frac{1}{4}$ to $\frac{3}{4}$ of a millimetre in diameter, with a silvery white metallic lustre, and consisting of regular octahedra, truncated by faces of the cube. They were associated with millerite, chalcopyrite, and crystals of ankerite (ferriferous dolomite), filling cracks in nodules of black clay ironstone. Upon analysis the crystals were found to contain nickel, iron, and a small proportion of copper, in addition to cobalt.

Although the appearance of the mineral as described by des Cloizeaux agrees with that of linnæite, the cobalt-nickel-iron percentage of his specimens was given as 40, which is much lower than is usually the case, so that there is some doubt as to the correct determination of the mineral.

Unfortunately, as far as the writer has been able to ascertain, no specimens appear to have been preserved in this country, and there is no other record of its occurrence in Glamorgan, except by F. W. Clarke, who merely mentions des Cloizeaux's communication.§ Owing to the extreme smallness of its crystals, the mineral may well have escaped notice, and it is not unlikely that specimens would be found if a careful search

* Jorisen (1896), p. 104.

† Haidinger (1845), p. 560.

‡ Des Cloizeaux (1880), p. 170.

§ Clarke (1916), p. 693.

were made for them in clay ironstone nodules. The occurrence of minute quantities of cobalt in the Coal Measures is not impossible, because that metal is frequently associated with nickel, which is known to be present, and Jorisen in the paper already alluded to, mentions its occurrence in the soot of Belgian coal.

GALENA.

Galena (sulphide of lead) is a heavy lead-grey mineral which often crystallises in cubes. It has a remarkably perfect cleavage in three directions at right angles to each other, by reason of which it readily breaks up into cubic or rectangular blocks. Galena is the most important ore of lead, and is found in abundance in some parts of the country, but in Glamorgan, although it occurs in the Carboniferous, Triassic, and Liassic rocks in many places, it is only present in small quantities, and has never been worked on a very large scale.

The most important occurrences of galena in Glamorgan are in the Carboniferous Limestone between Rudry and Machen. Here the mineral occurs in a veinstone consisting principally of barytes, with calcite and fragments of limestone. The veins, which probably represent joints in the Limestone, are impersistent, and extend in an easterly and north-easterly direction, that is, more or less in the direction of the strike of the rocks.

In the early part of last century, many of these veins were worked for lead, and a washing floor was made by the side of the Nant-y-Draethen, near Cwm Leyshon. The ore is believed to have been smelted in a furnace, the hearth of which was discovered on the farm called Ffurnes Blwm* at the western end of Caerphilly Common. Lead was obtained from these workings at least as late as 1850, but they may have been of very early origin, for Roman coins were found in one of them at Cefn Pwll-du, near Ruperra.†

Cerussite, or carbonate of lead, which results from the decomposition of galena, and frequently occurs in the upper

* Newport Memoir (1909), p. 47.

† *op. cit.*, p. 22.

portion of lead-bearing veins, has been found in these veins, and minium, red oxide of lead, has also been recorded.*

Galena has also been found in the Carboniferous Limestone further west. At Groes Faen, near Miskin, it occurs in thin strings associated with barytes, and at Pentre, near Llantrithyd, the limestone contains specks of the mineral, while galena containing an appreciable amount of silver was obtained from some calcite veins at the same locality.† The mineral was worked in levels between St. Hilary and New Beaupré, near Cowbridge, where the Triassic breccia rests upon the Carboniferous Limestone. At Langland Farm, near Brocastle, some four miles west of Cowbridge, a lead-bearing vein about three feet wide occurs in the Limestone, and a "mine" was sunk in it to a depth of 50 feet.‡ The late John Storrie found galena in the lower beds of the Carboniferous Limestone at Bendrick Rock, Barry.

The occurrence of lead in the Coal Measures is somewhat unusual, but it has been recorded from at least three localities in the south-eastern corner of the coalfield. In or about, 1868, W. Adams detected lead ore in a vein, too narrow to be worth working, in a fault fissure in the Van Colliery, Caerphilly.§ Some years previous to this, G. E. Rogers described and figured a similar vein in a coal seam in the Pennant series at Abercarn.¶ The vein was nearly vertical, and contained, in addition to galena, fragments of sandstone, shale, and coal; the lead ore was associated with calcite and pyrites, and the constituents were arranged in irregular layers, roughly parallel to the walls of the vein. Lumps of galena have been found in the clay beneath a coal seam at Coed Ely.||

Specks of galena are said to be present in the masses of Triassic breccia which project through the sand of Kenfig

* Howard (1899), p. 46.

† Bridgend Memoir (1904), p. 107.

‡ Moore (1867), p. 521, Fig. 6.

§ Adams (1870), p. 37.

¶ Rogers (1859), p. 228.

|| Pontypridd Memoir (1903), p. 81.

Burrows; and associated with pyrites, the mineral occurs in small veins in the Triassic rocks at Gwern Efa, about one mile south-east of Llantrisant. Here an old shaft was sunk in search of lead ore, which is said to have been washed by the side of the Afon Clun near by. The mineral has also been found at Kenfig Hill, associated with a fault which brings Rhaetic and Keuper rocks against the Millstone Grit.*

Small fragments of galena occur in shelly limestones in the Lias at Tair Onen, near Llantrithyd, in the Sutton Stone near Llwyn-helyg, a little to the west of Cowbridge,† and in the Sutton Stone of the coast section. De la Beche recorded it at Candleston, west of the Ogmores, both disseminated in the rock, and filling cavities left by the solution of fossils. He also stated‡ that at Dunraven, joints in the jet-like remains of fossil plants contained galena.

At Llan-gan, near Bridgend, a vein consisting principally of barytes with galena occurs in the conglomeratic beds of the Liassic and Rhaetic strata, and in 1877-9 some 140 tons of lead ore were raised from a mine, the shaft of which was sunk to a depth of 150 feet.§

CALCITE.

Calcite (calcium carbonate, or calc-spar) is one of the commonest and most widely distributed of minerals.

The varieties of crystalline form of calcite are very numerous, but the majority of the crystals are made up of three simple forms, either alone or in combination. These are, the hexagonal prism, the rhombohedron, and the scalenohedron. Owing to their sharply pointed terminations, scalenohedral crystals of calcite are frequently referred to as "Dog-tooth spar," "Nail-head spar" is the name given to crystals which are terminated by a combination of rhombohedral faces, the appearance of which suggests the head of a nail.

* Pontypridd Memoir (1903), p. 124.

† Bridgend Memoir (1904), p. 67.

‡ De la Beche (186), p. 273.

§ Barytes and Witherite Memoir (1915), p. 73

Calcite, when quite pure, is transparent and colourless, and is then known as Iceland spar, but as usually found it is either translucent or milky white and opaque, although it may also be tinted, or superficially stained red or brown by oxide of iron.

In this district calcite is of frequent occurrence in the Lias and Carboniferous Limestone. In the latter, white or pinkish calcite frequently occurs as irregular masses or as veins, and crystals are abundant on the sides of open fissures, or lining cavities in the rock. Huge scalenohedral crystals occur in cavities in the Limestone at the Little Garth Iron Mines, and in the quarry under Castell Coch, but are usually of such a nature as to be looked at rather than collected. Smaller and more perfect crystals are also fairly abundant. Calcite crystals of various types have been found associated with the iron ores at Mwyndy; some specimens of calcite from this locality containing inclusions of iron oxide were described by W. Vivian and J. H. Collins.*

Cavities in the Carboniferous Limestone in a railway cutting at Cadoxton have yielded (in 1915) fine scalenohedral and rhombohedral crystals of calcite, and the mineral may, indeed, be expected to occur in most places where the Carboniferous Limestone is being worked, or is exposed in cliff sections.

Small crystals of calcite (usually very flat rhombohedra) are frequently met with in fissures in clay ironstone nodules.

Veins of white calcite are to be seen in fissures, usually joints, in the Lower Lias Limestone throughout the county, more especially in the west, and if the mineral does not fill the fissure, its sides may be lined with small crystals, usually of the "dog-tooth spar" type.

Impure calcite in a fibrous condition occurs as thin bands, known as "beef," in the local Rhaetic Beds, and may be seen in the cliff section at Lavernock. The name "beef" is a quarrymen's term, and is an allusion to the fibrous structure which is supposed to resemble that of muscular tissue.

* Vivian and Collins (1876), p. 17.

DOLOMITE.

Dolomite is a carbonate of calcium and magnesium which occurs in rhombohedral crystals, often with curved faces. In this district dolomite occurs as a constituent of the dolomitic beds of the Carboniferous Limestone, and also in the conglomerates and breccias locally developed in the Trias. Crystals are frequently found lining cavities,* and the characteristic rhombic outlines of similar crystals may be seen in thin sections of those rocks. Pink crystals of dolomite, associated with galena, are said to have been found in the Carboniferous Limestone at Bendrick Rock, Barry; and crystals of ferriferous dolomite have been obtained from the Lower Coal Measure Sandstone at Park Colliery, Tirydail.†

CHALYBITE.

Chalybite, or carbonate of iron, may occur in a massive condition or in rhombohedral crystals resembling those of dolomite. It is usually light brown in colour, but owing to oxidation, it may exhibit various shades ranging to reddish-brown or very dark brown.

In view of the abundance of iron ores in the local Carboniferous Limestone, the rarity of chalybite is somewhat remarkable. Occasional specimens were found in the Mwyndy Mine.

An impure argillaceous form of chalybite, containing from 25 to 35 per cent. of iron occurs in the Coal Measures and is known as clay ironstone. It varies in colour from light to very dark brown, and has a flat, even fracture. Clay-ironstone may occur in nodules or in definite bands, called by the miners "balls" or "pins" respectively. Many of the nodules enclose fossils, around which the material is arranged in successive concentric zones, and fissures due to contraction frequently occur. Such cracks often contain quartz, calcite, millerite, pyrites, hatchettine, and other minerals; and traces of lead,

* Well formed rhombohedral crystals from 1 to 3 mm. in diameter occur in the Limestone at Thornhill, south of Caerphilly, Taff's Well, etc.

† Rudler (1905), p. 187.

copper, and silver have been found in many specimens that have been analysed.

Certain of the ironstones contain sufficient carbonaceous matter to enable them to be calcined without the addition of fuel, and such ironstones are known as "blackband."

During the early part of the nineteenth century, clay ironstone under the name of "Mine" was extensively worked as an ore of iron, but in South Wales at least, its use is now practically discontinued. Its former importance may be judged from the following statement by Mr. Blackwell in a lecture before the Society of Arts, Manufactures, and Commerce in 1854:—" (Coal-measure ironstones) are entitled to the first place, as they supply at least nine-tenths of the iron produced (in the United Kingdom)."*

The decline in the use of clay ironstone began with the discovery of the iron ores in the Liassic and Jurassic rocks of England, and with the inventions of Bessemer which brought into prominence the value of iron ores low in phosphorus. Ores of this class are not abundant in Britain, and the importation of foreign ores, especially from the Bilbao district of Spain, commenced. The imported ores were used for the production of ingot-iron, and those from the Secondary formations in the manufacture of foundry pig-iron, while the demand for puddled iron, for which clay ironstone was particularly suitable, rapidly declined, and at the present time it is being made only in Staffordshire and Scotland.

The disuse of the clay ironstones of South Wales was certainly not due to the exhaustion of the supply, for ironstone beds are known to occur under about 780 square miles of the coalfield, and according to Mr. J. F. Tallis, of Ebbw Vale, the amount of ironstone present may be taken at 13,000 tons per acre, 19,000,000 tons per square mile, or about 15,000 million tons for the whole coalfield. Although only a portion of this ore could be worked with advantage, the amount actually available is enormous, and " it is quite within the bounds of possibility

* Cited by H. Scrivenor (1854), p. 301.

that some other change in the iron industry may once again bring these ores to the front, and that ores not worth working to-day may in the future become once again of economic importance."*

In South Wales the ironstones occur principally in the lower portion of the Coal Measures, and when traced from east to west, the beds increase in thickness, but at the same time become poorer in iron, consequently the great iron-making district was at the Eastern end of the coalfield.

BARYTOCALCITE.

Barytocalcite is a double carbonate of barium and calcite, and is a rare mineral.

A specimen of barytocalcite in the British Museum, presented in 1886 by Col. Rimington, is said to have been obtained from Glamorgan, but the exact locality is not recorded. Dr. G. T. Prior, to whom the writer is indebted for this record, describes the specimen as consisting of small white crystals and massive material, with pyrites and limonite on ferruginous quartz. From the association of minerals, the specimen would appear to have been derived from one of the iron mines, probably that at Mwyndy, but there is no published record of its occurrence in that district.

BARYTES.

Barytes (sulphate of barium) occurs in small or large tabular crystals, or in a massive crystalline condition, and when pure is colourless or white, but is frequently yellow or pink owing to the presence of impurities.

Barytes may be distinguished from most other minerals which resemble it in appearance by its heaviness, having a specific gravity of about 4.5 (that of calcite is only 2.7).

In Glamorgan, although widely distributed in the Carboniferous Limestone and the Lower Lias, barytes does not occur in sufficient quantity to be of economic value. It is usually associated with calcite and galena.

* See Louis (1910), p. 640.

Massive barytes (more or less reddish in colour owing to the presence of iron) has been found in the Carboniferous Limestone in the quarries at Rhubina and Castell Coch. It occurs as a veinstone containing galena in the old lead workings in the Carboniferous Limestone between Rudry and Machen, and the same two minerals are found in association in the Lower or "Bastard" Limestones at Maes Mawr, near Llantrisant, and on the coast between Sutton and Southerndown. Small tabular crystals were found with the iron ores at the Mwyndy Mine, and it has also been recorded, accompanied by celestite, in the Carboniferous Limestone at Nells' Point, Barry Island.

Small veins of barytes occur in the Carboniferous and Liassic rocks between Cowbridge and Bridgend, *e.g.*, at Ty-pica, and also at Twmpath, where a vein of fairly pure, creamy-white barytes was formerly worked.

The mineral also occurs in cracks in the jet-like carbonaceous matter found in the Lower Lias at the Penarth Cement Works.

CELESTITE.

Crystals of celestite (sulphate of strontium) are very similar in appearance to those of barytes, and the mineral is also found in a massive crystalline, or granular condition.

Celestite is of rare occurrence in Glamorgan. It has been found in veins in the Carboniferous Limestone at Nells' Point, Barry Island, where it is associated with barytes, and W. D. Conybeare, in 1822, recorded that in the "Red Marle" (Keuper Marl), there were "geodes filled with crystals of sulphate of strontian occurring in the island of Barry,"* but these crystals are now referred to Barytocelestite. In the Lower Lias at the Penarth Quarries, milky-white celestite has been found in flattened, tabular crystals, but the crystals are so closely packed that only their lateral edges are visible.

* Conybeare (1822), p. 289.

BARYTOCELESTITE.

Barytes and celestite are isomorphous minerals, that is to say, they are allied in chemical composition, crystallise in the same crystal system, are closely similar in crystal habit, and may mutually replace one another. As a result, crystals are frequently found in which the sulphates of both barium and strontium are present. To such crystals the name barytocelestite has been given.

Fine tabular crystals of a delicate blue tint have been found in cavities in the Keuper Marl at Barry, and, as has already been mentioned, were formerly regarded as celestite. Some excellent specimens in cavities ranging up to a foot in diameter, were encountered during the excavation of the deep water entrance to Barry Dock, and on analysis were found to contain 43 per cent. of barium sulphate and 57 per cent of strontium sulphate.* These crystals are therefore referred to barytocelestite.

GYPSUM.

Gypsum is a hydrous sulphate of calcium which occurs as colourless oblique prismatic crystals in many clay deposits; in a massive granular condition (alabaster); and in veins with a fibrous structure (satin-spar). All varieties of gypsum are very soft, and can be scratched by the finger nail.

In this district gypsum is found in some abundance in the Keuper Marls, principally in the Red Marls, and less frequently in the lower part of the Tea-green Marls. It may be seen in the coast section at various points between Penarth and Barry.

The gypsum occurs in two conditions—as spheroidal masses or irregular lenticular beds of granular alabaster, usually of a pinkish colour, but occasionally pure white; and as thin veins or strings composed of the mineral in a fibrous condition, the fibres running perpendicularly to the sides of the vein.

In the former instance the mineral has probably been precipitated as a result of the evaporation of the water in arms of the Triassic seas which became land-locked owing to

* Howard (1895), p. 47.

earth movements, but it has also been suggested that its deposition may in part be due to the action of bacteria. Whatever its mode of origin, however, the formation of the gypsum in question was contemporaneous with the deposition of the rocks in which it occurs. The veins of fibrous gypsum on the other hand, are of secondary origin, and have been deposited by water circulating in cracks and fissures in the marls; they bear no relation to the bedding of the rock, and frequently intersect. Many veins of this nature were seen in the Keuper Marl traversed by a deep boring at Roath, and specimens are now preserved in the National Museum of Wales.* Fibrous gypsum was also recorded from the Black Shales of the Rhaetic Series at Penarth.†

Gypsum has many economic uses, among which the most important is perhaps, the manufacture of plaster of Paris and other cements. Marls, full of gypsum veins, when finely ground, are used as a polishing material in the South Wales tinsplate industry.‡

The massive variety "alabaster" is used for ornamental purposes, but owing to its softness it is only suitable for internal decorations. It is principally used for statuary and ecclesiastical architecture. The alabaster tiles in the new building of the University College, Cardiff, were obtained from levels in the cliffs near Lavernock, and the mineral was formerly worked in the Triassic Marls south-east of Cog.

WAVELLITE.

Wavellite is a hydrous phosphate of aluminium which was first discovered towards the end of the eighteenth century by Dr. Wavell, in fissures in slaty rocks, near Barnstaple. It consists of globular crystalline aggregates, and these, when broken, show a radiating or star-like appearance due to the grouping of very slender crystals around a centre.

* North (1916), p. 40.

† Etheridge (1872), p. 48.

‡ Gypsum Memoir (1915), p. 4.

In the *Proceedings of the Swansea Literary and Philosophical Institution* for 1837, there is a record of the occurrence of Wavellite at Cil Ifor Hill, near Llanrhidian, in the Gower Peninsula. The mineral was found in the joints of a "whitish-yellow close-grained sandstone . . . used for building purposes," and it is further mentioned that "the mineral (was) observed to abound in all the quarries in which the rock (was) worked to the distance of two miles from Cil Ifor Hill." The sandstone referred to occurs in the Millstone Grit series.*

Wavellite of a greenish tint occurs in cracks in the clayey rocks associated with rottenstone (*i.e.*, in the Upper Limestone Shale Series of the Geological Survey) in a quarry on Pwll-du Head, Gower.†

KAOLINITE.

Kaolinite is a hydrous silicate of alumina which occurs in many clays. It usually takes the form of a white powder consisting of very small plates, but may be tinted owing to the presence of impurities.

Films of kaolinite have been found lining fissures in the Pennant Grit, especially where the strata have been affected by faults, *e.g.*, at Cwm Fforch-wen in the Garw Valley. At that place it has been seen *in situ*, but the mineral may also be found among the debris thrown out from old workings in the disturbed area.‡

The mineral has probably resulted from the decomposition of feldspars, grains of which enter into the composition of the Pennant Sandstones and Grits.

MOUNTAIN LEATHER.

Mountain leather, a mineral allied to asbestos, and consisting of thin brownish sheets composed of interlacing fibres, was found with the iron ores at the Mwyndy Mines, and a small specimen is now in the National Museum of Wales.

* Logan (1837), p. 23.

† Swansea Memoir (1907), p. 27.

‡ Pontypridd Memoir (1903), p. 84.

GLAUCONITE.

Glaucosite is essentially a hydrous silicate of iron and potassium, so variable in composition as to suggest that it is a mixture rather than a definite mineral species. It usually occurs as dark-green grains in sedimentary rocks, and has been recorded in the Sutton Stone of the Bridgend district.

HATCHETTINE.

Hatchettine is a substance of organic origin which was noticed by J. J. Conybeare lining cracks in the clay-ironstone nodules at Merthyr, where it was associated with crystals of calcite and quartz.*

It has since been found at several places in the eastern part of the coalfield, particularly in the ironstones known as "Three-quarters Balls."

Hatchettine is a transparent yellowish substance, consisting of thin laminae with a nacreous (pearly) lustre, greasy to the touch, and of the consistency of soft wax. Upon exposure it becomes black and opaque, owing to the formation of carbon following upon the slow decomposition of the substance. J. F. W. Johnston, who analysed the mineral in 1838, determined it to be a hydrocarbon belonging to the group of which olefiant gas is the best known type.†

Conybeare named the mineral after Charles Hatchett, a contemporary chemist who specialised in bituminous substances, but it had previously been alluded to by Brande as mineral adipocire.‡

FLUOR in minute blue cubes and GOLD in rounded grains were found by the late John Storrie in a thin sandy bed in the Keuper Marl, which was met with at a depth of 334 feet in a boring for water at the Phoenix Brewery, Working Street, Cardiff.§

* J. J. Conybeare (1821), p. 136.

† Johnston (1838), p. 339.

‡ J. J. Conybeare (1823), p. 190.

§ Storrie (1894), p. 107.

III. SUMMARY.

Of 31 minerals which have been found in the county, only eight, viz., hæmatite, limonite, galena, pyrites, calcite, chalybite, barytes, and gypsum are at all abundant, while eight others, viz., gold, fluor, minium, chalcopyrite, linnæite, cerussite, barytocalcite, and mountain leather may be regarded as rarities.

The only minerals of economic importance which occur are hæmatite, limonite, galena, barytes, gypsum, and pyrites. The iron ores and galena were largely used during part of the latter half of the last century, while barytes, pyrites, and gypsum were worked to a limited extent. At the present time, hæmatite and limonite only are being produced (at Llanharry).

It has already been pointed out that vast quantities of clay ironstone are still available, and the pyrites of the coal measures might be used for its contained sulphur, but beyond this the minerals of Glamorgan are of scientific rather than of economic interest.

It will be noticed that in regard to the number of mineral species present, and the abundance and economic importance of those minerals, the Carboniferous Limestone is the most important mineral-bearing formation in the county. The second in importance is the Upper Carboniferous Series, including the Millstone Grit and the Coal Measures. Gypsum is the only mineral which occurs in any abundance in the Secondary Rocks.

In conclusion, the writer desires to express his thanks to Mr. T. C. Cantrill, Dr. H. K. Jordan, J.P., Dr. G. T. Prior, and others, who kindly furnished information concerning certain mineral occurrences, and to Dr. W. Evans Hoyle, and Professor T. Franklin Sibly, for reading and commenting upon the manuscript of this paper.

IV. WORKS IN WHICH THE MINERALS OF
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and occurrence of pyrites in the coals of South Wales.]

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THE HEMIPTERA OF GLAMORGAN.

BY H. M. HALLETT, F.E.S.

In Edward Saunders' "Hemiptera Heteroptera of the British Islands," London, 1892, there are some seventy species recorded for the County, most of which are credited to Mr. T. R. Billups, who collected in the Cardiff District, and a few to Mr. W. G. Blatch, from Swansea. During the last few years I have collected any that came in my way whilst working the *Hymenoptera*, and have lately been helped by Messrs. A. D. R. Bacchus, H. E. David, and J. R. le B. Tomlin; and as the list now amounts to well over 200 species, it seems to be worth putting on record. It is somewhat surprising that the Bugs have not received more attention, as they are attractive in appearance and easily collected, whilst the number of species is far less formidable than in the *Colcoptera* and *Lepidoptera*.

The physiography of the County would suggest a very much richer list than has so far been compiled, and, no doubt, further work will materially add to our knowledge of the local fauna, both in this and other orders.

I am greatly indebted to Mr. E. A. Butler, B.A., B.Sc., for his kind assistance, everything I have taken has been named by him.

HETEROPTERA.

PENTATOMIDÆ.

Thyreocoris scarabæoides, Linn. Cardiff (Billups); Kenfig and Porthcawl, not uncommon on *Viola curtisii*, and crawling on the bare sandhills.

Eurygaster maura, Linn. Cardiff (Billups).

Podops inuncta, Fab. Not uncommon under stones at Penarth, Cwrt-yr-ala, Sully, and Porthcawl.

Geotomus punctulatus, Cost. Cowbridge (Billups).

Sehirus bicolor, Linn. Cardiff (Billups).

- Sehirus luctuosus**, M. & R. Cardiff (Billups).
Ælia acuminata, Linn. Cowbridge (Billups).
Dolycoris baccarum, Linn. Llanmadoc, Gower, one adult and one larva, September, 1916 (David).
Palomena prasina, Linn. Cardiff (Billups).
Piezodorus lituratus, Fab. Llanmadoc (David); Sully, common on Furze (Bacchus and Hallett); Horton, Gower.
Pentatoma rufipes, Linn. Merthyr Mawr (David); Candleston, in larval condition.
Eurydema dominulus, Scop. Cardiff (Billups).
Zicrona cœrulea, Linn. Swansea (Blatch).
Acanthosoma hæmorrhoidale, Linn. Cwrt-yr-ala, one, under bark of a dead pine, 26th March, 1916.

COREIDÆ.

- Enoplops scapha**, Fab. Cowbridge (Billups).
Syromastes marginatus, Linn. Cardiff (Billups).
Pseudophlœus fallenii, Schill. Taff's Well (Billups); Crwmllyn Bog (Tomlin); Porthcawl and Kenfig, abundant under *Erodium*.
Alydus calcaratus, Linn. Horton, July, 1915, one larva running with the Ant, *Formica fusca*, var. *glebaria*, which it much resembles.
Stenocephalus agilis, Scop. Cowbridge (Billups); Merthyr Mawr (David); Porthcawl, not uncommon on *Euphorbia*.
Therapha hyoseyami, Linn. Merthyr Mawr, commonly, and Llanmadoc (David); Kenfig, not uncommon on *Euphorbia* and under *Erodium*.
Corizus subrufus, Gmel. Taff's Well (Billups).
Corizus parumpunctatus, Schill. Porthcawl, two specimens, June, 1915.

BERYTIDÆ.

- Berytus minor**, H. S. Llanmadoc, two specimens in September, 1916 (David).
Berytus signoreti, Fieb. Old Cogan, 1913; Cwrt-yr-ala, June, 1914.
Metacanthus elegans, Curt. Cardiff (Billups); Porthcawl, common, July, 1916, under *Ononis*.

LYGÆIDÆ.

- Nysius thymi**, Wolff. Porthcawl, one specimen, 23rd July, 1916.
Cymus glandicolor, Hahn. Cardiff (Billups).
Cymus clavicolus, Fall. Taff's Well (Billups).

- Ichnorhynchus resedæ, Panz.** Has been taken in Glamorgan (Butler).
- Heterogaster urticæ, Fab.** Cardiff (Billups); Pontneathvaughan, 3rd August, 1914, Porthcawl, June, 1915.
- Rhyparochromus prætextatus, H. S.** Porthcawl, 13th June, 1915.
- Plinthisus brevipennis, Latr.** Cowbridge (Billups).
- Stygnocoris rusticus, Fall.** Penarth, two swept off Fleabane, 20th September, 1916.
- Stygnocoris pedestris, Fall.** Llanmadoc, September, 1916 (David); Penarth, August, 1915, and September, 1916.
- Stygnocoris fuliginus, Geoff.** Porthcawl, under Ononis, June, 1915.
- Peritrechus geniculatus, Hahn.** Cowbridge (Billups).
- Peritrechus nubilus, Fall.** Penarth (Billups).
- Trapezonotus arenarius, Linn.** Kenfig, 1st June, 1914.
- Aphanus albo-acuminatus, Goeze.** Cardiff (Billups).
- Aphanus pini, Linn.** Taff's Well (Billups).
- Beosus maritimus, Scop.** Bridgend (Billups).
- Eremocoris plebejus, Fall.** Taff's Well (Billups).
- Drymus sylvaticus, Fab.** Cwrt-yr-ala, Sully, &c., not uncommon.
- Drymus ryei, D. & S.** Cwrt-yr-ala, 1912.
- Drymus brunneus, Sahlb.** Common at Sully, Cwrt-yr-ala, and Penarth.
- Drymus piceus, Flor.** Pontneathvaughan, one in moss on bank of River Perddyn, 12th August, 1916.
- Notochilus contractus, H-S.** Not rare at old Cogan, Cwrt-yr-ala, Sully, &c.
- Scolopostethus grandis, Horv.** Cwrt-yr-ala, 1913.
- Scolopostethus affinis, Schill.** Common at Penarth, Cwrt-yr-ala, Sully, Kenfig, &c.; the macropterous form occurring occasionally.
- Scolopostethus thomsoni, Reut.** Old Cogan, 1913; Penarth, April, 1916.
- Scolopostethus decoratus, Hahn.** Penarth, 1913, and April, 1916.
- Gastrodes ferrugineus, L.** Sully, common on Pine trees, July to September, 1916.
- Pyrhocoris apterus, Linn.** Cowbridge and Taff's Well (Billups).

TINGIDIDÆ.

- Serentia læta, Fall.** Penarth (Billups).
- Acalypta cervina, Germ.** Penarth, Cwrt-yr-ala, and Lavernock, not rare in moss.
- Acalypta parvula, Fall.** Cwrt-yr-ala, one under a stone, 17th September, 1916, common in moss at Sully, 12th October, 1916.

- Dictyonota strichnocera, Fieb.** The Heath, Cardiff; three examples beaten off Gorse, 5th September, 1916.
- Derephysia foliacea, Fallen.** Sully, one specimen, 12th November, 1916.
- Monanthia ampliata, Fieb.** Cowbridge (Billups); Lavernock, August, 1915.
- Monanthia cardui, Linn.** Very common on thistles at Penarth, Sully, Cwrt-yr-ala, Porthcawl, &c.
- Monanthia fabricii, Stal.** Taff's Well (Billups).
- Monanthia dumetorum, H-S.** Cardiff (Billups).
- Monanthia humuli, Fab.** Cowbridge (Billups), Cwrt-yr-ala, 24th September, 1916, common on *Mentha* and *Myosotis*.

ARADIDÆ.

- Aradus depressus, Fab.** Cardiff (Billups), Cwrt-yr-ala, one under a stone, March, 1915.
- Aneurus lævis, Fab.** Cwrt-yr-ala, one under bark, 1912, and again plentifully, 2nd April, 1916.

GERRIDIDÆ.

- Hydrometra stagnorum, Linn.** Very abundant at Penarth, Kenfig, &c.
- Microvelia pygmaea, Duf.** Cardiff and Taff's Well (Billups)
- Velia currens, Fab.** Very abundant throughout the County.
- Gerris paludum, Fab.** Taff's Well and Cardiff (Billups).
- Gerris najas, De Geer.** Caerphilly, two in the Castle Moat, March, 1915 (Bacchus).
- Gerris thoracicus, Schum.** Common at Penarth, Cwrt-yr-ala, &c.
- Gerris gibbifer, Schum.** Pontneathvaughan, July, 1914, and commonly, 12th August, 1916.
- Gerris lacustris, Linn.** Pontneathvaughan, common, July, 1914, and October, 1915, Cwrt-yr-ala, 30th April, 1916, and Penarth (Bacchus).

REDUVIDÆ.

- Coranus subapterus, De Geer.** Llanmadoc, one specimen, September, 1916 (David).
- Nabis lativentris, Boh.** Very common, Penarth, Sully, Old Cogan, Cwrt-yr-ala, Porthcawl, &c.
- Nabis major, Cost.** Not uncommon, Llanmadoc, September, 1916 (David). Penarth, August, 1914, and 26th August, 1916.
- Nabis flavomarginatus, Scholtz.** Cowbridge and Taff's Well (Billups), Penarth, 26th August, 1916.

- Nabis limbatus, Dahlb.** Llanmadoc (David); Penarth, common, Sully, Cwrt-yr-ala, &c.
- Nabis ferus, Linn.** Dinas Powis on Lucerne, 4th October, 1914; The Heath, Cardiff, 5th September, 1916.
- Nabis rugosus, Linn.** Old Cogan and Penarth, abundant; Llanmadoc, September, 1916 (David).
- Nabis ericetorum, Scholtz.** Pontneathvaughan, one specimen, 12th August, 1916.

SALDIDÆ.

- Salda scotica, Curt.** Llantrisant (Billups); Pontneathvaughan, 3rd August, 1914, and very abundantly, 12th August, 1916.
- Salda saltatoria, Linn.** Abundant at Kenfig Pool and Candleston; Pontneathvaughan, 3rd August, 1914, and 12th August, 1916; Cwrt-yr-ala, 23rd April, 1916.
- Salda c-album, Fieb.** Cardiff, Cowbridge (Billups); Swansea (Blatch); Pontneathvaughan, 12th August, 1916.
- Salda pallipes, Fab.** Commonly at Kenfig Pool and Candleston.
- Salda lateralis, Fall.** Oxwich Marsh, male and female, 16th August, 1916 (Tomlin).
- Salda cocksi, Curt.** Caerphilly Castle (Billups), Oxwich Marsh, 16th August, 1916 (Tomlin); Pontneathvaughan, 12th August, 1916.

CIMICIDÆ.

- Cryptostemma alienum, H-S.** Barry Island (Billups).
- Cimex lectularius, Linn.** Common in Cardiff, in some parts of the City; as it is in most towns.
- Lytocoris campestris, Fab.** Penarth, 1913 and 1914, Lavernock, common in haystack refuse, 23rd September, 1916.
- Piezostethus galactinus, Fieb.** Cardiff (Billups); Old Cogan, not uncommon, 23rd September, 1916; Penarth, in rubbish, 7th October, 1916.
- Piezostethus cursitans, Fall.** Penarth, one specimen, April, 1915.
- Temnostethus pusillus, H-S.** Penarth, not uncommon on Oaks, August, 1915.
- Anthocoris confusus, Reut.** Abundant at Penarth, Cwrt-yr-ala, Kenfig, &c.
- Anthocoris nemoralis, Fab.** Very common everywhere.
- Anthocoris gallarum-ulmi, De Geer.** Cwrt-yr-ala, one in haystack refuse, 25th December, 1916.
- Anthocoris nemorum, Linn.** Common, Penarth, Cwrt-yr-ala, Sully, Kenfig, &c.

- Tetraphleps vittata**, Fieb. Lavernock and Sully, common on *Pinus sylvestris* and *P. austriaca*.
- Acompocoris pygmæus**, Fall. Abundant with the last species.
- Triphleps nigra**, Wolff. Very common at Penarth, Sully, Dinas Powis, Porthcawl, &c.
- Microphysa elegantula**, Baer. Lavernock, one female beaten off *Pinus austriaca*, August, 1915.

CAPSIDÆ.

- Pithanus maerkeli**, H-S. Porthcawl, one running on the sandhills, June, 1915; Merthyr Mawr, 15th July, 1916; Pontneathvaughan, 12th August, 1916.
- Miris lævigatus**, Linn. Common, Penarth, Sully, Cwrt-yr-ala, &c.
- Miris holsatus**, Fab. Kenfig Burrows, 1st June, 1914.
- Megaloceræa erratica**, Linn. Penarth, Dinas Powis, Cwrt-yr-ala, Gower, &c., common.
- Megaloceræa linearis**, Fuessl. Taff's Well and Cowbridge (Billups)
- Megaloceræa ruficornis**, Fourc. Penarth, May, 1914.
- Leptopterna ferrugata**, Fall. Not uncommon round Penarth.
- Leptopterna dolabrata**, Linn. Old Cogan, Penarth, Cwrt-yr-ala, &c., common.
- Monalocoris filicis**, Linn. Common on Bracken at Cwrt-yr-ala and Pontneathvaughan.
- Pantilius tunicatus**, Fab. Taff's Well, on Hazel (Billups); Cwrt-yr-ala, 3rd October, 1915.
- Lopus gothicus**, Linn. Taff's Well (Billups).
- Miridius quadrivirgatus**, Cost. Barry Island (Billups).
- Phytocoris tiliæ**, Fab. Llanmadoc, September, 1916 (David); Penarth, 26th August, 1916, and Cwrt-yr-ala, 3rd September, 1916.
- Phytocoris longipennis**, Flor. Penarth, August, 1915, Cwrt-yr-ala, 3rd September, 1916.
- Phytocoris reuteri**, Saund. Cardiff (Billups).
- Phytocoris varipes**, Boh. Llanmadoc, September, 1916 (David), common at Penarth, 26th August, 1916; The Heath, Cardiff, 5th September, 1916; Cwrt-yr-ala, Porthcawl, &c.
- Phytocoris ulmi**, Linn. Common at Penarth in August, 1915 and 1916.
- Calocoris sexguttatus**, Fab. Llantrisant (Billups).
- Calocoris fulvo-maculatus**, De Geer. Penarth, 1913.
- Calocoris roseo-maculatus**, De Geer. Glamorgan (Billups).

- Calocoris bipunctatus, Fab.** Very abundant throughout the County on a variety of plants.
- Calocoris lineolatus, Goeze.** Sully 26th September, 1915, one example.
- Calocoris infusus, H-S.** Penarth, August, 1915, beaten off Ash.
- Calocoris striatus, Linn.** Llantrisant (Billups).
- Stenotus binotatus, Fab.** Fairly common, Penarth, Sully, Cwrt-yr-ala, Candleston, &c.
- Dichroscytus rufipennis, Fall.** Common on *Pinus sylvestris* and *P. austriaca* at Sully in July and August, 1916.
- Plesiocoris rugicollis, Fall.** Porthcawl, July, 1916, one specimen.
- Lygus pabulinus, Linn.** One example at The Heath, Cardiff, 5th September, 1916.
- Lygus contaminatus, Fall.** Pontneathvaughan, 9th October, 1915, Porthcawl, July, 1916; Cwrt-yr-ala, 3rd September, 1916.
- Lygus viridis, Fall.** Penarth, August, 1915, Porthcawl, July, 1916.
- Lygus lucorum, Mey.** Taff's Well (Billups); Old Cogan, 1913, Penarth, 26th August, 1916; Sully, 6th August, 1916.
- Lygus spinolæ, Mey.** Penarth, July, 1915, and 25th July, 1916.
- Lygus pratensis, Linn.** Dinas Powis, Sully, Penarth, Porthcawl, Cwrt-yr-ala, Gower, &c.; very abundant.
- Lygus rubricatus, Fall.** Llandaff (Billups); Sully, 6th August, 1916.
- Lygus cervinus, H-S.** Penarth, May, 1915.
- Lygus pastinacæ, Fall.** Fairly common, Penarth, Cwrt-yr-ala, Sully, &c.
- Lygus kalmii, Linn.** Crwmllyn Bog, one example, 15th August, 1916 (Tomlin).
- Camptozygum pinastri, Fall.** St. Fagans (Billups); Sully, 6th August, 1916.
- Camptobrochis lutescens, Schill.** Barry Island and Taff's Well (Billups).
- Liocoris tripustulatus, Fab.** Very abundant on nettles throughout the County.
- Capsus ruber, Linn.** Common on nettles wherever I have collected.
- Rhopalotomus ater, Linn.** Porthcawl, June, 1915; Penarth, July, 1916.
- Pilophorus cinnamopterus, Kb.** Taff's Well (Billups).
- Pilophorus perplexus, Scott.** Penarth, in company with the Ant *Donisthorpea fuliginosa*, on *Cornus sanguinea*, July-August, 1915, and again in August, 1916.
- Orthocephalus mutabilis, Fall.** Taff's Well (Billups).
- Halticus luteicollis, Panz.** Llantrisant and Cowbridge (Billups).

- Halticus apterus**, Linn. Taff's Well (Billups).
- Macrolophus nubilus**, H.S. Cardiff (Billups).
- Dicyphus constrictus**, Boh. Oxwich Marsh, one example, 16th August, 1916 (Tomlin).
- Dicyphus epilobii**, Reut. Common on Epilobium at Lavernock; The Heath, Cardiff, 5th October, 1916.
- Dicyphus errans**, Wolff. Cwrt-yr-ala, 1913; Sully, 26th September, 1915.
- Dicyphus stachydis**, Reut. Cardiff (Billups).
- Dicyphus pallidicornis**, Fieb. Taff's Well, very common on Foxgloves (Billups).
- Dicyphus annulatus**, Wolff. Barry Island (Billups); Porthcawl under Erodium commonly, 17th October, 1915, and July, 1916.
- Campyloneura virgula**, H-S. Sant-y-nil (Loveridge); Penarth and Pontneathvaughan, not rare.
- Cylocoris flavonotatus**, Boh. Llantrisant (Billups).
- Æthorhinus angulatus**, Fab. Welsh St. Donats (Loveridge); Lavernock, 1915.
- Globiceps flavomaculatus**, Fab. Cowbridge (Billups).
- Globiceps dispar**, Boh. Penarth (Billups).
- Mecomma ambulans**, Fall. Penarth, August, 1915; Pontneathvaughan, 12th August, 1916.
- Cyrtorrhinus caricis**, Fall. Cardiff (Billups).
- Orthotylus marginalis**, Reut. Penarth, August, 1915, and commonly at Porthcawl and Penarth in July, 1916.
- Orthotylus nassatus**, Fab. Taff's Well (Billups).
- Orthotylus viridinervis**, Kb. Penarth, 26th July, 1916.
- Orthotylus ochrotrichus**, D. & S. Penarth, July, 1915.
- Orthotylus flavosparsus**, Sahlb. Llantrisant (Billups).
- Orthotylus chloropterus**, Kbm. The Heath, Cardiff, 5th September, 1916, swept off Broom.
- Hypsitylus bicolor**, D. & S. Common on Gorse at Sully, 26th September, 1915, and Cwrt-yr-ala, 3rd October, 1916.
- Loxops coccinea**, Mey. Taff's Well (Billups).
- Heterotoma merioptera**, Scop. Abundant at Penarth, Sully, Cwrt-yr-ala, &c., beaten off a variety of plants.
- Heterocordylus genistæ**, Scop. Cardiff (Billups); Penarth, very abundant on Genista tinctoria.

- Malacocoris chlorizans, Fall.** Penarth, August, 1915, Cwrt-yr-ala, Pontneathvaughan, October, 1916.
- Onychumenus decolor, Fab.** Cowbridge and Taff's Well (Billups).
- Megalocoleus pilosus, Schr.** Porthcawl, July, 1916, not uncommon.
- Macrotylus paykulli, Mey.** Penarth (Bacchus); Porthcawl, very common under Ononis, June, 1915, and July, 1916.
- Harpocera thoracica, Fall.** Porthcawl, June, 1915; Penarth, both sexes in May, 1916.
- Byrsoptera ruffrons, Fall.** Penarth, June, 1914; August, 1915; 26th July and 26th August, 1916.
- Phylus melanocephalus, Linn.** One specimen beaten off Oak, July 21st, 1916.
- Phylus coryli, L., var. avellanæ, Mey.** Sant-y-nil (Loveridge); Penarth, 1915.
- Psallus ambiguus, Fall.** Candleston, 14th July, 1916.
- Psallus betuleti, Fall.** Candleston, not rare on *Quercus ilex*, 22nd June, 1915, and 14th July, 1916.
- Psallus variabilis, Fall.** Cwrt-yr-ala, 1913; Penarth, June, 1914, and 21st July, 1916, Candleston, 22nd June, 1915.
- var. simillimus, D. & S.** Candleston, with the type, beaten off *Quercus ilex*, 22nd June, 1915.
- Psallus lepidus, Fieb.** Penarth, August, 1915; and commonly on Ash, 21st July, 1916.
- Psallus alnicola, D. & S.** Taff's Well (Billups).
- Psallus fallenii, Reut.** Cwrt-yr-ala, not uncommon on Birch, 3rd September, 1916; The Heath, Cardiff, 5th September, 1916.
- Psallus varians, H. S.** Old Cogan, 1913 and 1914; Cwrt-yr-ala, 1914; Candleston, 22nd June, 1915.
- Psallus diminutus, Kb.** Penarth, May, 1914, and 21st July, 1916.
- Psallus roseus, Fab.** Penarth, August, 1915, and commonly 26th July, 1916.
- Psallus salicellus, Mey.** Penarth, August, 1915, Pontneathvaughan, October, 1915.
- Psallus rotermundi, Scholtz.** Candleston, one specimen beaten off *Populus alba*, 14th July, 1916.
- Psallus vitellinus, Scholtz.** Sully, one specimen beaten off *Pinus sylvestris*, 2nd July, 1916.
- Atractotomus magnicornis, Fall.** Lavernock, August, 1915; Sully, September, 1916, off Pines.
- Plagiognathus albipennis, Fall.** Penarth, male and female on *Artemisia abrotanum*, August, 1916 (Bacchus).

- Plagiognathus chrysanthemi, Wolff.** Common, Penarth, May, 1914, Sully, 1915 and 1916.
- Plagiognathus arbustorum, Fab.** Abundant throughout the County.
- Plagiognathus pulicarius, Fall.** Porthcawl, June, 1915.
- Plagiognathus bohemani, Fall.** Barry Island (Billups).
- Asciodema obsoletum, D. & S.** Sully, not rare on Gorse, 6th August, 1916.

NEPIDÆ.

- Nepa cinerea, Linn.** Not at all rare at Penarth; Kenfig Pool, &c.
- Ranatra linearis, Linn.** Cardiff (Billups).

NAUCORIDÆ.

- Naucoris cimicoides, Linn.** Cardiff (Billups).

NOTONECTIDÆ.

- Notonecta glauca, Linn.** Abundant at Penarth, Sully, Kenfig Pool, &c.
var. maculata, Fab. Penarth, not uncommon with the type (Bacchus).
- Plea minutissima, Fab.** Common at Penarth, Sully, Kenfig Pool, &c.

CORIXIDÆ.

- Corixa geoffroyi, Leach.** Very common, Penarth, Sully, Kenfig Pool, Pontneathvaughan, Cwrt-yr-ala, &c.
- Corixa lugubris, Fieb.** Not uncommon in the Little Roach Pond near Cogan, March, 1915.
- Corixa hieroglyphica, Duf.** Very abundant, Penarth, Sully, Kenfig Pool.
- Corixa sahlbergi, Fieb.** Not uncommon at Penarth and Kenfig Pool in April; Cwrt-yr-ala, 8th May, 1916 (Bacchus).
- Corixa linnæi, Fieb.** Penarth, March, 1914.
- Corixa limitata, Fieb.** Taff's Well (Billups); Sant-y-nil (Loveridge), Penarth.
- Corixa venusta, D. & S.** Not uncommon in the Little Roach Pond near Cogan, March, 1915; Penarth, April, 1916 (Bacchus).
- Corixa striata, Linn.** Common at Sully in March; Kenfig Pool, April, 1914. Penarth, April, 1916 (Bacchus).
- Corixa distincta, Fieb.** Not uncommon at Sully and Kenfig Pool.
- Corixa fallenii, Fieb.** Little Roach Pond, March, 1915; Penarth, 15th April, 1916 (Bacchus).
- Corixa fossarum, Leach.** Little Roach Pond, March, 1915. This pond is liable to be flooded at high spring tides, and seems very productive in *Corixæ*; the water is brackish, and I have brought up the common Shrimp in the net with the *Corixæ*.

- Corixa nigrolineata, Fieb.** Very abundant at Penarth, Sully, Kenfig Pool, &c.
- Corixa præusta, Fieb.** Penarth, March, 1914, and Kenfig Pool, April, 1914.
- Corixa concinna, Fieb.** Kenfig Pool, one in April, 1914.
- Corixa carinata, Sahlb.** One specimen of this northern species at Kenfig Pool, April, 1914. This is another productive locality for Water Bugs.

HOMOPTERA.

The **Homoptera**, or Frog Hoppers, have received practically no attention so far, only a few of the more striking species having been taken.

CERCOPIDÆ.

- Aphrophora alni, Fall.** Welsh St. Donats (Loveridge); Penarth, commonly in July, 1916.
- Aphrophora salicis, De G.** Not rare on Sallows at Penarth, August, 1915, and July, 1916.
- Philænus spumarius, Linn.** Very abundant, and variable in its markings. This is the insect known as the Spit Insect or Cuckoo-spit.
- Philænus campestris, Fall.** Sully, one specimen, 26th September, 1915.
- Philænus lineatus, Linn.** Penarth, not common, August, 1915.

MEMBRACIDÆ.

- Centrotus cornutus, Linn.** Taffs Well, June, 1914, Cwrt-yr-ala, May, 1915.

JASSIDÆ.

- Megophthalmus scanicus, Fall.** Porthcawl, July, 1916.
- Megophthalmus scabripennis, Edw.** Sully, one example, December, 1916.
- Tettigonia viridis, Linn.** Sully, one on 10th October, 1915.
- Euacanthus interruptus, Linn.** Cwrt-yr-ala, 1913.
- Euacanthus acuminatus, Fab.** Penarth, August, 1915.
- Batracomorphus lanio, Linn.** Penarth, not rare on Oak, July, 1915, and August, 1916.
- Oncopsis alni, Schr.** Porthcawl, commonly, in July, 1916.
- Macropsis scutellata, Boh.** Penarth, common, August, 1915.
- Macropsis rubi, Boh.** Penarth, commonly with the last.
- Macropsis tibialis, Scott.** Penarth, July, 1916.
- Macropsis impura, Boh.** Porthcawl, July, 1916.
- Idiocerus tremulæ, Estl.** Cwrt-yr-ala, 3rd October, 1915.

- Idiocerus lituratus, Fall.** Porthcawl, July, 1916.
Idiocerus populi, Linn. Penarth, July, 1915.
Idiocerus confusus, Flor. Penarth, August, 1915.
Acoccephalus nervosus, Schr. Old Cogan, 1913 and 1915.
Athysanus plebejus, Fall. Dinas Powis, plentiful, 4th October, 1914.
Athysanus lineolatus, Brulle. Dinas Powis, plentiful with the last on Lucerne.
Deltocephalus sabulicola, Curt. Porthcawl, July, 1916.
Jassus modestus, Fieb. Penarth, July, 1916.
Jassus mixtus, Fab. Penarth, July, 1915.
Thamnotettix subfuscus, Fall. Penarth, two specimens, May, 1916.
Limotettix 4-notata, Fab. Penarth, one example, October, 1916.
Alebra albostriella, Fall. Lavernock on Pinus, August, 1915, Penarth 26th July, 1916.
Empoasca smaragdula, Fall. Penarth, common on Sallows, July, 1916.
Empoasca butleri, Edw. Porthcawl, 17th October, 1915, common on Salix repens.
Chlorita flavescens, Fab. Penarth, May, 1916.
Eupteryx auratus, Linn. Penarth, commonly, 23rd September, 1916.
Eupteryx germari, Zett. Candleston, 14th July, 1916.
Eupteryx pulchellus, Fall. Lavernock, August, 1915.
Typhlocyba ulmi, Linn. Penarth, October, 1916.

FULGORIDÆ.

- Cixius pilosus, Ol.** Not rare, Penarth, May, 1916.
Delphax pellucida, Fab. Penarth, August, 1915, May, 1916.

PSYLLIDÆ.

- Psylla buxi, Linn.** Candleston, on Populus tremulæ, 14th July, 1916.

ENTOMOLOGICAL NOTES.

By H. M. HALLETT, F.E.S.

The past season was a late one, but otherwise proved a good collecting one for the *Aculeate Hymenoptera*.

In contrast to 1915, it was very free from the plagues of garden pests which were experienced that year, there was a gratifying absence of the Black Blight, and, at all events locally, of the larvæ of the Small White Butterfly. Considering the unusual abundance of "queen" wasps in June, these insects gave little, if any trouble, during the autumn.

LEPIDOPTERA.

Pararge egeria, L. The Speckled Wood. This butterfly appears to be decreasing in numbers, in many parts of the Country; so far, this does not appear to be the case in this district, it is plentiful in suitable districts in the neighbourhood of Cardiff.

Cyaniris argiolus, L. The Holly Blue. Was again plentiful in the spring; this is another butterfly which is considered to be getting scarce, but the reverse seems to be the case locally.

Lycæna corydon, Fab. Chalk Hill Blue. One example was taken at Caerphilly this year by Mr. Max Wright, this is a very interesting capture, as the only previous record was one by Mr. Evan John, near Southerndown Golf Course, some years ago.

HYMENOPTERA ACULEATA.

There are not many additions to the Glamorgan list to chronicle, but those that have occurred are rare and interesting, whilst the following further occurrences of species previously recorded are worth noting:—

Myrmica schencki, Emery. Mr. Horace Donisthorpe came down in September to study this recent addition to the British list, in its original locality, and we found three colonies in the same bank at Sully; on this occasion we succeeded in finding the male, which I had failed to secure before. The colonies are small and the nest extends only about two inches below ground.

- Donisthorpea umbrata, Nyl.** A strong colony was found at Sully on 8th October, under a large stone; there were present a large number of winged females, and among these occurred four examples of the interesting Myrmecophilous beetle, **Claviger longicornis, Mull.**, which is a welcome addition to the list of Glamorgan Coleoptera and a notable extension of its British distribution. The mite **Sphaerolaelaps holothyroides, Leon**, also occurred freely in this nest.
- Methoca ichneumonides, Latr.** This species occurred again at Rest Bay, Porthcawl, in July, but much less commonly than last year.
- Pompilus consobrinus, Dbm.** One female was taken at Porthcawl.
- Pompilus chalybeatus, Schiodte.** Commonly at Porthcawl in July, the males of this species are by far the most numerous of the red-bodied species at Porthcawl.
- Pompilus wesmaeli, Thoms.** A few males were taken on the Newton Burrows, and it would probably prove to be fairly abundant, if sufficient patience to catch these active insects was always forthcoming.
- Astatus stigma, Panz.** A few of each sex were again met with on the sandhills; it is locally plentiful.
- Tachysphex unicolor, Panz.** Proved to be again abundant, and commoner than **T. pectinipes**, though the latter was much more plentiful than last year.
- Stigmus solskyi, Mor.** Both sexes were taken on an old gate post on 21st July, 1916, in company with **Passalœcus insignis, V. d. Lind.**
- Psen bicolor, Jurine.** Not uncommon at Candleston in July, flying about the privet bushes on the sand below the Castle.
- Psen unicolor, V. d. Lind.** Abundant on the Sandhills between Newton and Candleston.
- Vespa austriaca, Panz.** The females occurred fairly commonly at Penarth, in the middle of June; one was noticed to pursue and kill a fly, and another was caught whilst engaged in collecting wood fibres from an old post, in the same manner as an industrious wasp. The females of **V. vulgaris, V. germanica, V. rufa**, and **V. sylvestris** were exceedingly abundant at the same time, and it is remarkable, in view of the large numbers of queen wasps this year, that so little trouble was experienced later on.
- Chrysis viridula, L.** Scarce at Sully.
- Chrysis neglecta, Shuck.** Not uncommon at Sully with **Odynerus spinipes**.
- Prosopis dilatata, Kirby.** One male was taken at Sully, 2nd July, 1916. One specimen annually of this bee is all I can ever find.
- Andrena nigriceps, Kirby.** Four females were taken at Rest Bay, Porthcawl, burrowing in a sandy bank.

- Andrena bucephala**, Steph. Occurred fairly freely in the female sex at Cwrt-yr-ala on 21st May.
- Andrena labialis**, Kirby. A very strong colony was found burrowing in an old limestone quarry near Lavernock.
- Nomada flava**, Panz. Previous records of *N. ruficornis*, L., prove to be this species, which is parasitic on **Andrena trimmerana**, K. (see Perkins, Ent. Mo. Mag., 1916, p. 210).
- Epeolus rufipes**, Th. Occurred rarely on Newton Burrows, Porthcawl, in July.
- Cœlioxys elongata**, Lep. Not uncommon on the sandhills at Candleston in July, in company with **Megachile maritima**.
- Cœlioxys mandibularis**, Nyl. Exceedingly abundant on the sandhills from Candleston to Porthcawl, and also at Kenfig.
- Osmia aurulenta**, Panz. Not common at Porthcawl.
- Osmia leucomelana**, Kirby. Fairly common on the Newton Burrows, and nests in the dead stems of Ragwort, which are lying on the sand.
- Additions to the Glamorgan list of *Hymenoptera aculeata* :—
- Myrmecina graminicola**, Latr. One worker was taken under a small stone at Sully, 18th June, 1916.
- Pemphredon carinatus**, Thoms. One female on an old willow stump at Porthcawl, 23rd July, 1916.
- Psen equestris**, Fab. One male occurred on the sandhills below Candleston Castle, 15th July, 1916.
- Gorytes campestris**, Linne. One male on Daucus at Sully, 2nd July, 1916.
- Hedychridium integrum**, Dhlb. Porthcawl, on bare sand, one female, 9th June, 1916, and one 23rd July, 1916; Kenfig, one female, 21st July, 1916.
- Sphecodes spinulosus**, V. Hag. This fine species occurred at Sully on 28th May, 1916, about the burrows of **Halictus xanthopus**, one male coming to my net, whilst Mr. Bacchus took a female.
- Andrena spinigera**, Kirby. Two males were taken at Sully on 9th April.
- Nomada bucephalæ**, Perk. One female of this, the parasite of **Andrena bucephala**, was taken with its host at Cwrt-yr-ala on 21st May. For description of this species see Perkins, Ent. Mo. Mag., 1916, p. 210, and January, 1917, p. 12.
- Stelis octomaculata**, Smith. Five specimens of this rare little bee occurred at Newton Burrows, Porthcawl, in July; the first four were taken settling on the bare sand, and the fifth entering an excavated stem of Ragwort; it is parasitic on **Osmia leucomelana**.

ORNITHOLOGICAL NOTES FOR 1916.

 BY T. W. PROGER AND D. R. PATERSON.

THE BLACK-TAILED GODWIT. (*Limosa belgica*).

This interesting wader is an addition to our list of local birds. A male bird of this species was shot on Pengam Moors, on September 16th, and we were able to handle it in the flesh, and identify it. According to Howard Saunders, Bar-tailed Godwits used to breed in the south of Yorkshire until the opening of the 19th century, and in the fens of Lincolnshire and Cambridgeshire down to 1829, and in Norfolk until 1847, but they are now only seen during Spring and Autumn migration, and even then are by no means numerous. Their breeding places are in certain favoured localities in Poland, Northern Germany, Denmark, Holland and Belgium, whilst their winter quarters are on the southern shores of the Mediterranean, and extending as far as Abyssinia.

SPRING ARRIVALS, 1916.

April 1st. Chiff-Chaffs and Willow Warblers in considerable numbers in the willows and hedgerows bordering the Waycock Brook, near Penmark, also noted a Wood Warbler and a Tree Pipit in the same locality.

These birds appeared to have only just arrived. A bright and sunny day, and only the fourth day following the great storm and blizzard of February 27th and 28th, which will long be remembered. The shade temperature at the Penylan Observatory on the following day was 62°. Very high for early April.

April 15th. SWALLOWS. Several seen near Gwain-y-to Wood in the same district as the above. (T.W.P.)

April 18th. SWALLOW. One seen flying over the Roach Ponds on Penarth Road (J.L.P.), and at Porthcawl on the same date. (A. W. WALDRON).

April 20th. CUCKOO. Heard and seen at Peterston-super-Ely. ARTHUR WALDRON. Also at Cwmciddy. (T.W.P.)

April 23rd, HOUSE MARTINS AND LAND MARTINS. Arrived to-day at St. Fagans. (T.W.P.)

April 25th. SWIFT. Two birds seen flying over Penarth Headland. (J.L.P.). St. Fagans on the 26th (T.W.P.); at Llandaff on the 27th. (JNO. E. WILLIAMS).

April 25th. Landrail. Heard at Porthkerry. (T.W.P.).

May 5th. NIGHT-JAR. At Cwmciddy. (T.W.P.).

May 6th. WHITE-THROAT AND SPOTTED FLYCATCHER. At Cwmciddy. (T.W.P.).

May 10th. RED-BACKED SHRIKE. At Cwmciddy. (T.W.P.)

September 30th. WOODCOCK. "I flushed a Woodcock in the Nurseries here this morning." (Harold Evans, Llanishen).

This is the earliest arrival of this species that we have ever heard of in the County—Woodcocks have been more numerous this winter than we can remember. We have seen more than fifty shot in one locality, and during the severe January frost, 1917, fifteen Woodcocks were seen feeding on a boggy spot close to the road in Porthkerry Park. Sixty-three were shot at Penrice during three days' shooting.

DEPARTURES.

September 11th. SWIFT. A single bird seen flying about Penarth Headland at 7.40 p.m. (J.L.P.).

October 27th. SWALLOWS AND HOUSE-MARTINS. A few still remaining at St. Fagans. Weather very wet and stormy. (T.W.P.).

October 30th. SWALLOW. One bird seen flying about Penarth Head. A sunny morning after five days of storm and heavy rain. (J.L.P.).

GENERAL NOTES.—The Barn Owl (*Strix flammea*) has become quite numerous in the district. It is frequently seen quite early in the afternoon hunting over especially the low-lying and marshy meadows. Most of the country church towers and many hollow trees have now a pair of Owls. A pleasing increase due chiefly to the suppression of the pole-trap.

Flocks of Redwings (*Turdus iliacus*) with a few Field-Fares (*Turdus pilaris*) passed over St. Fagans in a continuous stream from 4.30 to 6.0 p.m., on March 4th. They were probably beginning the return journey to their breeding haunts in Scandinavia. It was a bright frosty day, with signs of sharp frost.

A Reed-Bunting (*Emberiza schoeniculus*) was seen on March 6th, feeding on a manure heap at St. Fagans, a very unusual place for this bird of the marshes. The day was very cold with a fall of snow at night.

A Lesser Spotted Woodpecker (*Dendrocopus minor*) was observed on March 29th in a garden at Llandaff, searching for food on decayed branches.

NOTES ON MAMMALS.

May 11th. BADGER (*Meles meles*). A fine female Badger, with her half-grown cub, was dug out of her earth in the Big Wood at St. Fagans. We had noted her presence there for some months previously, and regret that it was not possible to allow her to remain undisturbed.

October 10th. POLECAT. (*Mustela putorius*). A Polecat was trapped near Bridgend on this date, and sent to Mr. Mountney for preservation. These animals have become very scarce in Glamorgan owing to constant trapping. In parts of Carmarthenshire and Pembrokeshire they are still not uncommon. They are most destructive to game and poultry.

BIOLOGICAL AND GEOLOGICAL SECTION.

 REPORT FOR THE 29TH SESSION, 1915-16.

COMMITTEE.

THE PRESIDENT and HON. SECRETARY OF THE C.N.S. (*ex-officio*).W. N. PARKER, Ph.D., F.Z.S. (*President*).

G. E. GAMMON.

H. E. SALMON.

H. M. SALMON.

J. J. NEALE, J.P.,

ERNEST HEATH, F.R.M.S., } *Hon. Secretaries for Field Walks.*R. W. A. SOUTHERN (*Hon. Treasurer*).H. M. HALLETT, F.E.S. (*Hon. Secretary*).

The number of Members on the books is 85.

Five Ordinary Meetings, and the Annual Meeting (May 11th, 1916) have been held in the course of the Session and have been well attended.

The following is a list of the papers read:—

- Nov. 4, 1915. J. DAVY DEAN. "*Helix pisana*, its varieties and distribution."
- H. M. HALLETT, F.E.S. "Entomological Notes, 1915, with a list of Additions to the Glamorgan records of *Hymenoptera aculeata*."
- Dec. 2, 1915. F. J. NORTH, B.Sc., F.G.S. "New light on a hidden subject,—an account of a boring for water made at Cardiff."
- Jan. 6, 1916. T. FRANKLIN SIBLY, D.Sc., F.G.S. "Geological Photographs in the Cardiff District." Illustrated by Lantern Slides.

- Feb.* 17, 1916. G. C. S. INGRAM. "Some Nature Notes and Pictures." Illustrated by Lantern Slides.
- Mar.* 16, 1916. ARTHUR LOVERIDGE. "Natural History Notes from British East Africa." (Read by the Hon. Secretary.)
- May* 11, 1916. F. J. NORTH, B.Sc., F.G.S. "The Minerals of Glamorgan."

The following exhibits were made and commented on :—

- Nov.* 4, 1915. A. E. CAMERON, M.A., D.Sc. Galls made by the *Cynipid Rhizobia aptera* on the roots of Oak trees at Roath Park.
- Dec.* 2, 1915. G. C. S. INGRAM. Stereoscopic photographs illustrating local Bird Life.
- Feb.* 17, 1916. JOHN GRIMES. Leaves of evergreen shrubs to show the damage caused by the gales of December 27th and January 1st.
- Mar.* 16, 1916. ERNEST HEATH, F.R.M.S. Stereoscopic photographs of scenes in British East Africa.
- JOHN GRIMES. Woody flower-like growths from East Africa.
- W. EVANS HOYLE, M.A., D.Sc. An ornament carved from the base of a tusk of Walrus or Elephant.
- May* 11, 1916. JOHN HUTCHINSON. Specimens of Haematite and Limonite from the Llanharry Mine.

Since the last Report was read the third part of Mr. Tomlin's paper on the Coleoptera of Glamorgan has appeared in Vol. XLVII. of the Transactions, and the fourth and concluding part is now in the press. The whole work is a most important contribution to the knowledge of the County Fauna, and has received very favourable notice in the Entomological Journals.

H. M. HALLETT,
Hon. Secretary.

ARCHÆOLOGICAL SECTION.

 ANNUAL REPORT. SESSION 1915-16.

OFFICERS AND COMMITTEE.

President - - - - J. S. CORBETT.
Vice-President - - - - W. EVANS HOYLE, M.A., D.Sc.
Hon. Secretary and Treasurer - JOHN W. RODGER.

Committee.

J. WARD, F.S.A.	Professor O. L. RICHMOND, M.A.
J. H. WESTYR EVANS.	W. CLARKE.
C. H. FARNSWORTH.	C. MORGAN, B.A.
F. BLIGH BOND, F.R.I.B.A.	B. AMSDEN.

FINANCIAL STATEMENT.

The Accounts have been audited and show a credit balance of £11 4s. 2d.

MEMBERSHIP.

The Membership is 55, being a decrease of three since last year.

PAPERS.

The Annual Meeting was held at No. 6, High Street, Cardiff, on April 4th, at 7.30 p.m., after which a Lantern Lecture was given by F. BLIGH BOND, Esq., F.R.I.B.A., on "Old Screens and Rood Lofts in the Churches of Wales."

RESEARCH WORK.

Owing to the continuation of the War, all research work is still in abeyance.

JOHN STUART CORBETT,
President.

JOHN W. RODGER,
Hon. Secretary.

CARDIFF NATURALISTS' SOCIETY.

ARCHÆOLOGICAL SECTION.

Dr.

Cash Account for the 1915 16 Session.

Cr.

	£	s.	d.		£	s.	d.
To Balance in hand, September 30th, 1915	7	6	6	By Postages and General Expenses	..	0	17 4
„ Subscriptions	..	..	..	„ Rent of Room and Expense of Lantern for Lecture	..	..	0 12 6
				„ Balance in hand, September 30th, 1916	11	4	2
					£12	14	0

Audited and found correct,

JOHN W. RODGER,
Hon. Secretary.

CHAS. H. FARNSWORTH.
10th February, 1917.

PHOTOGRAPHIC SECTION.

REPORT FOR THE FIFTH SESSION, 1915-16.

OFFICERS AND COMMITTEE.

President.

Mr. J. PETREE.

Vice-Presidents.

Mr. S. W. ALLEN.

Mr. E. W. M. CORBETT, J.P.

Mr. T. MANSEL FRANKLEN.

Dr. P. RHYS GRIFFITHS.

Mr. GILBERT D. SHEPHERD.

Hon. Treasurer.

Mr. ARCHIBALD BROWN.

Hon. Lanternist.

Mr. B. LEWIS HOPKINS.

Committee

Mr. ERNEST T. BEVAN.

Mr. G. T. FLOOK.

Mr. GEOFFREY C. S. INGRAM.

Mr. ARCHIBALD H. LEE.

Mr. STANLEY J. MILNER.

Mr. HARRY STORM.

Together with the President and Hon. Secretary of the Cardiff
Naturalists' Society.

Hon. Secretary

Mr. ARTHUR MORGAN.

The Committee has pleasure in presenting its Fifth Annual Report, dealing with the work of the Photographic Section for the 1915-16 Session.

Meetings were held during the Winter Session at which papers were read or demonstrations given. The attendances throughout the winter were good, and the interest in the Section has been well maintained.

The following is a list of Meetings held, viz. :—

1915.

- Oct. 19. Annual General Meeting.
*Lecture, "Some Notes on the Reflex Camera."
- Nov. 9. *"Amateur Photographer" Prize Slides.
One Man Show—Mr. J. ARTHUR LOMAX.
- Dec. 7. Demonstration, "Lantern Slide Making." Mr. J. STUTTARD.
One Man Show—Mr. H. B. REDMOND (Newport).
- „ 21. Lecturettes :—
* "Nature Photography," Mr. G. C. S. INGRAM.
* "Some Castles of the District," Mr. G. T. FLOOK.
"Print Criticisms," Mr. HARRY STORM.
One Man Show—Mr. ERNEST T. BEVAN.

1916.

- Jan. 11. *Lecture, "Light and Shadow in the Isle of Man,"
Mr. J. PETREE.
One Man Show—Mr. A. NIXON JAMES.
- „ 25. Demonstration, "Bromide Enlarging," Mr. J. ARTHUR LOMAX.
One Man Show—Mr. HUGO VAN WADENOYEN.
- Feb. 15. *Members' Lantern Slide Evening.
- March 8, 9, 10, and 11. Members' Annual Exhibition.
- „ 21. Evening in Cardiff Library. Exhibition of Books on Photography, etc.
- April 4. Joint Meeting with Archæological Section, *Lecture,
"Rood Screens and Lofts in Welsh Churches,"
Mr. F. BLIGH BOND, F.R.I.B.A.

The Lectures marked * were illustrated by lantern slides. The whole of the meetings were held in the room of the South Wales Institute of Architects, High Street, with the exception of that held on March 21st in the Cardiff Reference Library.

The Field Walks which have been a popular feature of the Section during the summer months were discontinued, owing

to the War, but the Committee hopes to commence them again next summer, as many of the members have "permit books."

The Members' Annual Exhibition on March 8, 9, 10, and 11, 1916, was very successful, a record number of entries being received in the various classes. In fact, hanging space could not be found for all. The judges were the same as at the Exhibition a year previously, viz., Mr. A. H. Blake, M.A., of London, for the Pictorial Classes, and Dr. W. Evans Hoyle, M.A., of Cardiff, for the Scientific and Natural History Classes. Mr. Blake, in addition to judging, provided a loan exhibit, which was very much enjoyed by all who attended. Both judges kindly attended in the evening and gave the members the benefit of their opinions of some of the pictures, and made many helpful suggestions which were much appreciated. Mr. Blake expressed himself as highly pleased at the high quality of the pictorial work. Certificates of merit were awarded in the various classes, and the Silver Rose Bowl was awarded to Mr. Harry Storm for his picture "Peggy."

The Section was approached by the Photographic Society of Ireland, through Mr. Stuttard, for the loan of a collection of prints, and Mr. Storm, at the request of the Committee, collected 72 pictures, which were afterwards shown at the Engineers' Hall, Dublin, from March 20th to 25th, 1916. A silver medal was awarded to Mr. Harry Storm for his picture "1915 Landscape," and a bronze medal to Mr. Lomax for "A Bye-way in Brittany."

The Membership of the Section at the close of the Session was 86, of whom 17 were on service with His Majesty's Forces.

The Annual Statement of Accounts is presented herewith.

REPORT OF THE COUNCIL

FOR THE

Year ending September 30th, 1916.

The Council has pleasure in submitting to the Members the Forty-ninth Annual Report of the Society.

The number of members at the close of last

Session was	520
Elected during 1915-16	21
	<hr/>
	541
Deaths	12
Removals	11
Resignations	38
	<hr/>
	61
	<hr/>
	480
	<hr/> <hr/>

The members are distributed thus :—

Honorary Members	3
Ordinary Members	449
Life Members	16
Non-Resident Members	4
Corresponding Members	7
Associates	1
	<hr/>
	480
	<hr/> <hr/>

The Society has unfortunately suffered heavy losses during the year by the death of the following members :—Mr. Edmund Handcock, The Right Rev. Bishop Hedley, Mr. James Howell, J.P., Mr. W. H. James, Mr. Llywarch Reynolds, B.A., Mr. Edward Roberts, Mr. Arthur Sessions, Mr. W. E. Stephens, Lieut.-Col. Lord Ninian Crichton Stuart, M.P., Mr. Thomas Thomas, 2nd Lieut. George Widowfield, and Mr. T. J. Williams. Lord Ninian Stuart and 2nd Lieut. Widowfield fell in action in France.

The following is a list of papers read at Members' Meetings, viz. :—

1915.

- Oct. 21st. Annual Meeting. Presidential Address by Mr. John Grimes—"The Naturalist and the Gardener."
 Oct. 28th. Mr. H. Avray Tipping, M.A., F.S.A.—"The Interior Decoration of English Homes."
 Nov. 24th. Mr. Harry Farr—"Modern English Fine Printing."
 Dec. 16th. Professor O. L. Richmond, M.A.—"The love of Nature among the Greeks and Romans."

1916.

- Feb. 10th. Miss E. P. Hughes—"A Trip in Java."
 Feb. 24th. Mr. F. J. North, B.Sc., F.G.S.—"Some Animals of the Past."
 Mar. 23rd. Mr. Evan W. Small, M.A., B.Sc., F.G.S.—"The Geography of the Austro-Italian War Area."
 April 13th. Captain J. H. Shaxby, B.Sc.—"X-Rays."

The following Public Lectures have been delivered during the year :—

1915.

- Nov. 11th. Mr. Fred Enock, F.L.S., F.E.S.—"Insects and our Food Supply."
 Dec. 9th. Mr. Frederic Coleman, F.R.G.S.—"Ten months on Active Service."

1916.

- Jan. 13th. Mr. Edward Lovett—"Russian Folk-lore."
 Jan. 27th. Rev. T. T. Norgate, F.R.G.S., F.R.Hist.S.—"The Middle-Eastern Campaign: from the Balkans to the Bosphorus."
 March 9th. Mr. A. H. Blake, M.A.—"Portugal: The Land and People."

The Meetings on November 24th, 1915, and April 13th, 1916, were held in the Reference Department of the Public Library and the Lecture Theatre of the South Wales Institute of Engineers respectively. The others were held in the Cory Hall.

The thanks of the Society are due to members who have read papers, and also to those who entertained the Lecturers.

Owing to the War, it was decided to hold only one Field Meeting during the Summer instead of three, and that it should be for a half-day. The Field Meeting (Ladies' Day) took place on Wednesday, July 5th, 1916, when about 40 members visited Chepstow. On arrival there at 1.45 p.m., the party proceeded to the Church, and the many interesting features were explained by the Vicar, Rev. Percy Dewe, M.A., and the Sexton. The Castle was next visited, Mr. H. Edgar Salmon acting as guide. After tea at the Beaufort Arms Hotel, a meeting of members was held, when Dr. W. Evans Hoyle, M.A., was elected President for the 1916-17 Session. By the kind invitation of Mr. W. R. Lysaght, J.P., the members were then able to inspect the gardens and large Museum at "Castleford." It was with deep regret that the Council heard of the tragic death of Mr. Dewe on August 5th. He was drowned whilst rescuing his son, who was bathing in the Severn and had got into difficulties owing to the strong current. A wreath was sent to the funeral on behalf of the Society.

During the year, Volume XLVIII. of the Transactions has been issued to the members. Included in the volume was a list of members of the Society, and of the Sections, on service with His Majesty's Forces at the 1st January, 1916, to the number of 50.

A Special Committee has been appointed to consider the possibility of issuing a "Fauna of Glamorgan," as a permanent memorial of the forthcoming celebration of the Society's Jubilee, in the year 1917. The other ways in which the Jubilee will be celebrated in the autumn of 1917 will be dependent upon the early and successful termination of the War.

A Joint Deputation from Cardiff waited upon the General Committee of the British Association at Newcastle-on-Tyne on Thursday, September 7th, 1916, and presented an invitation to the Association to visit Cardiff in the year 1918. This

Society was represented on the Deputation by Dr. W. Evans Hoyle, the President-Elect, who acted as one of the speakers. The Cardiff invitation was cordially and unanimously accepted by the Association.

The Council desires to express its thanks to Dr. E. Walford, D.P.H., F.R.Met.Soc., for again kindly editing the Meteorological Report.

The three Sections of the Society, viz.:—Biological and Geological, Archæological, and Photographic, have been maintained during the year, although their activities have necessarily been restricted to a large extent owing to the continuance of the War.

The Annual Statement of Accounts is presented herewith.

CARDIFF NATURALISTS' SOCIETY.

Dr. Revenue Account for the Year ending 30th September, 1916. Cr.

	£	s.	d.		£	s.	d.
To Reports and Transactions	75	13	2	By Balance from last year's Account ..	485	15	8
„ Members' Meetings	47	7	0	„ Subscriptions—Ordinary	322	5	0
„ Stationery, Printing, etc.	18	13	3	„ Dividends and Interest	19	10	6
„ General Expenses	64	2	1	„ Transfer from Gelligaer Excavations Account	16	8	4
„ Field Meetings	17	17	8	„ Transfer from Extended Exchanges List Account	1	3	6
„ Less Tickets sold	14	12	0	„ Transfer from Reserve Account ..	2	5	6
„ Lectures	90	17	5	19	17	4	
„ Less Receipts	1	18	0				
„ Depreciation of Furniture	88	19	5				
„ Writing down £200 Barry Railway Consolidated 4 per cent. Prefer- ence Stock to present quotation	1	4	0				
„ Conversazione Reserve	37	0	0				
„ Balance to next year's Account ..	21	0	0				
	490	3	11				
	£847	8	6		£847	8	6

CARDIFF NATURALISTS' SOCIETY.

Balance Sheet, 30th September, 1916.

LIABILITIES.

	£	s.	d.
Sundry Creditors	97	16	2
Subscriptions paid in advance	5	15	0
Conversazione Reserve Account	113	1	0
Balance, being Excess of Assets over Liabilities .. 490 3 11	490	3	11
	£706 16 1		

ASSETS.

	£	s.	d.
Value of Furniture	10	10	0
" Library	25	7	6
" Reports unsold	5	0	0
" "Cardiff Flora" unsold	0	1	0
" "Glamorgan Flora" unsold	0	7	2
	41 5 8		
£200 Barry Railway Company 4 per cent Preference Stock (at 74)	148	0	0
Cash at Lloyds Bank, Limited, viz. —			
Deposit Account	422	8	0
Current Account	95	2	5
	517 10 5		
	£706 16 1		

(Signed) T. W. PROGER, HON. AUDITOR.
CARDIFF, 10th October, 1916.

(Signed) A. BROWN, HON. TREASURER.
CARDIFF, 10th October, 1916.

CARDIFF NATURALISTS' SOCIETY.

 ESTABLISHED 1867.

Past Presidents.

- 1868—WILLIAM ADAMS, C.E., F.G.S.
 1869—WILLIAM ADAMS, C.E., F.G.S.
 1870—WILLIAM ADAMS, C.E., F.G.S.
 1871—WILLIAM ADAMS, C.E., F.G.S.
 1872—WILLIAM ADAMS, C.E., F.G.S.
 1873—WILLIAM ADAMS, C.E., F.G.S.
 1874—FRANKLEN G. EVANS, F.R.A.S., F.R.M.S.
 1875—JOHN WALTER LUKIS, M.R.I.A.
 1876—WILLIAM TAYLOR, M.D.
 1877—JOHN WALTER LUKIS, M.R.I.A.
 1878—COLONEL PICTON TURBERVILL.
 1879—HENRY HEYWOOD, C.E., F.C.S.
 1880—LOUIS TYLOR.
 1881—CLEMENT WALDRON.
 1882—GEORGE E. ROBINSON.
 1883—WILLIAM GALLOWAY.
 1884—PETER PRICE.
 1885—C. T. VACHELL, M.D.
 1886—HENRY HEYWOOD, C.E., F.C.S.
 1887—J. VIRIAMU JONES, M.A.
 1888—T. H. THOMAS, R.C.A.
 1889—W. RÖNNFELDT.
 1890—J. GAVEY.
 1891—C. T. VACHELL, M.D.
 1892—C. T. VACHELL, M.D.
 1893—C. T. WHITMELL, M.A.
 1894—EDWIN SEWARD, F.R.I.B.A.
 1895—R. W. ATKINSON, B.Sc., F.I.C.
 1896—Rev. CANON C. J. THOMPSON, D.D.
 1897—ROBERT DRANE, F.L.S.
 1898—J. TATHAM THOMPSON, M.B.
 1899—C. T. VACHELL, M.D.
 1900—W. N. PARKER, Ph.D.
 1901—J. J. NEALE.
 1902—C. H. JAMES.
 1903—D. R. PATERSON, M.D.
 1904—T. W. PROGER.
 1905—P. RHYS GRIFFITHS., M.B.
 1906—E. H. GRIFFITHS, Sc.D., F.R.S.
 1907—J. BERRY HAYCRAFT, M.D., D.Sc.
 1908—A. H. TROW, D.Sc.
 1909—ARCHIBALD BROWN.
 1910—Rev. DAVID DAVIES, M.A.
 1911—PROFESSOR W. S. BOULTON, B.Sc., F.G.S.
 1912—WILLIAM SHEEN, M.S., F.R.C.S.
 1913—E. P. PERMAN, D.Sc., F.C.S.
 1914—JOHN W. RODGER.
 1915—H. M. HALLETT.
 1916—JOHN GRIMES.

OFFICERS AND COMMITTEE, 1916-17.

President.

W. EVANS HOYLE, M.A., D.Sc.

Vice-Presidents.

JOHN W. RODGER.

H. M. HALLETT, F.E.S.

JOHN GRIMES.

Hon. Treasurer.

ARCHIBALD BROWN.

Hon. Librarian.

H. M. HALLETT, F.E.S.

Hon. Secretary.

OWEN L. RHYS, M.D.

Hon. Assistant Secretary.

GILBERT D. SHEPHERD, F.C.A.

Committee.

HAROLD EVANS.

HARRY FARR.

ERNEST HEATH, F.R.M.S.

GEOFFREY C. S. INGRAM.

D. SIBBERING JONES.

O. L. RICHMOND, M.A.

H. EDGAR SALMON.

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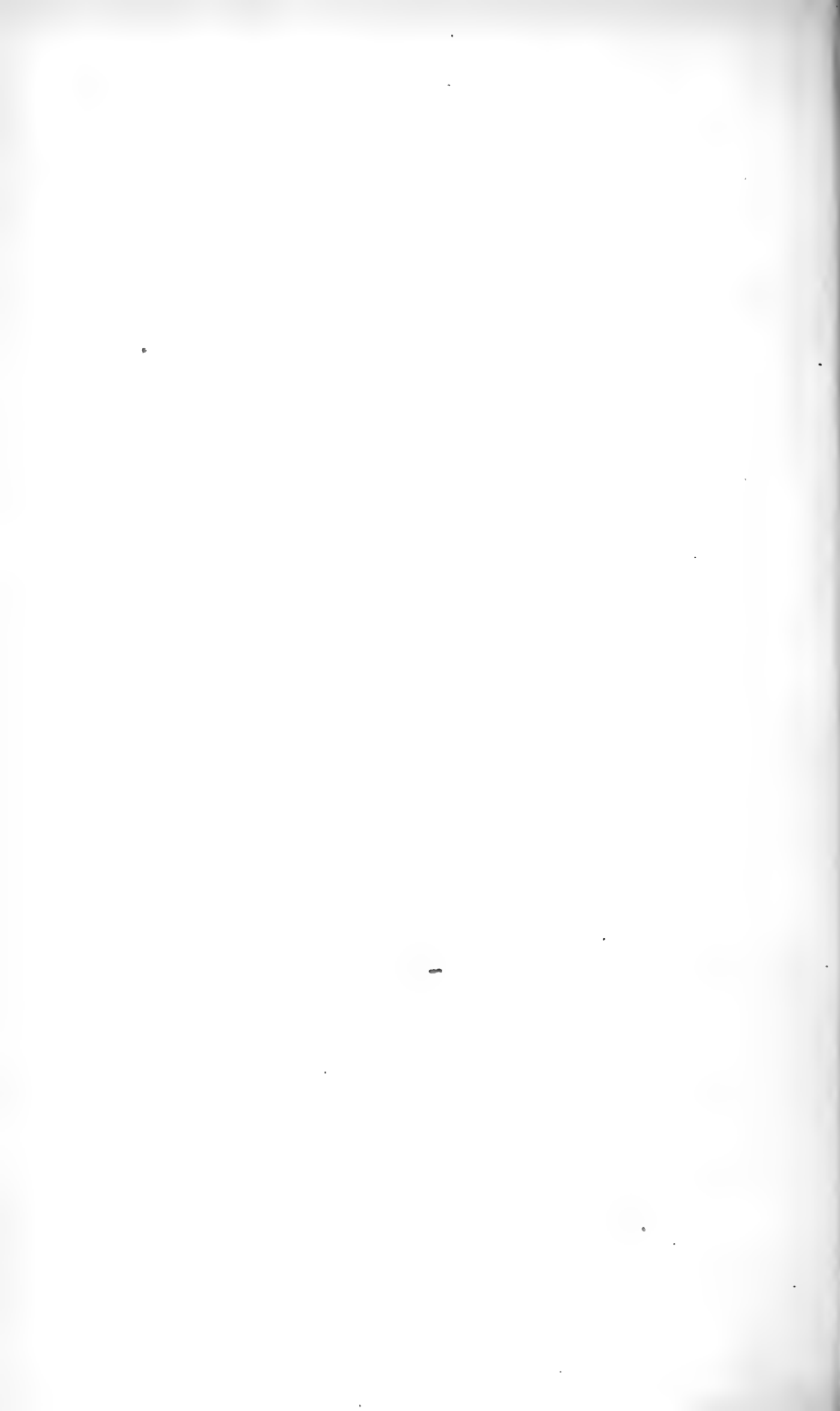
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TRANSACTIONS OF THE
CARDIFF NATURALISTS' SOCIETY.

VOL. I.

1917.



Cardiff Naturalists' Society.

REPORT AND TRANSACTIONS

VOL. L

1917

The Price of the Transactions is Ten Shillings and Sixpence



PRINTED FOR THE SOCIETY BY
WILLIAM LEWIS (PRINTERS) LTD., CARDIFF

1920

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CONTENTS.

VOL. L. 1917.

	PAGE
Meteorological Observations in the Society's District. E. WALFORD, M.D., F.R.Met.Soc - - -	1
Address at the Unveiling of the Memorial to the late C. T. Vachell, M.D. C. ST. D. SPENCER - -	17
Castell Coch. JOHN STUART CORBETT - - -	20
Roman Remains—Cardiff Racecourse. JOHN WARD, M.A., F.S.A. - - - - - - - - -	24
The Lepidoptera of Glamorgan. H. M. HALLETT, F.E.S. - - - - - - - - -	45
Storm Burst in the Vale of Neath and its effect. F. T. HOWARD, M.A., F.G.S. - - - - -	87
Biological and Geological Section. Report and State- ment of Accounts for the Thirtieth Session, 1916-17	94
Archæological Section. Report for the Session 1916-17	98
Photographic Section. Report and Statement of Accounts for the Sixth Session, 1916-17 - -	99
Report of the Council of the Society, 1916-17 - -	102
Statement of Accounts for the Year ending September 30th, 1917 - - - - - - - - -	106
List of Past Presidents of the Society - - -	108
Officers and Council of the Society, 1917-18 - -	109



METEOROLOGICAL OBSERVATIONS IN THE SOCIETY'S DISTRICT, 1917.

By E. WALFORD, M.D., F.R.MET.SOC.

The average monthly rainfall over the whole of the Society's district (comprised within the semi-circular area, having the Beacons as its northernmost point, its base the coastline from Neath to Chepstow, and with a mean height of 637 feet above the sea level) was as follows :—

January	2·03 inches.
February	1·59 ”
March	3·54 ”
April	2·39 ”
May	3·81 ”
June	3·01 ”
July	3·31 ”
August	11·01 ”
September	3·65 ”
October	7·82 ”
November	3·41 ”
December	1·44 ”
	<hr style="width: 10%; margin: 0 auto;"/>
	47·01 ”
	<hr style="width: 10%; margin: 0 auto;"/>
Total in 1916	62·12 ”
„ 1915	51·52 ”
„ 1914	59·77 ”
„ 1913	57·17 ”
„ 1912	68·20 ”
„ 1911	50·95 ”
„ 1910	59·27 ”
„ 1909	50·83 ”
„ 1908	45·60 ”
„ 1907	52·37 ”
„ 1906	49·29 ”
„ 1905	39·98 ”
„ 1904	50·02 ”
„ 1903	67·90 ”
„ 1902	41·72 ”

OBSERVERS.		FEET ABOVE MEAN SEA LEVEL.	INCHES OF RAIN.
C. H. PRIESTLEY,	Summit of Tyle Brith, Brecknockshire	2350	63·28
„	Nant Penig	2000	78·19
„	Nant Ddu	1560	62·29
„	Storey Arms	1430	59·70
„	Beacons Reservoir	1340	69·39
„	Nant Gwineu	1275	49·04
T. W. COATES,	Pontlluestwen Reservoir, Maerdy, No. 1		
	Gauge	1250	72·31
„	„ No. 2 Gauge	1225	55·45
„	„ No. 3 Gauge	1200	66·73
H. C. STEEL,	Blaenavon Estate Office, Mon.	1150	50·98
C. H. PRIESTLEY,	Cantreff Reservoir	1120	63·50
„	Garw-nant	1100	59·70
R. C. HARRISON,	Gwernllwyn, Dowlais	1071	42·29
EBBW VALE STEEL, IRON, AND COAL CO.,	Ebbw Vale	902	48·96
C. H. PRIESTLEY,	Llwynon Reservoir, Brecknockshire	860	51·83
„	Troedyrhiw	860	54·16
„	Pont-ar-daf	850	56·31
GLYNCORRWG COLLIERY COMPANY,	Glyncorrgw	725	57·12
THE UNITED NATIONAL COLLIERIES, LTD.,	Treherbert	670	72·00
NEWPORT CORPORATION,	Newchurch, Wentwood, Mon.	525	40·07
„	Nantpridd, Wentwood, Mon.	500	38·19
„	Llanvaches Embankment	456	37·23
„	Pant-yr-eos Reservoir, Mon.	435	46·59
EDWARD CURRE,	Itton Court, Chepstow	390	32·75
E. TUDOR OWEN,	Ash Hall, Cowbridge	315	43·49
HENRY CLAY,	Piercefield Park, Chepstow	300	33·23
T. W. COATES,	Lan Wood Reservoir, Pontypridd	300	47·59
GODFREY L. CLARK, J.P.,	Talygarn, Glam.	250	49·98
JAMES WILLIAMS,	Wern House, Ystalyfera	240	63·00
SIR HENRY MATHER JACKSON, Bart.,	Llantilio Court, Mon.	230	19·50
E. WALFORD, M.D.,	Meteorological Station, Penylan, Cardiff	204	40·23
Rev. Canon HARDING,	Pentwyn, Rockfield, Mon.	191	30·44
J. F. MATTHYSSENS,	Witla Court, Rumney	177	36·77
The Hon. Lady SHELLEY,	The Hendre, Monmouth	176	28·55
C. H. PRIESTLEY,	Llanishen Reservoir, Glam.	155	36·38
„	Lisvane Reservoir, Glam.	150	34·34
Mrs. LYSAGHT,	Castleford, Chepstow	146	32·24
C. H. PRIESTLEY,	The Heath Filter Beds, Cardiff	132	38·43
NEWPORT CORPORATION,	Ynis-y-fro Reservoir, Mon.	130	36·38
C. H. PRIESTLEY,	Cogan Pumping Station, Glam.	121	31·92
„	Ely Pumping Station, Glam.	53	38·27
A. A. PETIGREW,	Roath Park, Cardiff	52	37·32
C. H. PRIESTLEY,	Trade Street Depot, Cardiff	45	38·39
NEWPORT CORPORATION,	Friars Street Depot, Newport	33	38·50
T. E. FRANKLIN,	Biglis Pumping Station, Cadoxton, Barry	20	32·61

TABLE I.

BAROMETRIC PRESSURE AND RELATIVE HUMIDITY.

1917.	Mean Barometric Pressure.*		Hygrometer.*		
	Uncorrected.	At M.S.L. and 32° F.	Dry Bulb (Mean).	Wet Bulb (Mean).	Mean Relative Humidity.
	in.	in.	°F.	°F.	%
January ..	29.706	29.931	34.8	33.8	89
February ..	29.914	30.144	34.6	33.6	89
March ..	29.667	29.838	38.6	36.9	71
April ..	29.739	29.948	43.1	40.2	78
May ..	29.968	30.141	55.7	51.1	72
June ..	29.888	30.048	58.8	55.2	78
July ..	29.936	30.092	60.3	56.9	80
August ..	29.592	29.747	58.4	56.6	83
September ..	29.925	30.081	56.8	55.0	88
October ..	29.604	29.787	46.5	44.5	85
November ..	29.954	30.154	47.2	45.8	89
December ..	30.022	30.245	37.1	35.6	86
Means ..	29.022	30.013	47.7	45.4	82

* From observations at 9 a.m. and 9 p.m.

TABLE II.

TEMPERATURE.

1917.	Maximum.	Minimum.	Mean of Maximum.	Mean of Minimum.	Mean Temperature.	Difference from Average (28 years).
	° F.	° F.	° F.	° F.	° F.	° F.
January ..	49.8	22.0	38.6	31.9	35.2	- 4.1
February ..	48.9	16.3	39.6	30.7	35.1	- 5.0
March ..	53.9	20.8	45.6	33.1	39.5	- 2.8
April ..	59.6	27.2	57.0	36.1	43.5	- 3.0
May ..	77.8	33.9	64.8	47.1	55.9	+ 3.4
June ..	84.1	43.1	67.3	50.7	59.0	+ 1.9
July ..	76.3	45.4	68.7	53.4	61.1	+ 0.4
August ..	73.0	47.9	64.5	54.7	59.6	+ 0.8
September ..	70.1	44.4	63.9	51.6	57.9	+ 1.5
October ..	63.2	30.0	53.6	40.0	46.8	+ 3.6
November ..	57.4	31.9	51.2	44.0	47.6	+ 3.2
December ..	51.1	22.3	42.2	33.1	37.7	- 3.0
	Max. 77.8	Min. 16.3	Mean 54.2	Mean 42.2	Mean 48.2	-11.9

TABLE III.

SOLAR AND TERRESTRIAL RADIATION, UNDERGROUND TEMPERATURE, AND SUNSHINE.

1917.	TEMPERATURE.			Bright Sunshine.	Bright Sunshine— Difference from Average (9 years).
	Grass Minimum (Mean).	Underground (Mean.)			
		1ft.	4ft.		
	° F.	° F.	° F.	hrs.	
January ..	28·6	37·7	42·2	50·2	— 1·4
February ..	25·4	34·2	38·6	68·7	— 11·3
March ..	28·2	39·9	41·1	114·7	+ 8·9
April ..	28·2	44·2	43·3	184·1	— 4·5
May ..	39·0	55·4	49·4	202·2	— 12·8
June ..	43·1	62·2	55·4	226·8	+ 16·3
July ..	46·2	63·3	58·0	219·2	+ 2·9
August ..	49·0	62·2	59·4	141·9	— 55·6
September ..	46·2	59·4	58·2	131·6	— 18·2
October ..	34·2	50·7	54·8	134·7	+ 38·8
November ..	40·1	47·6	50·4	54·4	— 12·8
December ..	27·4	40·6	47·1	78·3	+ 28·8
	Mean 36·3	Mean 48·7	Mean 49·8	Total 1606·8	— 19·9

TABLE IV.

RAINFALL.

1917.	Amount.	Difference from Average (28 years).	*Greatest Fall in 24 hours.	*Date of Greatest Fall.	*No. of Days with Rain (0·01 in. or more).
	ins.	ins.	ins.		
January ..	1·31	— 2·22	·32	5th	10
February ..	1·86	— 1·11	·74	19th	11
March ..	3·85	+ ·65	·74	8th	22
April ..	1·92	— ·75	·36	11th	14
May ..	3·79	+ 1·33	1·25	12th	14
June ..	2·47	— ·50	·63	28th	18
July ..	2·69	+ ·12	·71	8th	9
August ..	9·43	+ 5·31	1·36	27th	24
September ..	2·68	+ ·05	1·32	18th	12
October ..	7·00	+ 1·96	1·40	3rd	24
November ..	2·20	— 1·23	·45	8th	21
December ..	1·03	— 3·59	·35	15th	11
	Total 40·23	+ ·03	1·40	October 3rd	190

* 24 hours ending 9 a.m. next day.

MAIN FEATURES OF THE MONTHS.

1917.

JANUARY.

The weather was generally dry and cold, with prevailing east and north-easterly winds.

The barometric pressure was below the average, the mean reading being 29.706 inches.

The temperature was 4.1° below the average, the mean for the month being 35.2° . The maximum (49.8°) was reached on the 1st, the minimum (22.0°) on the 30th. The minimum on the grass was 18.4° on the 30th.

The total rainfall was 1.31 inches, being 2.22 inches below the average for 28 years. Rain fell on 10 days, the greatest fall in 24 hours was .32 inches on the 5th. The number of hours of bright sunshine amounted to a total of 50.2 hours, the average for the past nine years being 51.6 hours.

FEBRUARY.

The cold weather which characterised January continued with greater intensity during the early part of February. The cold spell lasted for 26 days, the continuous frost coming to an end on the 10th of this month. A heavy fall of snow occurred on the 5th and 6th. Generally the weather was dull and dry, with prevailing north-east and east winds during the earlier part of the month, and south-east during the later period.

The barometric pressure was above the average, the mean reading being 29.914 inches.

The mean temperature was 35.1° , being 5.0° below the average for 28 years. The maximum temperature was 48.9° on the 28th. The minimum was 16.3° on the 7th and 8th. The grass minimum was 4.3° on the 8th, the lowest ever recorded at this Station.

The total rainfall amounted to 1.86 inches, being 1.11 inches below the average. Rain fell on 11 days, the greatest fall (.74 inches) occurred on the 19th.

The number of hours of bright sunshine was 68·7, being 11·3 hours below the average for the past nine years.

MARCH.

The weather was cold and unsettled, with frequent snow showers and prevailing south and south-east winds during the earlier part of the month, and north and north-east during the later period; heavy and frequent gales were experienced during the month.

The mean barometric pressure was 29·667 inches, being approximately the average pressure for the month of March.

The mean temperature for the month was 39·5°, being 2·8° below the average. The maximum temperature (53·9°) was registered on the 17th and 18th, the minimum (20·8°) on the 8th. The minimum on the grass was 14·0° on the 9th.

The total rainfall for the month was 3·85 inches, being ·65 above the average. Rain fell on 22 days, the greatest fall being ·74 inches on the 8th. There was a heavy fall of snow on the 9th.

The number of hours of bright sunshine amounted to a total of 114·7 hours, being 8·9 hours above the average.

APRIL.

The weather continued abnormally cold and dull, with high winds and occasional gales, chiefly from the north-east and north-west.

The mean barometric pressure was 29·739 inches.

The mean temperature was 43·5°, being 3·0° below the average. The maximum (59·6°) was reached on the 22nd, the minimum (27·2°) on the 2nd. The grass minimum registered 17·0° on the 4th.

The total rainfall in the month was 1·92 inches, being ·75 inches below the average of 28 years. Rain fell on 14 days. No rain fell after the 17th of the month. The greatest fall in 24 hours (·36) was on the 11th. Snow fell rather heavily on the 10th, and also on the 11th, with thunder and lightning.

The total number of hours of bright sunshine amounted to 184 hours, being 4.5 hours below the average.

This month was probably one of the coldest Aprils on record, although towards the end the temperature was slightly above the average, and a general improvement and warmer weather set in.

MAY.

The improvement in the weather which commenced towards the end of April was maintained during May. The month was generally warm, although dull and rainy.

The mean barometric pressure was normal, being 29.968 inches, but very variable. Light easterly and north-easterly winds prevailed.

The mean temperature was 55.9° , being 3.4° above the average. The maximum of 77.8° was reached on the 26th, the minimum (33.9°) on the 7th. The grass minimum registered 27.0° on the 1st and 7th.

The total rainfall for the month was 3.79 inches, being 1.33 inches above the average. Rain fell on 14 days, the greatest fall (1.25 inches) on the 12th.

The total number of hours of bright sunshine amounted to 202.2 hours, or 12.3 hours below the average.

Thunder storms occurred on the 12th, 27th, and 28th.

JUNE.

The weather during the month was generally fine and bright, with plentiful sunshine and very little rain during the first fortnight. The prevailing wind was north-east.

The mean barometric pressure was 29.388 inches, with frequent and considerable variations.

The mean temperature was 59.9° , or 1.9° above the average. The maximum of 84.1° was reached on the 17th, the minimum (43.0°) on the 26th. The grass minimum thermometer recorded 31.0° on the 26th.

The total rainfall in the month amounted to 2.47 inches, being .50 below the average. Rain fell on 18 days. The greatest fall was .63 inches on the 28th.

A total of 226·8 hours of bright sunshine was recorded, during the month, being 16·3 hours above the average for the past nine years.

JULY.

The weather was generally fine and dry and warm, without any very hot days. North-easterly light winds prevailed during the earlier part of the month, and south and south-westerly winds towards the end of the month.

The mean barometric pressure was 29·936 inches, with considerable variations of pressure during the month.

The mean temperature was 61·1°, being ·40° above the average. The maximum of 76·3° was reached on the 22nd and 24th, and the minimum (45·4°) on the 2nd. The grass minimum thermometer recorded 36·0° on the 1st.

The total rainfall in the month amounted to 2·69 inches, being ·12 above the average. Rain fell on nine days, the greatest fall was ·71 inches on the 8th.

A total of 219·2 hours of bright sunshine was recorded, being 2·9 hours above the average for the past nine years.

AUGUST.

This month was excessively wet and dull, with few hot, or even warm days. Wet Augusts are not uncommon, but in this year a record in this respect was reached.

The barometric pressure was generally low, the mean for the month was 29·592. West and south-west winds prevailed.

The mean temperature was 59·6°, being ·8° below the average. The maximum (73·0°) was reached on the 6th, the minimum (47·9°) on the 27th. A minimum of 40·0° was recorded on the grass on the 27th.

The total rainfall in this month amounted to the high figure of 9·43 inches, or 5·31 inches above the average for 28 years. Rain fell on 24 days. The greatest fall in 24 hours was 1·36 inches on the 27th.

A total of 141·9 hours of bright sunshine was recorded, which was 55·6 hours below the average of the past nine years.

SEPTEMBER.

The weather was dull and showery, with prevailing westerly winds.

The mean barometric pressure was 29.925 inches. The mean temperature was 57.7° , and 1.5° above the average. The maximum of 70.1° was reached on the 4th and 7th, the minimum (44.4°) on the 30th. The grass minimum thermometer recorded 36.0° on the 27th.

The total rainfall was 2.68 inches, being .05 inches above the average for 28 years. Rain fell on 12 days. The greatest fall was 1.32 inches on the 18th.

A total of 131.6 hours of bright sunshine was recorded, which was 18.2 hours below the average for the past nine years.

OCTOBER.

The weather was variable, at times fine and bright, but with many wet days and prevailing westerly winds.

The barometric pressure was generally low, the mean for the month was 29.604 inches.

The mean temperature was 46.8° , being 3.6° below the average. The maximum of 63.2° was reached on the 2nd, and the minimum (30.0°) on the 28th. The grass minimum thermometer registered 22.0° on the 28th.

The total rainfall for the month amounted to 7.00 inches, being 1.96 above the average. Rain fell on 24 days, the greatest fall (1.40 inches) occurred on the 3rd.

A total of 134.7 hours of bright sunshine was recorded, being 39.8 hours above the average for the past nine years.

NOVEMBER.

The weather was dull and windy, but warm for the time of the year. Westerly winds prevailed.

The mean barometric pressure for the month was above the average, being 29.956 inches.

The mean temperature was 47.6° or 3.2° above the average. The maximum (57.4°) was reached on the 21st, the minimum (31.9°) on the 15th. A temperature of 24.0° was registered by the grass minimum thermometer on the 15th.

The total rainfall in the month amounted to 2.20 inches, being 1.23 inches below the average. Rain fell on 21 days, the greatest fall (.45 inches) occurred on the 8th.

A total of 54.4 hours of bright sunshine was recorded in the month, being 12.8 hours below the average of the past nine years.

DECEMBER.

The weather was generally bright, dry, and cold, with easterly winds prevailing.

The barometric pressure was comparatively high, the mean for the month being 30.022.

The mean temperature was 37.7°, or 3.0° below the average. The maximum (51.0°) was reached on the 7th, the minimum (22.3°) on the 19th. The grass minimum thermometer registered 15.0° on the 19th.

The total rainfall in the month amounted to 1.03 inches, being 3.59 inches below the average. Rain fell on 11 days, the greatest fall (.35 inches) occurred on the 15th.

A total of 78.3 hours of bright sunshine was recorded, being 28.8 hours above the average.

EXTREMES.

December was the driest month in the year, with a rainfall of 1.03 inches.

August was the wettest month, with a rainfall of 9.43 inches.

October was also a wet month, with a rainfall of 7 inches.

The wettest day was the 3rd October, with a rainfall of 1.40 inches.

Rain fell on 190 days, the total amounting to 40.23 inches, approximately the average for 28 years.

The hottest day was the 17th June, when a temperature of 84.1° was recorded.

The coldest days were February 7th and 8th, the minimum temperature recorded being 16.3°.

The total number of hours of sunshine was 1,606.8, being 19.9 hours below the average.

EARTHQUAKES.

The Seismograph at the Station gave the following records of earthquakes during the year 1917 :—20th February, 1st May, and the 15th November.

The meteorological conditions in 1917 were, on the whole, favourable to the public health : the crude death-rate was at the rate of 13·4 per 1,000 persons living, the lowest rate on record. No prolonged or excessive heat waves were experienced during the summer, the mortality from summer diarrhœa amongst infants was therefore low, consequently the low rate of infant mortality of 1916 was maintained. The mortality from respiratory diseases, pneumonia, bronchitis, &c., was, as usual, more marked in the summer months, and influenced the death-rate recorded in these months, as will be seen by reference to the attached table.

Month.	Annual death-rate per 1,000.					Deaths under 1 year per 1,000 births.				
	1913.	1914.	1915.	1916.	1917.	1913.	1914.	1915.	1916.	1917.
January ..	14·7	16·2	15·4	14·0	15·0	134	130	96	77	144
February ..	14·1	16·7	17·0	14·0	17·9	99	133	82	73	191
March ..	12·8	15·5	18·3	15·1	15·1	115	108	114	116	97
April ..	13·1	13·9	15·2	14·6	14·6	87	108	85	103	102
May ..	11·3	13·1	11·9	13·8	11·1	95	89	101	75	74
June ..	11·6	11·0	11·5	9·2	10·9	71	79	67	44	53
July ..	8·1	10·1	10·5	9·4	9·4	48	78	62	62	74
August ..	14·7	10·1	10·7	8·4	9·0	195	89	44	55	96
September ..	14·9	12·7	13·6	12·9	8·4	204	162	201	150	60
October ..	12·6	11·6	14·7	10·6	10·6	118	72	129	98	100
November ..	12·3	13·6	14·3	13·1	11·7	92	127	136	66	52
December ..	14·1	15·6	15·6	18·5	12·6	137	122	151	140	123
Year ..	13·7	14·0	14·8	13·7	13·4	115	109	106	89	99

RAINFALL IN THE DISTRICT, 1917.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Summit of Tyle Brith Average ...	2·07 6·74	1·63 5·47	2·66 5·03	2·20 4·42	6·07 4·24	4·39 4·29	4·63 4·96	17·66 6·92	4·29 4·92	10·58 8·37	5·44 7·45	1·66 9·39	62·28 72·80		
Nant Penig Average ...	3·15 8·64	1·81 6·63	3·51 7·42	4·08 5·61	5·61 4·16	5·16 4·92	5·12 5·14	19·41 8·05	5·59 4·78	14·27 9·15	8·10 7·91	2·38 11·64	78·19 84·05		
Nant Ddu ...	2·91	1·64	3·69	2·80	4·59	3·46	4·87	15·14	4·00	10·98	6·31	1·90	62·29		
Storey Arms Average ...	1·96 6·19	1·73 5·55	4·58 5·89	2·05 4·49	6·14 3·82	4·07 4·31	4·21 4·03	15·85 6·87	3·77 3·94	9·68 8·34	3·84 6·77	1·82 9·82	59·70 70·02		
Beacons Reservoir Average ...	3·15 8·03	1·85 6·36	4·34 6·60	3·01 4·98	5·22 4·16	4·23 4·42	4·59 5·09	17·04 7·76	4·75 4·45	12·10 8·79	6·25 7·85	2·86 10·54	69·39 79·03	228 ...	{ 1·98 Aug. 17th.
Nant Gwineu ...	2·24	1·52	2·67	1·80	4·39	2·60	3·57	12·27	3·53	8·55	4·39	1·51	49·04		
Pontlluestwen Reservoir (No. 1 Gauge)	3·66	2·02	4·10	3·80	4·08	4·26	5·32	16·92	6·39	13·07	6·15	2·54	72·31	216	{ 2·49 Aug. 18th.
Pontlluestwen Reservoir (No. 2 Gauge)	2·46	1·71	3·65	2·50	3·76	3·29	4·08	13·55	4·49	9·40	4·82	1·74	55·45	210	
Pontlluestwen Reservoir (No. 3 Gauge)	3·16	1·74	4·08	3·23	4·05	3·72	4·98	15·80	5·61	12·19	5·85	2·32	66·73	210	
Blaenavon ... Average ...	2·30 5·02	1·41 5·23	5·66 5·73	2·12 3·82	6·18 3·47	3·21 3·35	2·70 3·14	11·57 4·65	4·36 2·89	7·09 6·63	2·86 5·32	1·52 7·72	50·98 56·97	175 ...	{ 1·62 Sept. 19th.

RAINFALL IN THE DISTRICT, 1917.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Cantrefr Reservoir	3·02	1·98	4·55	3·09	3·96	3·33	4·80	15·46	4·11	10·49	6·23	2·48	63·50	214	1·82
Average	7·18	5·83	5·84	4·43	3·75	3·82	4·11	6·65	3·82	7·82	6·72	9·32	69·29	...	{ Aug. 13th and 17th.
Garw-nant...	3·38	1·81	3·95	2·72	4·21	2·92	4·39	13·90	4·23	9·85	5·98	2·36	59·70		
Dowlais, Gwernllwyn	1·90	1·17	4·01	2·06	3·62	2·95	2·89	9·91	3·28	6·51	3·03	·96	42·29	202	1·33
Average	4·95	4·21	4·15	3·20	2·78	2·94	3·22	4·97	3·01	6·14	5·18	6·89	51·04	...	{ Sept. 18th.
Ebbw Vale	2·10	1·31	4·95	3·31	4·87	3·08	2·84	9·89	4·13	8·02	2·83	1·63	48·96	204	1·53
Average	5·32	5·96	5·46	3·75	3·35	3·54	3·40	5·19	2·42	7·77	5·45	9·14	60·75	...	{ Sept. 18th.
Llwynon Reservoir	2·63	1·75	3·52	2·48	3·99	2·46	3·73	12·67	3·41	8·65	4·52	2·02	51·83	221	2·25
															{ Aug. 13th.
Troedyrhiw	2·44	1·88	4·12	2·94	4·03	2·47	3·87	13·21	3·52	9·15	4·67	1·86	54·16		
Pont-ar-daf	3·03	1·74	4·45	2·94	4·23	2·85	4·12	13·16	3·68	9·12	5·01	1·98	56·31	218	2·14
															{ Aug. 13th.
Glyncorrwg Colliery	3·34	·80	1·54	3·09	3·28	3·78	4·55	14·40	7·46	7·04	5·22	2·62	57·12	171	2·58
Average	8·64	6·76	6·93	5·17	4·65	4·87	5·47	8·39	5·37	8·95	8·20	11·18	84·58	...	{ Aug. 18th.
Treherbert, United Nat. Collieries, Ltd.	3·40	2·25	5·08	4·16	4·96	3·44	5·06	17·62	4·66	12·57	6·40	2·40	72·00	228	2·08
Average	8·26	6·63	6·84	4·98	4·19	4·40	4·89	8·78	4·77	9·08	8·17	11·38	82·37	...	{ Aug. 17th.
Newchurch, Wentwood, Mon.	1·28	1·40	4·10	2·84	3·33	2·85	2·43	10·20	3·69	5·37	1·67	·91	40·07	192	2·00
															{ Sept. 18th.

RAINFALL IN THE DISTRICT, 1917.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 in. or more rain.	Greatest fall in one day.
Nantypriid, Wentwood, Mon.	1.17	1.31	3.82	2.50	3.40	2.77	2.38	9.36	3.58	5.43	1.66	.81	38.19	192	{ 1.87 { Sept. 18th.
Llanvaches Embankment, Mon.	1.10	1.29	3.86	2.53	3.47	2.48	2.56	8.55	3.50	5.59	1.49	.81	37.23	197	{ 1.62 { Sept. 18th.
Pant-yr-eos Reservoir, Mon.	1.94	1.68	4.38	2.93	3.56	3.30	2.79	10.22	3.78	8.31	2.58	1.12	46.59	205	{ 1.65 { Sept. 18th.
Chepstow, Itton Court ...	1.36	1.11	3.00	2.28	2.48	2.08	2.24	8.16	3.54	4.58	1.27	0.65	32.75	171	{ 1.94 { Sept. 18th.
Average ...	3.34	2.86	2.87	2.27	2.30	2.50	2.67	4.04	2.42	4.57	3.47	4.63	37.94	...	...
Cowbridge, Ash Hall ...	2.16	2.08	3.34	1.94	3.50	2.10	4.58	8.89	2.75	7.42	3.55	1.18	43.49	195	{ 1.83 { Oct. 3rd.
Average ...	3.99	3.30	3.55	2.76	2.53	2.68	3.15	4.44	3.14	5.29	4.27	5.56	44.66	...	...
Chepstow, Piercefield Park ...	1.44	1.33	3.02	2.03	2.07	2.54	2.31	7.95	3.62	4.97	1.31	0.64	33.23	153	{ 2.16 { Sept. 18th.
Average ...	2.99	2.56	2.76	2.17	2.27	2.41	2.58	3.57	2.17	4.11	3.16	4.16	34.91	...	...
Pontypriid, Lan Wood Reserv. ...	1.92	1.58	3.18	2.27	3.24	2.45	3.00	11.63	3.97	9.10	3.70	1.55	47.59	208	{ 1.52 { Aug. 9th.
Average ...	5.05	4.76	4.23	3.31	2.64	3.06	3.13	5.25	3.45	6.39	5.38	7.35	54.60	...	...
Talygarn ...	3.81	1.97	3.26	2.27	3.73	2.96	3.46	9.64	3.76	9.48	4.49	1.15	49.98	195	{ 1.79 { Oct. 4th.
Average ...	6.42	4.76	4.96	3.55	2.81	2.98	3.32	4.84	3.87	6.58	5.53	8.39	58.01	...	{ 1.91 { Aug. 17th.
Ystalyfera, Wern House ...	2.67	2.08	3.45	3.94	3.49	3.99	5.39	15.94	4.00	10.46	5.29	2.30	63.00	219	{ 1.91 { Aug. 17th.
Average ...	6.62	5.89	5.85	4.31	3.73	4.22	4.11	6.34	3.57	7.59	6.43	9.11	67.77	...	...
Llantilio Court, Mon. ...	1.03	1.22	2.36	1.22	2.81	1.77	.75	4.80	2.22	1.32	—	—	19.50	77	{ 1.62 { Sept. 18th.
Average ...	2.71	2.55	3.11	2.06	2.29	2.10	2.33	3.19	2.13	4.22	2.85	4.17	33.71	...	...

RAINFALL IN THE DISTRICT, 1917.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Cardif Meteorological Station, Fenylan	1·31	1·86	3·85	1·92	3·79	2·47	2·69	9·43	2·68	7·00	2·20	1·03	40·23	190	{ 1·40 Oct. 3rd.
Pentwyn, Rockfield, Mon.	1·13	1·35	2·79	1·31	3·22	3·23	2·00	6·07	3·03	4·03	1·42	·86	30·44	166	{ 1·49 Sept. 18th.
Ramney, Witla Court ...	1·13	1·78	2·75	2·03	3·19	2·71	2·57	8·30	2·58	6·71	2·02	1·00	36·77	150	{ 1·46 Oct. 3rd.
Monmouth, The Hendre... Average ...	1·09 2·41	1·34 2·23	2·78 2·28	1·12 1·78	3·12 2·10	3·58 2·05	2·00 1·93	5·04 2·84	2·97 1·82	3·58 3·72	1·20 2·62	0·73 3·62	28·55 29·40	168 ...	{ 1·49 Sept. 18th.
Llanishen Reservoir ... Average ...	1·37 3·38	1·56 2·76	3·20 3·06	1·66 2·38	3·44 2·30	2·48 2·51	2·79 2·83	7·81 4·18	2·60 2·56	6·35 4·70	2·06 3·60	1·06 4·88	36·38 39·14	182 ...	{ 1·33 Sept. 18th.
Lisvane Reservoir ... Average ...	1·28 3·18	1·61 2·61	3·31 2·86	1·45 2·29	3·41 2·21	2·38 2·35	2·71 2·64	7·66 2·37	2·53 4·30	5·44 3·26	1·59 4·46	·97 3·77	34·34 36·30	179 ...	{ 1·39 Sept. 18th.
Chepstow, Castleford ... Average ...	1·50 2·81	1·31 2·67	3·24 2·93	1·97 1·81	2·46 2·28	2·66 2·67	2·17 2·63	7·42 3·50	3·01 1·77	4·45 4·70	1·26 3·04	0·79 4·70	32·24 35·51	168 ...	{ 1·45 Sept. 18th.
Cardiff Heath Filter Beds Average ...	1·51 3·68	1·67 2·92	3·22 3·28	1·77 2·41	3·16 2·34	2·57 2·46	2·64 2·78	8·52 4·13	2·84 2·70	6·95 4·76	2·47 3·81	1·11 5·16	38·43 40·43	196 ...	{ 1·40 Sept. 18th.
Fonmon Castle ... Average ...															
Ynisyfro Reservoir, Mon.	1·33	1·54	3·59	1·63	3·81	2·90	2·02	7·84	2·99	5·84	1·87	1·02	36·38	204	{ 1·41 Sept. 18th.

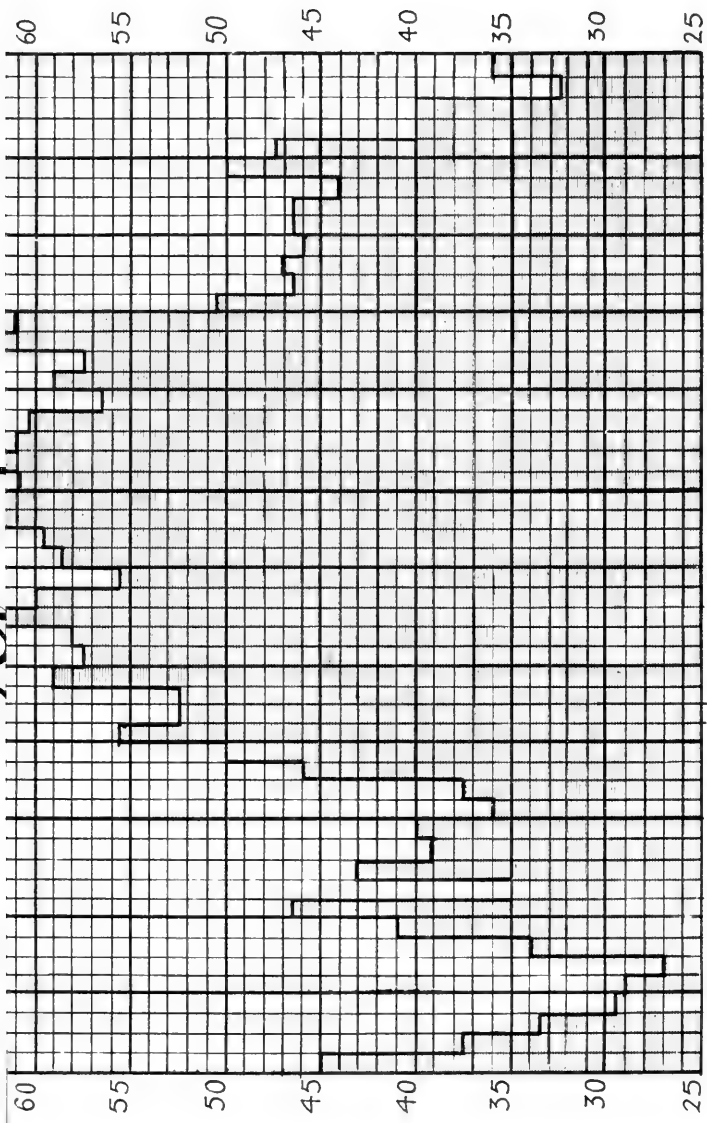
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RAINFALL IN THE DISTRICT, 1917.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Cogan Pumping Station ...	1·06	1·33	2·58	2·02	2·54	2·04	2·15	7·24	2·03	5·99	1·92	1·02	31·92	177	1·45
Average ...	3·11	2·65	2·94	2·21	2·11	2·31	2·85	3·89	2·59	4·40	3·47	4·54	37·07	...	{ Oct. 3rd.
Ely Pumping Station ...	1·36	1·56	3·04	2·16	3·36	2·71	2·52	7·90	2·77	7·06	2·55	1·28	38·27	247	1·55
Average ...	3·72	2·98	3·35	2·51	2·38	2·54	3·04	4·40	2·83	4·93	3·92	5·21	41·81	...	{ Oct. 3rd.
Cardiff, Roath Park ...	1·32	1·58	3·16	1·79	3·14	2·64	2·70	8·50	2·04	6·70	2·09	1·06	37·32	188	1·39
															{ Oct. 3rd.
Cardiff, Trade St. Depot ...	1·32	1·55	3·21	2·20	2·75	2·60	2·55	8·50	2·49	7·89	2·27	1·06	38·39	184	1·68
Average ...	3·63	3·11	3·42	2·49	2·30	2·74	2·63	3·94	2·26	4·96	3·59	5·21	40·28	...	{ Oct. 3rd.
Newport, Friars St. Depot	1·13	1·48	3·43	1·62	5·28	2·78	2·25	8·41	3·13	6·15	1·82	1·02	38·50	184	1·82
															{ May 12th.
Cadoxton, Biglis Pmg. Stn.	1·29	1·43	2·43	1·93	2·54	2·53	2·90	6·02	2·26	6·22	2·01	1·05	32·61	171	1·76
Average ...	2·72	2·40	2·59	2·05	1·81	2·19	2·59	3·71	2·52	4·19	3·02	4·15	33·93	...	{ Oct. 3rd.

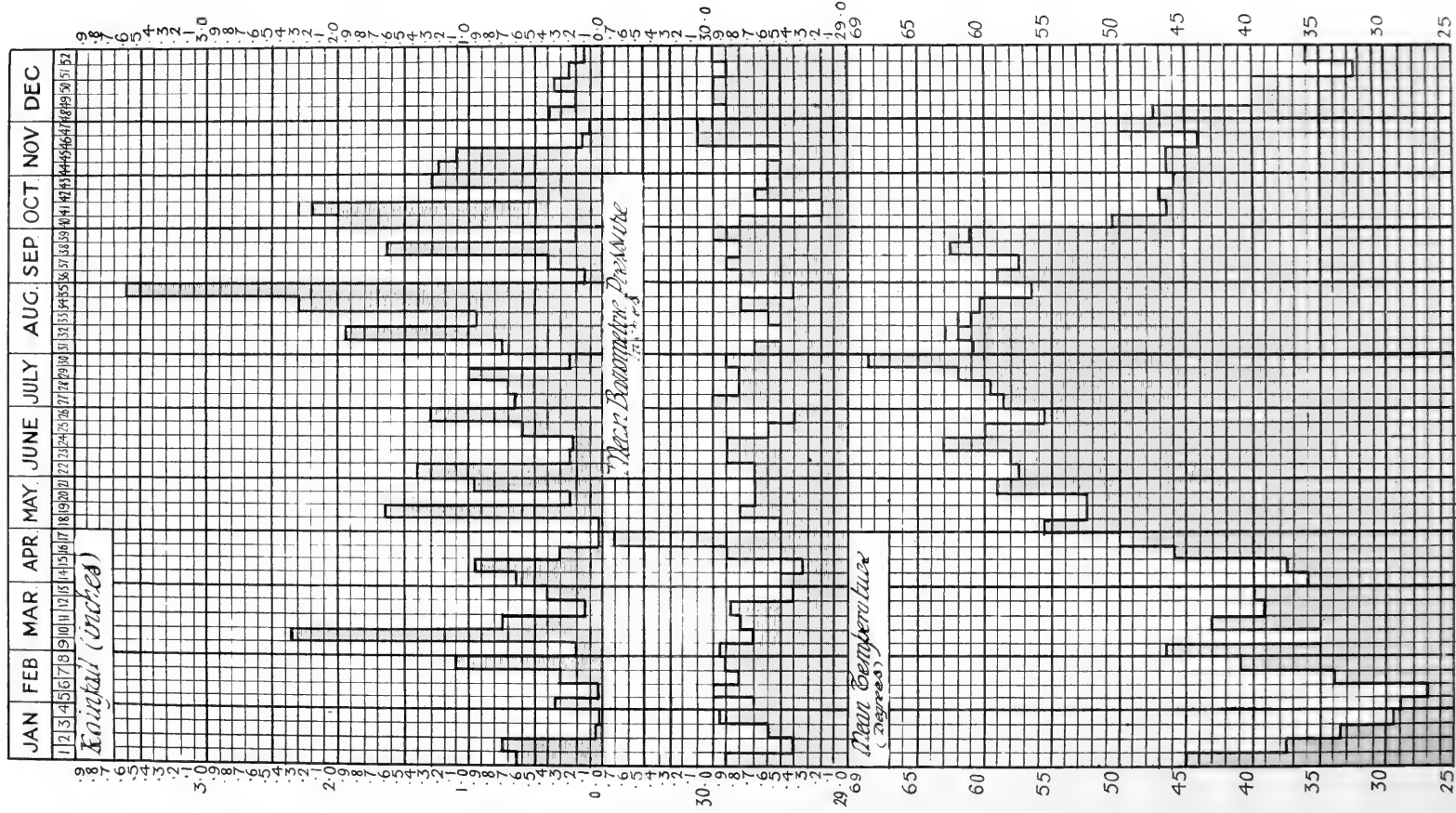
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Chart

SHOWING RAINFALL MEAN BAROMETRIC PRESSURE, AND MEAN TEMPERATURE
 RECORDED AT THE METEOROLOGICAL STATION, PENYLAN, CARDIFF.
 IN EACH WEEK, DURING THE YEAR 1917.



ADDRESS AT THE UNVEILING OF THE
MEMORIAL TO THE LATE
C. T. VACHELL, M.D., ON APRIL 14TH, 1917.

BY C. ST. D. SPENCER.

You must, please, understand that I am only going to do the best I can to fill a place which others might have much better occupied—someone more learned in stained glass might better describe the beauties of the window which we are met to dedicate, and some older friend could do more justice to him in whose memory it has been erected.

I wish in the first place to thank every subscriber to the memorial fund, from the largest to the smallest, for the liberality which has enabled the memorial to Dr. Charles Vachell to take so noble and adequate a form—when the first meeting to consider the form of a memorial was called, the world was at peace, and even then it was only with some hesitation that the East window of this Church was suggested as a possible form of commemoration—while the appeal for funds was in the post, the World-war broke upon us, and the response to the first circular was in itself as great a testimony to the worth of our old friend as the stained glass behind me.

It is easier to understand in oneself the readiness of this response than it is to give expression to the reason of it in words before a gathering, many of whom were in closer touch with Dr. Vachell than I have been, but I think that it was the enthusiasm which he brought to every matter in which he was concerned which appealed most strongly to his friends; there were no half-measures with him—if a thing was worth touching at all, it was worth not only doing well, but worth doing with all his heart and soul, and he was a many-sided man; there were such varied objects which he found worth

doing ; he was scarcely a public man in the ordinary sense of the word ; he was never Mayor of the old town ; Lord Mayor of the new city, and yet without any memorial especially dedicated to himself so long as the King Edward VII. Hospital, the National Museum of Wales, or the Cardiff Naturalists' Society endure, it is hard to believe that Dr. Vachell's name and intimate and ardent connection with each of them will be forgotten.

It is not too much to say that these three great undertakings owe as much to Dr. Vachell as to any other one citizen of Cardiff ; these, and works like these, are the real memorial of the man ; the East window of this Church is only an expression of the feelings inspired in his friends by a life spent not so much in the public service as for the public good.

You will, I am certain, all agree with me that of all possible means of commemoration a window is the most suitable to recall the ideals of our late friend ; the main object of a window, even though it be of stained glass, is to let in the light, and to let light into the dull places of life was, to my mind, one of the doctor's great characteristics. Sometimes it was natural science in the ordinary wide sense, sometimes it was that medical science of which for so many years he was one of the great exponents in this part of the world—but, whatever the object on which he was engaged, throwing more light upon it with all the energy at his command was Dr. Vachell's great delight.

I have tried to touch very briefly on the semi-public side of his career, and I shall be even briefer on the personal side, because no one needs to be reminded of the cheery optimistic doctor who, either as friend or physician, was so well known and welcome to all of us ; we can all draw our own picture of him in the exact tone of colour which best suits the phase of him which each of us knew best, but there will be a strong family likeness between all these mental portraits, and kindness and hopefulness must be strong features in each of them, especially, perhaps, hopefulness. I could not wish a more

certain antidote to depression in these times than a talk with him, and as to his kindness, there must be for each one of us whom somewhat better worldly circumstances have enabled to subscribe to this window, a score whose experiences of his ways would have made subscribers had they the means.

Finally, there is the domestic side of his life, on which I cannot touch at all, except to say that I feel his memory there is quite safe in the hearts of those who mourn his loss.

Before I finish, I think I ought to say a few words about the window itself. When once it had been decided that the East window of this Church was to be undertaken, there scarcely seemed a question as to the figures which should fill the five bays, "the Christ" for the central figure is almost a necessity for a main East window, and St. John the Baptist and the Virgin Mary as the Patron Saints of the two great parent Churches of this city followed as a course; Dr. Vachell's profession called for St. Luke the physician, and who could more adequately fill the fifth place than St. David, the Patron Saint of all good Welshmen?

The work was entrusted to Mr. J. N. Comper, of Norwood, who had already a knowledge of the Church, and who had recently executed some very beautiful work in Westminster Abbey. The sketch submitted by him was in some particulars improved by Mr. J. S. Corbett and Mr. E. W. M. Corbett, to whose efforts in all directions the success of this memorial is largely due—that the window goes further in letting in the light than most windows of its kind is, I think, beyond doubt, and yet the richness of tone of the blue and ruby, and the brilliance of the yellow employed, prevent the general effect from being sketchy; there will, no doubt, be some criticism of the unconventional treatment of the centre figure, but when the last critic has had his say, I trust that the general opinion will be unanimous that the work is worthy of its object, and of its fine position in this old Church.

CASTELL COCH.

THE FOLLOWING IS A COPY OF A SHORT PAPER ON CASTELL COCH READ BY MR JOHN STUART CORBETT, ON THE OCCASION OF A VISIT OF MEMBERS OF THE CARDIFF NATURALISTS' SOCIETY TO THE CASTLE, ON JUNE 27TH, 1917.

I have been asked to say something to you as to the history of this Castle, and that is in one sense a simple, and in another a most difficult matter, for practically nothing is known of its history, and very little of its origin.

We are in the Red Castle in the Red Forest; the name of the Castle, which it shares with several others in Wales, being no doubt derived from the colour of the local stone of which it was built, which, when the building was new, would have a distinctly red appearance. As to the Red Forest, by which name the wood in which the Castle stands was known in mediæval times, it seems probable that it was derived from the autumnal colour of the beech trees, of which the wood largely consisted, in those days perhaps to a greater extent than at present.

So far as I am aware, the Castle is not even mentioned in any document of a date near the time of its building, and this is curious, considering the numerous records (printed by the late Mr. Clark in his "Cartæ") which exist with respect to the disputes about the building of Caerphilly, and the fact that it is almost certain that Castell Coch must have been built about the same time, and by the same person, namely, Earl Gilbert de Clare, who ruled in Glamorgan from 1262 to 1295. Mr. Clark, in his "Mediæval Military Architecture," expresses the view that Castell Coch might be slightly earlier than Caerphilly, but the two must have been so near in point of date that it would hardly be possible to found any argument as to the order in

which they were built from the style of the architecture. I here refer to the earlier portion of Caerphilly built by Gilbert de Clare. In his "Land of Morgan," Mr. Clark regards it as certain that Castell Coch was the work of that Gilbert de Clare who built Caerphilly, and at a somewhat later date, Morlais.

That he must have been the builder, and the approximate date, can be proved with practical certainty from historical facts known to us.

The Lordship of Senghenydd, in which both Castell Coch and Caerphilly stand, was in the hands of Welsh Lords up to the time of the above-mentioned Gilbert de Clare.

An extent or inquisition of Glamorgan, taken soon after the death of his father, Earl Richard, in 1262, expressly mentions that Griffith ap Rees held Senghenydd at that time, owing no service but a heriot at death.

It was not until 1266 or early in 1267 that Gilbert, son of Richard, captured and imprisoned this Griffith, who was last Welsh Lord of Senghenydd, and seized the district into his own hands. Then followed the building of Caerphilly and the long controversy with Llewelyn, Prince of Wales, to which this gave rise, and which at last terminated by the death of Llewelyn and the conquest of North Wales by Edward I. This event, and the end which it put to the fear of invasion from the north down the Valley of the Taff, would much reduce the importance of Castell Coch, and may be the reason why no mention is made of it in the inquisitions on the deaths of Lords of Glamorgan, with one exception, the inquisition taken in 1307 on the death of Joan, Countess of Gloucester, where "*Rubum Castrum*" is mentioned in a list of the "members" of Senghenydd. Practically all we know about its origin is that it was almost certainly built by Gilbert de Clare. It could not be earlier than his time, because he was the first Lord of Glamorgan to possess Senghenydd.

What happened to it afterwards, we do not know. There are legends, referred to by Mr. Clark in his "*Mediaeval Military Architecture*," of its having been taken by the Welsh.

Such events might have happened in the great rising which took place in 1295, the last year of de Clare's life, in the rising of Llewelyn Bren in 1315, or in the wars of Owen Glyndwr. In fact, there can scarcely be any doubt that if it was maintained as a fortress in Glyndwr's time it would fall into his hands, as was the case with Caerphilly and Cardiff.

In his description of the Castle, as it was in its ruined condition before the recent restoration, Mr. Clark says that two-thirds of the circumference of the South tower had been blown away by a mine. If this is so, it followed that its destruction took place after gunpowder had come into use, though at what date we do not know. It seems to me not improbable that it may have been destroyed by Owen Glyndwr, like so many other Castles in the neighbourhood.

At any rate, it was in ruins in Leland's time, for he writes thus:—

“ Castelle Gogh standeth on a high Rok of a redde stone
 “ or Soile a 2 Miles from Landaf upper on Taue; a
 “ quarter of a mile from the Est Ripe of Taue
 “ Castelle Gough al in Ruine no bigge thing but high.
 “ It longith to the King and standeth by ‘ Keuen On.’ ”

Rhys Myrkyke says of the Castle that it was supposed to be built by Ivor Bach, which is of course quite impossible as regards the Castle with which we are dealing.

If in fact Ivor had any fortress hereabouts, it must have been some previous building either on or near the site of the present Castle, or else perhaps what Mr. Clark calls “ the Cymric Camp ” higher up. What exactly that camp was I do not know. It is marked on the Ordnance Map as remains of an entrenchment, but I am not aware whether it has ever been carefully examined.

Ivor Bach was Lord of Senghenydd and ancestor of that Griffith ap Rhys who was dispossessed by de Clare, and it may well be true that he had some stronghold at or near the site of the Castle. Of that, however, nothing is certainly known. What no doubt is true is that he surprised Cardiff Castle in

or about 1158 and took William, Earl of Gloucester, prisoner, carrying him off to some fastness in the hills, which may or may not have been near this place.

Mr. Clark in his work to which I have referred gives a very careful and minute description of the ruins as they stood before reconstruction, so far as he was able to investigate them, which he describes as being a matter of some difficulty, owing to the extent to which they were overgrown with brushwood. I may add that in a paragraph at the end of his notice, added after the rebuilding, Mr. Clark says the restoration is very complete and in strict accordance with what has been ascertained of the original structure.

ROMAN REMAINS—CARDIFF RACECOURSE.

BY JOHN WARD, M.A., F.S.A.,

Keeper of the Archaeological Department, National Museum
of Wales.

Of the large low-lying alluvial tract through which the three rivers, the Ely on the west, the Rhymney on the east, and the Taff midway between the two, reach the Severn Sea, only a small portion extends westwards beyond the first river, and on this is the Cardiff Racecourse, the City of Cardiff occupying the rest as far as the last river. The Ely hereabouts flows windingly to the south-east, and north of the Racecourse is bridged by the Cowbridge Road, which heads south-west. Within the angle formed by the two and about the middle of the course, are the obscure mounds and hollows which we are about to consider. They are distant nearly half-a-mile south-by-east of Ely Bridge, and are about midway between the river and the road ; while some 130 feet to the south is the modern straight course of the Caerau Brook, and a quarter-of-a-mile further, the steep wooded slope of Cocks Hill. The Cowbridge Road here is by general consent regarded as part of the important Roman highway popularly known as the Via Julia, and Ely Bridge as the place where it crossed the river.

In the Spring of 1894, the late Mr. John Storrie called the attention of the Committee of the Cardiff Naturalists' Society to these mounds, and more especially to the fact that they contained ancient pottery, as proved by some trial holes he had made. The Committee decided upon a thorough investigation, and to this end made a grant of £25 towards the expenses, and issued an appeal for contributions, which yielded a further sum of £37. Mr. Storrie was engaged to superintend the work of excavation. A trench, 335 feet long and about 4 feet 6 inches

wide, was cut through the largest group of mounds from W.S.W. to E.N.E., and on June 26th he submitted a letter (afterwards printed as a circular¹) stating what he had done and had found. The trench had brought to light the remains of several walls and concrete floors of a Roman building, a roadway, and potsherds and other small finds of that and (as he supposed) an earlier era. He had by that date dug 81 holes in the mounds and their vicinity, and had come to the conclusion that they were "not artificial but morainic and natural, and that having been found by the early men, habitations were erected on them."

In the next stage of the work, the walls and floors exposed in the trench were followed up by further digging. On July 13th a second appeal was made for contributions, and this yielded nearly £34; but five weeks later the work had to cease for lack of funds. I then received instructions to make a selection of the finds for the Museum, and during the following fortnight or more, I was frequently on the spot studying the surface-configuration and structural remains and making notes, plans, and sketches of details. Shortly afterwards the diggings were filled in.

In the *Cardiff Naturalists' Transactions*, Vol. 26, pp. 125-8, is published a short, but unsatisfactory report, on the investigation, apparently drawn up by the then newly-formed Archæological Section, and with it is associated a plan of the portion of the remains brought to light.² The situation, excavations, and general results are condensed into a page-and-a-quarter, the rest of the report consisting of an incomplete list of the small or "portable" finds. It need hardly be said that

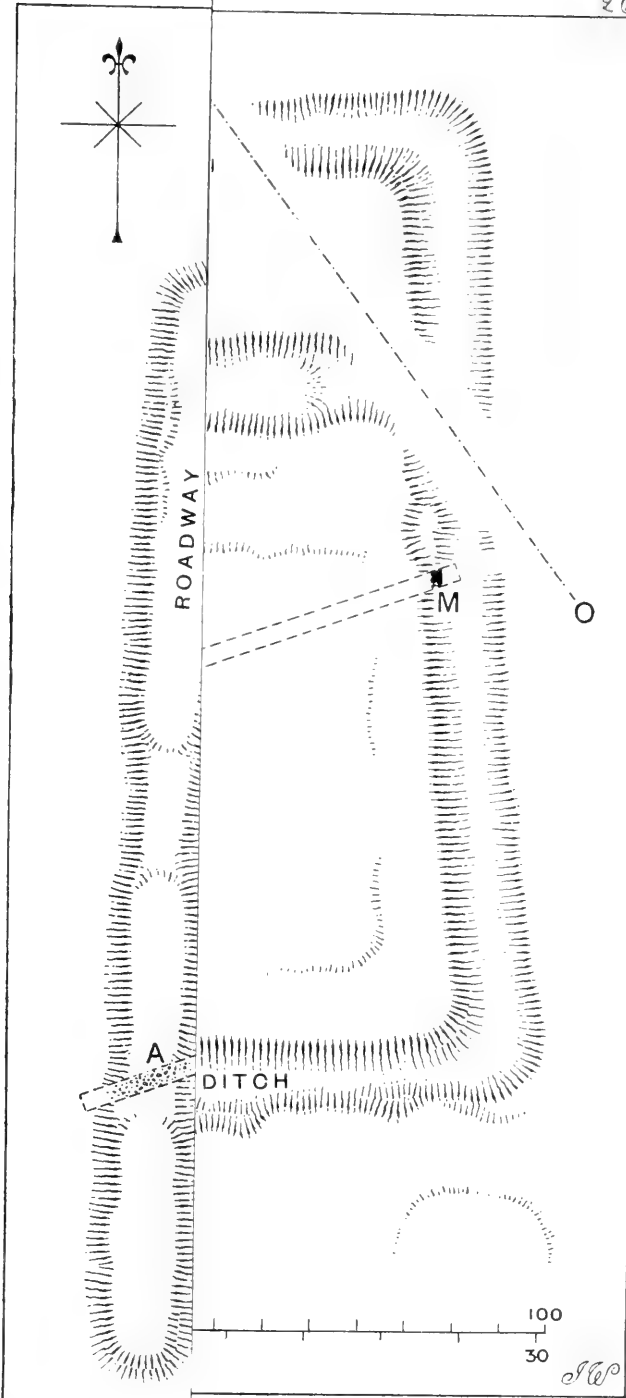
1. This letter appeared verbatim in *The Antiquary* for August, 1894, Vol. 30, p. 46.

2. In Lyell's useful "Bibliographical List of Romano-British Architectural Remains" (1912), under the head of our subject, the reader is referred to the *Antiquary*, *Archæologia Cambrensis*, *Builder*, and the *Transactions of the British Archæological Association* and the *Cymmrodorion Society*, for information, but the Society which instituted and carried out excavations is not even mentioned! There is a like omission under Llantwit Major, an earlier exploration of the Society.

in this small space the subject is necessarily treated in only a sketchy and imperfect manner. There is no attempt to describe the site generally—the group of mounds—of which the excavated remains formed only a fraction. This brevity, this apparent ignoring that the whole is of greater importance than the part, can be explained, I think. When the diggings were filled in, there was no intention that the work should be permanently abandoned, and in such a case the wiser course would be to postpone the issue of a detailed report until the spade had done its work. It is, however, curious that no attempt was made to resume the work in the following year. Several years later, Mr. Storrie gave me sundry notes and plans, which he made when the work was in progress, thinking they might be useful in the event of its resumption. In March, 1906, I brought the matter before the Committee of the Archæological Section, giving three chief reasons why the work begun in 1894 should be completed,—“1st, the site is at our own doors and so has a stronger claim on us than had it been at a distance; 2nd, it is the Society’s duty to see that the work is completed; and 3rd, the work already done had supplied clues which would render its continuance easy.” The site was visited by several members, and my suggestion was favourably considered, but the time was not considered opportune for carrying it out. I am afraid that in consequence of the recent war no further work can be entertained in the near future. The remains are shown on the Ordnance Survey as revised in 1898-9, appearing first on the 25in. sheets in 1901, and subsequently on the 1in. and 6in. sheets. Mr. Storrie supplied the information.

SURFACE INDICATIONS AND BURIED BUILDINGS.

In our plan of the site (Fig. 1) the rises and hollows are delineated in the usual manner; the extent of the excavations is indicated with broken lines, and the walls brought to light are shown black. It will be observed that the mounds are narrow and straight, and that the chief features of the site are a squarish space enclosed with a bank and outer ditch-



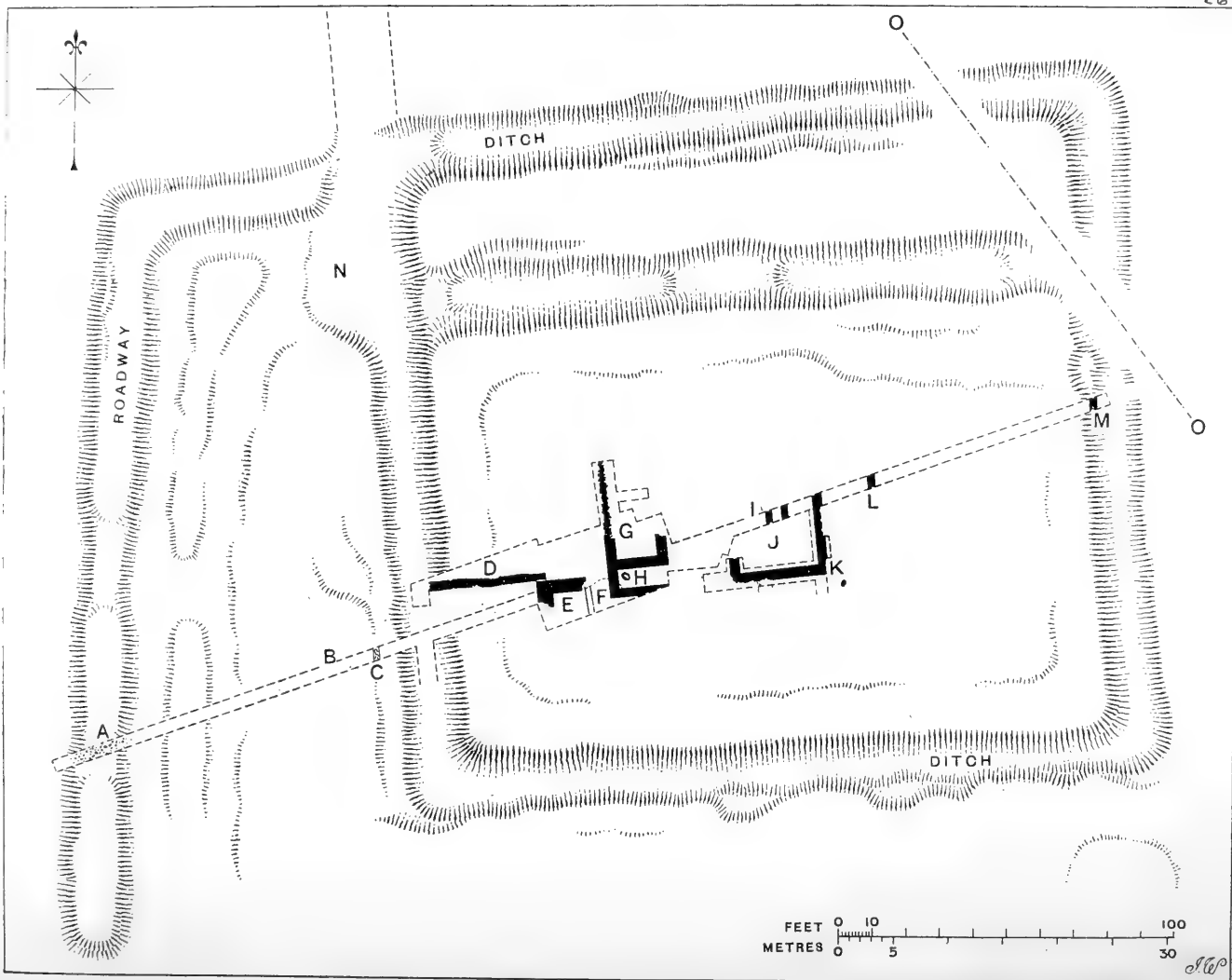


FIG. 1. PLAN OF ROMAN REMAINS ON CARDIFF RACECOURSE.

like hollow, and a long low mound (undoubtedly a road) diverging from the north-west corner and pointing almost due south. It is curious that Mr. Storrie should have concluded that these mounds, which seem so plainly artificial, were "morainic and natural." It is true that they are low and rather obscure, and that their arrangement might escape notice. But this did not escape him, for when his long trench was being cut, he prepared a rough outlined plan of the site to scale, and on it the above two features are noticeable at a glance. Between the road and the enclosure are some faint hollows, which I have introduced into the plan as correctly as I can. They certainly are not natural, and yet appear to have had no definite purpose. It will be seen presently that there is reason for thinking that this tract was artificially raised in ancient times, and I suggest that the hollows are the result of incomplete tipping. Within the north-east corner of the main work, the ancient earthworks have been considerably disturbed by the introduction of a modern agricultural drain (O, O).

The enclosure, which we will consider first, is not symmetrical. It is slightly askew, and the opposite sides are not of equal length. It is, in fact, an irregular rhomboid. Many Roman camps and forts are similarly askew, and there is little doubt that this was not intentional, but was due to a faulty setting out at the start. The Roman forts of Gellygaer and Cardiff are good examples to the point. The dimensions, reckoned along the centre line of the ditch, are as follows:—north, 216ft., south, 210ft., west, 192ft., and east, 198ft. There are two lines of entrenchment on the north, 45ft. apart at the west end, but diverging eastwards by several feet. As there is no apparent reason why this side should be more strongly protected than the others, it is probable that the outer line was introduced in order to enlarge the enclosed space, but this can only be satisfactorily settled by the spade.

In their present condition, the ditch rarely sinks, and the bank rarely rises, more than 1 foot from the normal level. The

former is the more conspicuous ; the latter shows as a broad, low convexity, distinctly defined in front by the indent of the ditch, but gradually merging into the general surface behind. We may reasonably surmise that the original form of the bank was narrow and steep, and that its spread-out condition is due in great measure to subsequent cultivation.

Mr. Storrie's long trench was carried down to, and in several places into, the undisturbed subsoil, a pebbly sandy soil of glacial origin. The trench sides showed almost everywhere the following beds,—7ins. to 1ft. of dark earth—undoubtedly the ancient surface-mould—resting directly on the sub-soil ; a bed of varying character and thickness and occasionally consisting of pure soil, but generally much mixed with debris derived from the ancient buildings on the site ; and above all 5ins. to 7ins. of modern surface mould. In addition to these three, there was, here and there, a thin seam of no great extent and usually rather obscure. The trench also presented sections of the ditch and bank. The west ditch was V-shaped (Fig. 2, G), approximately 14ft. wide and a little over 4ft. deep. Its filling was silt-like at the bottom, and contained a sprinkling of stones, mostly fragmentary and rough, pieces of concrete, broken roof-tiles and potsherds. So far as I remember, the section of the east ditch was similar, but not so well disclosed.

East of the ditch the trench-side presented the edge of a concrete floor (C) which rested upon the ancient surface mould. It was in a decaying condition, 3ins. thick, and extended eastwards about 29ft. Above this was a comparatively pure soil (D) which attained a maximum thickness of 2ft. 3ins. at the summit of the bank. Eastwards, this passed into a soil composed mainly of debris, more or less decayed, which covered the building-remains below. Above all was the modern surface-mould (F) from 6 to 7ins. in thickness. Several feet to the north (and so not showing in the trench) Mr. Storrie's later diggings brought to light a wall (Fig. 1, D) running east and west at a higher level than the concrete floor. It was of very poor construction, and although later than the floor and

15

WSW

ENE

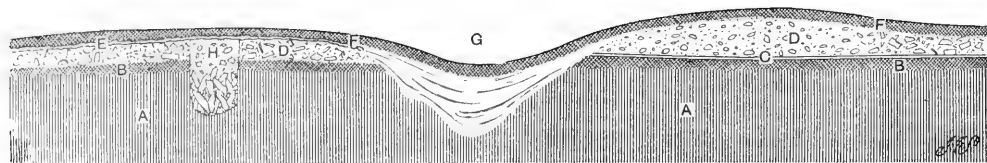


FIG. 2. SECTION OF DITCH, ETC., CARDIFF RACECOURSE.

apparently unconnected with it, there was no reason to doubt its Roman age. West of the ditch, the trench-side exhibited the same succession of deposits, less the concrete floor, of which no trace was seen. There was, in addition, however, a thin spread (Fig. 2, E) of broken stone and other debris—"rammel," would best describe it—at the bottom of the modern turf, which extended westwards beyond the limit of our section as far as the road. Although so near the surface, it was undoubtedly of Roman or sub-Roman age. The layer below, which consisted of soil mixed with broken stone, decayed mortar and other debris, was considerably thinner than the corresponding layer on the other side on the ditch. Like the "rammel," it extended beyond the section, but next the ditch it was slightly heaped up and suggestive of a spread-out smaller bank. It is probable that this was a regular feature, for on other sides of the enclosure, I noticed faint surface-indications of an outer bank. Its use may have been to give increased depth and width to the ditch. A curious feature was a filled-in trench (H) of 3ft. wide running north and south. The lower two-thirds of the filling consisted of quarried lias blocks, which Mr. Storrie regarded as the foundation of a wall that had been removed. Instead, however, of being compacted together to form a solid platform for a weighty superstructure, they were deposited at various tilts as if with the intention of leaving as many open spaces as possible between them, that is, with the intention of forming a "rumble" drain. It appeared to run parallel to the ditch, but as there were no surface-indications, it was impossible to say how far it extended, still less whether it accompanied the ditch all round the enclosed space. Mr. Storrie's trench was not carried far enough eastwards to prove whether there was a similar feature on that side.

We now turn to the remains within the enclosure. My detailed plan of them is so similar to Mr. Storrie's in the official report of 1894, that very little would be gained by its reproduction here. If fault is to be found with his, it is that it conveys an impression of greater definiteness than the actual remains

warranted. For instance, in the middle of his plan (on mine, Fig. 1, G) is shown a long wall running northwards, as throughout of definite and equal width and with facing stones in position, whereas it ended in this relatively perfect condition between the words "Glass Jars" and "Pottery," the only hint of its former existence north of this being traces of foundation rubble.³ This portion of the course of the wall would have been better indicated by broken lines. It should be noticed, however, that the published plan is not actually Mr. Storrie's, but an architect's rendering of his.

As already intimated, the second stage of the digging operations was the exploration of the various walls and floors brought to light in the long trench by lateral cuttings therefrom. As this work came to an untimely end through the lack of funds, the full extent of these remains north and south of the trench was not ascertained. The concrete floor next the ditch was the first intimation of a building, and structural remains continued without a break for about 130ft. eastwards. Beyond this, the remaining 60ft. to the eastern bank and ditch seem to have been garden land, for the old surface mould was thicker and darker than elsewhere, and contained bits of pottery and charcoal; and it had, as Mr. Storrie also noticed, all the appearance of having long been under cultivation. The diggings provided no clue how far the structural remains extended north and south. The remains of the wall (Fig. 1, G) mentioned in the preceding paragraph, were traced 32ft. in the former direction, and those of another (K) 20ft. in the latter direction; but these were exceptions. The average either way was about 8ft. In the result, the excavations, thorough

3. Another instance is a well-defined wall shown along the middle of the ditch. No such wall was found. What was found was a quantity of stone, which, like the pieces of roof-tiles and concrete, had evidently rolled into the ditch from the ruined buildings. The wall was probably introduced into the plan as an interpretation of a curious view held by Mr. Storrie. He regarded the stones as the leavings of a wall which had been grubbed up from its foundations, and the ditch as simply the result of digging on each side of the wall so as to get down to the foundation!

and carefully carried out as far as they went, may be likened to an irregular rent in the greensward which exposed part of the plan of a buried building of considerable magnitude. Sundry rooms and other enclosed spaces projected into the rent, but, with one doubtful exception, not sufficiently so for their full dimensions to be determined. Nor can we safely infer what the whole plan was like from the part thus exposed to view. But from razed walls, floors, broken tiles, and other oddments, we can form some idea of the building or group of buildings which once reared its head on this spot.

The walls were of substantial width and build. Most fell within the limits of 2oins. and 2ft. 4ins., but one (E) had the extraordinary width of 5ft., and another adjoining it was well-nigh 4ft. In some, the facing stones were more carefully selected or were larger than in others, and the mortar varied considerably. Most of them were reduced to the floor levels, or even lower; but the faces of two or three which remained to a greater height, retained patches of stucco painted in fresco, and portions of the usual quarter-round plinths which bordered the floors of the era. More, however, could be gleaned of the mural treatment of the rooms from the loose pieces of painted plaster scattered about the site. On some were stripes (probably the borders of panels and dados), foliage and other designs, and polychrome splashes. The colours on some of the pieces were still vivid, and Mr. Storrie considered that they were quite equal to those of the walls of the Romano-British building near Llantwit Major, part of which was opened out under his superintendence a few years earlier. Most of the rooms brought to light in the "rent" had floors of concrete, made of lime and the local gravel, with or without the addition of broken pennant or roughly powdered brick, and at least several of them had been surfaced with fine cream-coloured cement, decayed traces of which remained. Near the right-hand side of Mr. Storrie's plan is a shaded patch (Fig. 1, I) marked "Coarse red-tile tesserae," but there is no reference to them in the official report. In one of his written notes,

Mr. Storrie described them more explicitly as "Much displaced tesserae *in situ*, brick of two kinds and pennant cubes." The width of the patch was about 6ft., but it is impossible to say how far it extended north and south. The cubes both of red tile and grey stone, averaged 1in. by $1\frac{1}{4}$ ins. a size generally used for coarse mosaic pavements and especially for the plain margins of decorated ones. Perhaps the disturbed pavement was that of a corridor or passage running north and south. In his letter to the Committee, several weeks later (June 26th, 1894), Mr. Storrie stated that he found in the vicinity of the patch a few smaller and better shaped tesserae, several of which were of polombina marble imported from Italy; and he suggested that they were strays from a decorated mosaic pavement somewhere close by—a suggestion with much probability in it, which should whet the appetite for the complete exploration of the site!

The scattered fragments of window-glass tell of glazed windows. The glass was precisely similar to that almost invariably found on the sites of houses and the buildings of Roman age, both at home and abroad—a greenish slab glass, flat and dull on one face, and uneven and bright on the other, varying from $\frac{1}{4}$ to $\frac{1}{8}$ in. in thickness. It was cast into panes of considerable size or sizes, perhaps standardised. Like our ground glass, it was obscure, and this effect seems to have been increased when necessary, by a scouring of sand on the flat side.⁴ Some of the roofs were clothed with grey pennant "slates" and others with red clay tiles, both characteristic of the period. The former were thin slabs, about 11ins. wide, with sides parallel or nearly so, and the foot trimmed to a right-angled point instead of being square as is customary with us, while the head was usually left rough, and was pierced with a nail-hole. These slates, when fixed on the roof, gave rise to a pleasing diamond or lozenge pattern. The red tiles were in two series—large flat *tegulæ* with the lateral edges turned up,

4. For further particulars, see "Romano-British Buildings and Earthworks," p. 271.

and half-round *imbrices* of the same length to cover the joints between the *tegulæ*. These tiles gave rise in combination to the "roll-and-flat" type of roof which is still a familiar feature in Italy. Fragments of both kinds—grey slates and red tiles—have generally been found on Roman sites in the west of England and Wales.⁵ Gellygaer is a notable exception, as only the latter kind occurred there.

EXTERNAL REMAINS.

The only one of these which shows on the surface is the ridge already referred to as a road. Its average width is 16ft., and its flattish surface rises nearly 1ft. above the adjacent ground. It proceeds from the north-west corner, westwards for about 70ft., and then sharply turns nearly due south. It was the first feature cut through in Mr. Storrie's long trench (Fig. 1, A), and was found to consist of a thick spread of pebbles from the local gravel, covered, of course, with the greensward. In his rough plan it is continued to the Caerau Brook, but the visible indications abruptly end, as indicated in our plan and the Ordnance Survey, about 95 feet short of that stream. Mr. Storrie was a careful observer, however, so it is probable that he satisfied himself that traces of metalling remain in the interval. In the official report, it is stated that "this was evidently the original roadway to the existing buildings on the site and was clearly traceable and straight as a line to Ely Bridge." In two respects this is not correct. Projected northwards in a straight line, this length of road would cut the river about 500ft. east of the bridge. But instead of proceeding thus, it made the sharp turn to reach the north-west corner of the enclosure, as already stated. Here, according to Mr. Storrie, it again made a turn, this time approximately north-by-west, and pointing direct to the bridge. This part of the road is indicated on his rough plan and on the Ordnance Survey, with broken lines. I did not attempt to trace its course, as I understood that the surface-indications were so vague that he had to rely on digging and probing.

5. *Op. cit.* p. 262.

Whether the road was a private one for reaching the building and its appurtenances, or a public one, it is impossible to say. It has long been suggested that a line of Roman road skirted the coast of Glamorgan, for the most part from one to two miles inland, and that it deviated from the *Via Julia* in the vicinity of the River Ely and rejoined it at Kenfig. Although no definite evidence for such a road has been forthcoming, I incline to think that much can be said in its favour, and that its probable course lay through or near Wrinston, Merthyr Dovan, Welford, St. Athan, Boverton, Llantwit Major across Merthyr Mawr Warren (where is a buried road corresponding in direction), Newton Nottage, and Kenfig. Some of the roads traversed in this route have a decided old-world look, notably in the vicinity of Llantwit Major. Assuming that there was such a Roman road, the short length on the Racecourse so well fits in, that one would hardly hesitate to regard it as part of the line. It may be urged, however, that there was no need to carry the road so far north or inland in order to cross the Ely. The answer, I think, is that it was necessary in order that the crossing should be beyond the reach of high water. As it is, the highest point to which ordinary tides flow is only about half-a-mile below the bridge.

Another external feature was a well (N) situated a little below the north-west corner, and near the outer side of the ditch—it would be more correct to say, “where the outer side should be,” for to judge from the surface indications, the ditch here seems to have expanded into a considerable hollow with the well about the centre. There is no mention of this well in the official report or in Mr. Storrie’s notes, but it is shown on his rough plan and on the large-scale Ordnance Surveys. I did not see it, as it had to be refilled without delay, being outside the fence which enclosed the excavations. On the plan it is shown as circular, and about 10ft. in diameter,⁶ unusually large for a well, but perhaps it was not sketched in to scale, or the

6. For Roman Wells, see “*Romano-British Buildings and Earthworks*,” p. 279.

steining may have fallen or have been removed, in which case the original diameter would be less. Mr. Storrie, however, thought it possible that it was not a well at all, but a sump to receive surface and drainage water, as the general situation is low. This is interesting from the point of view of our supposed rumble drain, which if projected northwards would end with the well.

The remains of the iron furnace and hearth, another external feature, described by Mr. Storrie in the *Transactions*, were discovered in cutting his long trench, at a distance of about 30ft. from the west side of the enclosure (B). It is marked on the Ordnance Survey as "Roman Iron Furnace." In addition to this, the Survey has "Roman Steel Furnace" near the south-east corner, but I cannot find any reference to this by Mr. Storrie.

PERIOD AND DURATION OF OCCUPATION.

When Mr. Storrie first cast eyes on the site, he thought that it might contain the remains of a prehistoric marsh-village similar to that near Glastonbury. But after a few hours digging, he thus wrote :—" I was able to find evidence, not only of the prehistoric village, but of palæolithic man, sufficient to convince me at least, that the fields between the course and the river have been a settlement of man continuously from the time of palæolithic men of the river-gravels, then the marsh-dwellers, then the Romans, and that it was only, I believe, deserted when the present village of Ely took its rise, probably during the early Norman period."⁷ From palæolithic man to the Norman is indeed " a far cry ! " Several weeks later, when he penned his letter to the Committee, he still clung to his prehistoric theory, in spite of the fact that the finds had been overwhelmingly Roman ; but the subsequent official report is silent as to any occupation of the site before the Roman period. In the " List of Articles Found " appended to that report, seven, with " a considerable number of pieces of hand-made

7. Extract from letter, *The Antiquary*, Vol. 29, p. 243.

pottery" are classed as "Pre-Roman." Most of them are certainly not Pre-Roman, and apart from this they were 'portable' objects, indicative of the presence of man, but not necessarily of his permanent settlement. All the structural remains were characteristic of the Roman period, and none of them could be construed as evidence of earlier or later human settlement. The "considerable number" of potsherds, just referred to, were the rough cores of common Roman grey and black pottery, which had lost their original surfaces by decay. Four of the objects were of flint, but only one, a neatly made arrow-head, could be properly called an implement. The others were shapeless bits, which surely should have been classed with "the travelled pieces derived from the boulder clay of the district," of which Mr. Storrie observed many. There is no reason to doubt the prehistoric age of the arrow-head; but a flint arrow-head (probably lost by some hunter) as little proves a settlement as would a half-penny of George III. the former existence of a house of that reign on or near the spot where it was found. Another item on the list is a "lias slab with a natural cavity and sandstone muller found together." The second was a natural pennant pebble, which, being of globular form, could not have been used as a muller, but might have served as a pestle; and the two, it should be observed, were not strictly together, but some inches apart. As pennant pebbles were found throughout the diggings, the presence of one near the slab does not count for much. Another difficulty is that neither the cavity nor the pebble showed the least trace of wear from usage. But assuming that the two were mortar and pestle, what evidence is there that they were prehistoric? A short time ago I saw at Marros, Carmarthenshire, a similar rough slab with a hemispherical cavity (but in this case smoothed from trituration) which was in use a few years ago. It belonged to "a wise woman," who had used it for many years for pounding roots for her medicines. Another item on the list is a "tally stone, marks not yet understood." In reality it was a small piece of shaly lias exhibiting a number of small criss-

cross cracks due to shrinkage in the drying. How Mr. Storrie, with his geological experience, could have mistaken these cracks for artificial scratches, is indeed puzzling!

As the diggings progressed, it became more and more evident that the structures which had occupied the site had undergone alterations, and some at least, had been entirely rebuilt. In short notices on the excavations in the *Builder* for October 6th, 1894 (Vol. 67, p. 244) and the *Antiquary* for November, 1894 (Vol. 30, p. 208) it is stated that there had been a large and important Roman house on the site, which, having fallen into decay, was *replaced* by a smaller house. This is rather a sweeping statement considering how small a portion of the site had been subjected to the spade! In any case, however, the alterations were strongly suggestive of a long occupation of the site—an occupation probably of centuries. Few people realise that the Roman era in Britain lasted some four centuries, a stretch of time equal to the interval which separates us from Cardinal Wolsey when at the zenith of his fame.

In the section of the western enclosing works (Fig. 2) a halt of probably many years was indicated, which a casual observer would fail to notice. It is, of course, self-evident that the thin concrete layer (C) was laid down before the soil (D) was deposited upon it, but did the latter immediately follow the former, or was there an interval of months or years between them? This concrete, as we have already seen, was the floor of the westernmost room of the large building cut through by Mr. Storrie's trench. The remains of the old eastern wall of this room were found; but westwards, the floor abruptly ended with the side of the ditch, and no trace of a wall was seen. As the floor did not extend as far as the further side of the ditch, the inference is that this wall stood where the ditch subsequently was. Clearly it is a relic of a portion of the building which was eventually pulled down before the ditch and bank were made. There is reason to believe that the demolition was not in order to provide space for these. The reader will recollect that above the floor, and entirely uncon-

nected with it, were the remains of a poor wall (Fig. 1, D) of ancient age. It is certain that this wall, probably a rough outdoor fence, was erected after the demolition. We thus appear to have intervening between the laying down of the concrete floor and the depositing of the soil above it, the whole existence of the structure containing the floor, its demolition, and the erection of the rough wall on the site. The evidence, therefore, is strong that the ditch and bank were, here at least, not an original work, but a subsequent addition; and while it is not safe to generalise from a single section, the presumption is that this will be found to apply to their whole circuit. In the section west of the ditch it will be noticed that the trench of what I regarded as a rumble drain (H) was sunk through the thick bed (D) into the subsoil below, but was overlaid by the rammel (E), thus showing that it was an intermediate work. While this does not prove that the interval between (D) and (E) was longer than it would take to make the drain, there is a circumstance which favours a longer one. If the drain was contemplated before (D) was deposited, why was it not made at the start, and thus have saved the unnecessary labour of cutting through this bed? Hence the alternative, that it was not contemplated, is the more reasonable.

The remains of the building provided hints in the same direction. The differences in the construction of the walls, and in the mortars, concretes, and levels of the floors, were suggestive of a building that had undergone many alterations and was of considerable age when it was abandoned. There was, however, one detail which was conclusive of the pulling-down and rebuilding of a portion of it. Near the foot of Mr. Storrie's plan of 1894 will be noticed a piece of concrete floor marked "Sloping Couch" (Fig. 1, F). Why it should have been given this name is impossible to say. It certainly had a slight slope towards two stone steps on the left, by which descent was made to a lower concrete floor (E). The "couch" it will be observed, rested upon and overlapped the west and

south walls at their junction of a narrow space (H) with an earthen floor, perhaps the western part of a corridor running eastward. These walls had been reduced to two or three courses, before the structure containing the "couch" was built.

Of the various objects found, only three could be dated within narrow limits. Two were bronze coins, the one of Augustus (B.C. 27, A.D. 24) and the other of Nerva (A.D. 96-98), and the third was a silver denarius of Antoninus Pius (A.D. 138-161). The first two were extremely worn and must have been in circulation long before they were lost. The last was almost in mint condition, and could have been only a very short time in circulation. These coins, unfortunately, were stolen, and I have no record of their types and inscriptions, but I recollect that the denarius was struck in the earlier part of the reign of Pius, so presumably its owner lost it before the end of that reign, and this may be accepted as fair evidence that the site was in occupation in that reign.⁸ How much earlier and later, we can only guess.

SOME CONCLUSIONS AND CONJECTURES.

At first I regarded the remains as those of a small military post to guard the passage of the Ely, chiefly because of the enclosing ditch and bank, but when upon consideration some years later, there was strong reason for thinking that these were not part of the original work, but an addition of later date, I gave up this opinion as no longer tenable, for in a fort, small or great, the defences would be the chief consideration from the first. Moreover, while one could not doubt that they were introduced as a defence, they seemed to be too slight for a permanent military post; and still more to the point, the structures found within the enclosure had nothing of a military character in their planning or other respects.

Mr. Storrie considered the remains to be those of a Roman villa, but he admitted that it was "against all previous

8. The fragments of *mortarium* rims found on the site indicate a long occupation. Some were of early and others of late type.

experience that the Romans would have erected a villa of the size and character of the present one, in such a low marshy situation, when the adjoining hill was only 10 minutes walk distance." By way of explanation why the hill was not selected, he offers the curious suggestion that "it was held by an adverse force which it was necessary to permanently dislodge." But surely the magnate who contemplated building his mansion before this enemy was dislodged, would be singularly lacking in prudence! Nevertheless, I can see nothing incompatible in the walls and rooms brought to light by his spade, being part (but not the chief part) of a large house. But the low situation is a serious objection, for beautiful surroundings and a fine outlook were characteristic of the seats of the Romano-British gentry.

I venture to suggest that this building was a *mansio*, or Imperial posting establishment. These establishments were distributed along the great highways at suitable distances apart, and were equipped for the public service. In them, authorised travellers were entertained, post-horses, vehicles, and postillions were kept in readiness, and passports were examined. They contained sumptuous rooms for high officials, and some at least had granaries and other stores for the use of troops on the march. They must not be confounded with *mutationes*, which appear only to have provided changes of horses and refreshments, nor with the private roadside inns. I do not know whether a *mansio* has been excavated and examined in this or any other country, nor whether anything is known of the planning of one. But inasmuch as a modern hotel is essentially a dwelling-house modified to serve as a temporary home for the wayfarer and stranger, it is reasonable to think that a *mansio* was on the lines of a large country house similarly modified to meet its peculiar requirements. Indeed, it is not unlikely that some of the "villas" which have been explored were really *mansiones*.⁹

9. It is probable that the following two buildings were *mansiones*. The one was a large building just within the south gate of Silchester, the Roman *Caleva Atrebatum*; the other, a smaller one, in a similar posi-

The majority of the Romano-British houses, and nearly all the larger ones, belonged to the 'corridor type.'¹⁰ This type at its simplest consisted of a row of rooms, bordered on one side with a corridor or verandah which served as a means of communication between them, and this faced a square or oblong garden or yard. In a development of this, a wing from the range extended along a contiguous side of the open space; and in a further development there was another wing at the other end of the range. Finally, the domestic buildings surrounded the space, forming what is known as a 'courtyard' house. The house thus had its front to the garden or yard, and its back outwards. The remains of an excellent example of a medium-sized country house have been found at Spoonley Wood, Gloucestershire.¹¹ It consisted of a main range with two wings, the one containing the baths and the other apparently the servants' quarters, which together extended two-thirds round the garden, a wall containing a large gateway completing the circuit. The gate was in the middle of the wall and faced the main range, and from it a stone path crossed the garden to a large door in the corridor, on the further side of which was the door into the principal apartment, the central feature of the range. The plan of this house was remarkably symmetrical, whereas as a rule the outlines of a house of this type were irregular through the presence of outshoots, stokeries of hypocausts, and other additions along their backs.

Returning to our Racecourse remains. From the ancient garden land of the eastern portion of the site, we may reasonably infer that the building faced the east, and that the front would have the usual corridor. Now this, like the ambulatory of a mediæval monastic cloister, was nearly always an external feature with a pentice or lean-to roof, hence its outer wall was

tion, at Caerwent, *Venta Silurum*. Both resembled in their main features large 'courtyard' houses, yet there were differences which were not consistent with their being private residences. The Silchester example was regarded as a *hospitium*, or public guest-house by its explorers.

10. See "Romano-British Buildings and Earthworks," pp. 138-173.

11. *Archæologia*, Vol. 52, p. 562.

rarely as thick as the main walls of the house. A glance at our plan (Fig. 1) will show that the easternmost wall (L) of the building cut through by Mr. Storrie's long trench, was comparatively thin, not thick as one would expect in the case of the external wall of a large building. On the other hand, the next wall (K) was a thick one, and the space between the two was rather narrow for a front room, but not too wide for a verandah-like corridor running north and south. Near the eastern extremity of Mr. Storrie's trench was another wall (M) close to the ditch. This, it seems reasonable to think, was part of a precinct wall which, like that at Spoonley Wood, completed the closing-in of the garden.

Fortified houses, although numerous in mediæval times, appear to have been rare in Roman Britain. The best example I know of was a small building at Cwmbryn, near Laugharne, Carmarthenshire,¹² the remains of which I excavated in 1906. I regarded it as a small military post, but the late Mr. George E. Fox, C.E., pronounced it to be a fortified farmhouse. The discovery was specially interesting to him as he had long considered that certain small entrenched enclosures, which were known to contain Roman remains, could not, from their situations and other circumstances, have had a military purpose, and would prove to be domestic sites if put to the spade. The Cwmbryn enclosure contained a small house with a bath at one end, and wooden sheds around a yard. The excavation furnished no evidence whether the ditch and bank were an original or an added work.

From the rarity of these fortified houses, it would seem that the need for them arose from local, and not general, conditions, and was limited in respect to time. The fact that Cwmbryn and our Racecourse are within easy reach of the Bristol Channel and that Mr. Fox's supposed examples are in East Anglia, is suggestive that the need arose from the incursions of the sea rovers, for these two regions were specially menaced by them in

12. *Archæologia Cambrensis*, 1907, p. 175.

late Roman times. We have evidence in our own district, at Llantwit Major,¹³ of a large country house which came to its end by being sacked and its inmates massacred. The skeletons of the vanquished lay where they fell, and the slain of the victors were in shallow graves. As at Ely, the exploration was only partial, and we are not informed whether the site was entrenched.

It is difficult to imagine that there would be need to fortify domestic buildings under the settled security afforded by the Roman administration of our country in its earlier period. The *Pax Romana* was then no empty name. But the latter half of the third century was marked by civil commotions and the increased boldness of our external enemies. The menace of the latter continued throughout the next century, and to guard our estuaries were erected those coast strongholds, Cardiff Castle for one, the huge walls of which, 10 ft. or more in thickness, are among the most notable of our remains of the Roman era.¹⁴ To the same period belong the equally strong walls of some of our Roman towns, of which the south wall of Caerwent is a good example. Under such conditions as these, it would be strange, if here and there the owner of a house in the less Romanized parts of the country did not fortify his house, and it is reasonable to think that future investigations will bring more examples to light. With these observations in mind, we return to our Racecourse remains, and find that our inferences there certainly seem to fall into line with them. We have found reason for thinking that the site was in occupation and built upon in the second century, as early as the time of Pius, or earlier; also for thinking that at some subsequent time—say, the third or fourth century—it was enclosed with ditch and bank.

In conclusion,—my aim in writing this paper has not been solely to describe and interpret what was discovered in 1894,

13. *Cardiff Naturalists Transactions*, Vol. 10, p. 49.

14. "Romano-British Buildings and Earthworks," pp. 77-79.

as something throwing light upon the early history of Cardiff and district; but also to indicate the desirability of completing the exploration, and to facilitate it by providing the future explorers with particulars of what has already been found. The excavations of 1894 were altogether inadequate for so promising a site, and I think my paper bears witness to this in the frequent use of such words as "probable," where, if the spade had completed its work, there would have been certainty.

THE LEPIDOPTERA OF GLAMORGAN.

BY H. M. HALLETT, F.E.S.

Butterflies and Moths always have attracted more attention from collectors than any other order of insects, and the County of Glamorgan furnishes no exception to this rule, though, unfortunately, few of our collectors have left behind them any trace of their work, beyond scattered records in various periodicals, nor do the collections formed by them usually contain any data from which information can be gleaned as to the localities whence the specimens have been obtained. The present list is, therefore, with the exception of the records furnished by the collection formed by Mr. H. W. Vivian, of Port Talbot, now in the National Museum of Wales, almost entirely compiled from information supplied by contemporary entomologists, and, as will be seen, is largely the work of Mr. Evan John and Major Robertson. All available authorities were consulted; amongst others, the Entomological Journals, Stainton's Manual, Barrett's British Lepidoptera, and the Minutes of the Penarth Entomological Society.

Owing to the War and other circumstances, many sources of information were cut off for the time, but Mr. Evan John, Mr. E. T. B. Reece, and Major Robertson have been good enough to go through the manuscript, so that it is hoped there are not many omissions.

The National Museum of Wales also possesses the collections formed by Mr. G. A. Birkenhead and the late Mr. T. L. Howe, both of Penarth, but, unfortunately, in neither of them are the specimens localised, and I have, therefore, been unable to make use of them in compiling this list.

Practically nothing has been done towards working out the distribution of those moths usually called the Micro-Lepidoptera,

but the few recorded species have been included, and it is hoped that this large and profitable field will not remain long neglected.

It has been considered desirable to insert the English names of the Macro-Lepidoptera, as it is thought they would prove a help, at any rate to beginners, in identifying the various changes made in nomenclature since the publication of South's Synonymic List.

The list follows South's three volumes on the British Butterflies and Moths, so far as they go, and for the remainder his Synonymic Catalogue, but for considerations of space has not been divided into the various families.

It is hoped that the publication of this list will prove a help to those now working on the Lepidoptera of the County, and further records, either of additions to the County species, or of any extension of the distribution of the rarer species, if sent to the Hon. Secretary of the Biological Section of the Cardiff Naturalists' Society, will be published from time to time in the *Transactions*.

The County of Glamorgan comprises within its borders almost every kind of geographical condition; on the north the ground runs up to the Brecon Beacons to about 2,000 feet above sea level, this high ground being pierced by many deeply cut river valleys, whilst on the south the Bristol Channel forms its termination in that direction, and the conditions vary in the latter district from the heavy clay soil in the eastern end to the sandhills of the Porthcawl and Gower districts in the west. An absence of chalky soils and of any extensive heather moors are almost the only conditions wanting from the point of view of the collector, and there can be no doubt that the County will prove, when as assiduously worked as some of the English Counties have been, to rival most of them in productiveness. The bulk of the work done so far has been confined to the Vale of Glamorgan and the low-lying sea coast, and probably an equal amount of work in the mountainous districts to the north of the County would yield much valuable information towards completing our knowledge of the Lepidoptera of the County.

RHOPALOCERA.

- Papilio machaon, L.** Swallow Tail. "One was seen at Sketty by Mr. H. Forrester, in 1887, when *Colias edusa* was so common" (Robertson); C. W. Dale, in Ent. Mon. Mag., 1902, p. 37, records the capture of this butterfly at Penclawdd and Llanghor by J. D. Llewelyn—the latter locality is probably intended to mean Loughor.
- Aporia crataegi, L.** Black-veined White. Llantrisant (John); Leckwith (Birkenhead.) Mr. Drane recorded the larvæ of this species as being extremely abundant at Penarth in 1858.
- Pieris brassicæ, L.** Large White. Common throughout the County.
- Pieris rapæ, L.** Small White. Very abundant, and often a serious pest. It is very partial to the garden Nasturtium, as a food plant.
- Pieris napi, L.** Green-veined White. Common throughout the County.
- Euchloë cardamines, L.** Orange Tip. Common. Llantrisant, Swansea, Cardiff, etc.
- Leucophasia sinapis, L.** Wood White. Once only at Llantrisant (John).
- Colias hyale, L.** Pale Clouded Yellow. Near Port Talbot (Vivian); Swansea, rare (Robertson).
- Colias edusa, F.** Clouded yellow. Periodically abundant, and has been recorded from most parts of the County.
- ab. ♀ helice, Hb.** Swansea, 1892 (Robertson); Sully, 1889 (Birkenhead); Penarth, several in 1892.
- Gonepteryx rhamni, L.** Brimstone. Generally common, and has been recorded throughout the County from Gower to Cardiff.
- Limenitis sibylla, L.** White Admiral. Mr. T. H. Thomas saw a specimen in his garden at Cardiff in the summer of 1906. Almost certainly an escape.
- Polygonia c-album, L.** Comma. Not a common insect in the County. Llantrisant (John); Penarth, several on 18th September, 1892 (Howe); Peterston, 1913 (Reece); Llandough, 1910 (Hallett).
- Vanessa polychloros, L.** Large Tortoiseshell. Llantrisant, rare (John); Glais, Swansea Valley, rare (Robertson); Penarth, 1894 (Shellard).
- Vanessa urticæ, L.** Small Tortoiseshell. Very common throughout the County.
- Vanessa io, L.** Peacock. Common, and has been recorded from most districts.
- Vanessa antiopa, L.** Camberwell Beauty. Single specimens have been recorded from Llandaff, Penarth, and Llandough, some years ago. Langland Bay, one seen in 1892 (Robertson); one specimen was taken at St. Nicholas near Cardiff, November 6th, 1917, by some children, and has been deposited in the National Museum of Wales, Cardiff.

- Pyrameis cardui, L.** Painted Lady. Sometimes abundant; recorded from Llantrisant (John); Swansea (Robertson); Penarth, Taff's Well, etc.
- Pyrameis atalanta, L.** Red Admiral. Common throughout the County.
- Argynnis paphia, L.** Silver-washed Fritillary. Llantrisant, common (John); Swansea, scarce (Robertson); Caerphilly, abundant (Reece); Taff's Well (Hallett).
- Argynnis adippe, L.** High Brown Fritillary. Llantrisant (John); Swansea, scarce (Robertson); Taff's Well (Hallett).
- Argynnis aglaia, L.** Dark Green Fritillary. Llantrisant, common (John).
- Argynnis euphrosyne, L.** Pearl Bordered Fritillary. Common at Llantrisant (John); Swansea (Robertson); and generally distributed. "Have taken it in our garden at Roath about 20 years ago" (Reece).
- Argynnis selene, Schiff.** Small Pearl Bordered Fritillary. Common at Llantrisant (John); fairly common at Swansea (Robertson); Taff's Well, Cwrt-yr-ala, etc.
- Melitæa aurinia, Rott.** Greasy Fritillary. Llantrisant (John); Swansea, very common just outside Sketty Park in 1892 and 1893 (Robertson); Llandough. This species used to occur in the greatest abundance in a field at Lower Penarth, but disappeared shortly after the field was included in the golf course. The local form differs from the typical English form in being larger and brighter.
- Anosia plexippus, L.** The Monarch. One was caught at Penarth Dock in 1888, another, in the Vivian collection labelled Glamorgan, September, 1886, was taken by H. W. Vivian at Glanafon; and one was taken at Neath, 6th September, 1876, by Sir J. T. D. Llewelyn, this last specimen is in the Natural History Museum at South Kensington.
- Melanargia galatea, L.** Marbled White. Local. Llantrisant (John); Penarth (Hallett).
- Satyrus semele, L.** Grayling. Llantrisant (John); Swansea, common, (Robertson); Garth Mountain, abundant (Reece); Porthkerry, Porthcawl (Hallett).
- Pararge egeria, L.** Speckled Wood. Common in suitable localities, Cwrt-yr-ala, Taff's Well, etc.
- Pararge megæra, L.** Wall Butterfly. Common throughout the County.
- Epinephele ianira, L.** Meadow Brown. Abundant everywhere.
- Epinephele tithonus, L.** The Gate-keeper. Generally distributed. Llantrisant (John); Swansea (Robertson); Gower, Sully, Taff's Well, etc.
- Aphantopus hyperanthus, L.** Ringlet. Llantrisant (John); Taff's Well (Hallett).

- Cœnonympha pamphilus, L.** Small Heath. Very common everywhere.
- Zephyrus betulæ, L.** Brown Hairstreak. Llantrisant, rare (John).
- Zephyrus quercus, L.** Purple Hairstreak. Llantrisant, common (John); Swansea, common on oaks at Sketty Park (Robertson).
- Thecla w-album, Knoch.** White Letter Hairstreak. Porthkerry (Allen); Swansea, one seen by Barrow's Farm, 1892 (Robertson).
- Callophrys rubi, L.** Green Hairstreak. Llantrisant (John); Swansea, common (Robertson); Caerphilly, abundant (Reece); Vale of Neath (Hallett).
- Chrysophanus phlœas, L.** Small Copper. Very common and generally distributed.
- Lycæna argus, Haw.** Silver-studded Blue. Llantrisant, not common (John).
- Lycæna astrarche, Bergst.** Brown Argus. Local. Porthcawl (John); Deurch Bay, fairly common (Robertson); Porthkerry.
- Lycæna icarus, Rott.** Common Blue. Very common throughout the County.
- Lycæna corydon, F.** Chalk-hill Blue. Has been taken near Southern-down Golf Course (John). Mr. Max. Wright took a single specimen in 1916 at Castell Coch.
- Cyaniris argiolus, L.** Holly Blue. Llantrisant (John); scarce at Sketty and Penllergaer in 1893 (Robertson); quite common in the City of Cardiff (Reece); Cwrt-yr-ala, exceptionally abundant in the Spring of 1915 (Hallett). The Spring brood, in this district, appears to be much more abundant than the Autumn brood.
- Zizera minima, Fuess.** Little Blue. Llantrisant (John); Penarth (Hallett).
- Nomiades semiargus, Rott.** Mazarine Blue. In the "Intelligencer" of 1859, Mr. T. Parry, Merthyr, writes—"In 1835-6-7, I could take it in plenty, but have never seen it since." In 1874, 1875, and 1877, specimens in small numbers appear to have been taken at Penarth, and in 1871 A. E. Hudd met with half-a-dozen near Llantrisant (Barrett, Brit. Lep., Vol. I.). Mr. Evan John writes—"I used to take it every year, and once saw about twenty specimens in one field."
- Nemeobius lucina, L.** Duke of Burgundy. Not recorded from many districts. It is not uncommon at Taff's Well (Hallett).
- Hesperia malvæ, L.** Grizzled Skipper. Common. Llantrisant (John); Taff's Well, Cwrt-yr-ala, etc.
var. **taras, Meig.** Glamorgan (Vivian).
- Thanaos tages, L.** Dingy Skipper. Common, Llantrisant (John); Swansea (Robertson); Peterston, common (Reece); Taff's Well, Cwrt-yr-ala, etc. (Hallett).

- Adopæa thaumas, Hufn.** Small Skipper. Common. Llantrisant (John); Swansea (Robertson); Sully, Taff's Well, etc. (Hallett).
- Augiades sylvanus, Esp.** Large Skipper. Common. Llantrisant (John); Swansea (Robertson); Sully, Cwrt-yr-ala, etc. (Hallett).
- Augiades comma, L.** Silver-spotted Skipper. Bedwas, near Caerphilly (John).

HETEROCERA.

- Dilina tiliæ, L.** Lime Hawk. Larvæ have been taken at Merthyr Mawr (E. U. David).
- Smerinthus populi, L.** Poplar Hawk. Common, Llantrisant (John); Swansea (Robertson); Penarth, Sully, Cwrt-yr-ala, etc.
- Smerinthus ocellatus, L.** Eyed Hawk. Not rare. Penarth (Birkenhead); Llantrisant (John); Port Talbot (Vivian and Robertson); Larvæ abundant at Merthyr Mawr, 1910 (Reece).
- Acherontia atropos, L.** Death's Head. A few specimens turn up every year. Llantrisant (John); Swansea (Wakefield); Penarth, etc. Appears to be decreasing everywhere since the introduction of spraying potatoes (Reece).
- Sphinx convolvuli, L.** Convolvulus Hawk. Penarth (Birkenhead); Llantrisant (John); Swansea, common in 1892 (Robertson); Llandaff (David); one in Newport Road, Roath, about 25 years ago (Reece).
- Sphinx ligustri, L.** Privet Hawk. Not uncommon, Llantrisant (John); Swansea, one larva at Killay, 1892 (Robertson); Penarth.
- Deilephila galii, Schiff.** Bedstraw Hawk. Has been taken on the coast (Birkenhead).
- Phryxus livornica, Esp.** Striped Hawk. Llantrisant (John); Sketty Park, one taken on Rhododendrons, 5th June, 1892 (Robertson); Port Talbot (Vivian).
- Metopsilus porcellus, L.** Small Elephant Hawk. Penarth, Barry Island (Birkenhead); Llantrisant (John); Swansea, common in garden, 1892 (Robertson); Port Talbot (Vivian).
- Chærocampa elpenor, L.** Elephant Hawk. Llantrisant (John); Swansea, scarce in garden, 1892 and 1893 (Robertson); Port Talbot (Vivian); Roath, in 1906, at electric light in street (Reece).
- Macroglossa stellatarum, L.** Humming-bird Hawk. Common, Llantrisant (John); Langland Bay and Sketty (Robertson); Penarth, Sully, etc.
- Hemaris tityus, L.** Narrow Bordered Bee Hawk. Penarth, 1890 (Birkenhead); Llantrisant, common (John); fairly common at Penllergaer and Sketty Park, 1892 and 1893 (Robertson).

- Cerura bicuspis**, Borkh. Alder Kitten. Llantrisant (John); Port Talbot (Vivian).
- Cerura furcula**, L. Sallow Kitten. Llantrisant (John).
- Cerura bifida**, Hb. Poplar Kitten. Port Talbot and Merthyr Mawr (Vivian); Cardiff, at electric light (Reece).
- Dicranura vinula**, L. Puss Moth. Not uncommon, Llantrisant (John); Port Talbot (Vivian); Penarth (Howe); Cardiff, at electric light (Reece); Swansea, larvæ on sandhills and in garden (Robertson).
- Stauropus fagi**, L. The Lobster. Fonmon, at light, Bridgend (Birkenhead); Penllergaer (Stafford); Port Talbot, Merthyr Mawr (Vivian); Sketty Park, one male in trap, 2nd May, 1893, Margam, both sexes, 9th May, 1893 (Robertson).
- Drymonia trimacula**, Esp.
var. **nodonea**, Hb. Marbled Brown. Llantrisant (John); Swansea, scarce in traps in Sketty Park (Robertson).
- Drymonia chaonia**, Hb. Lunar Marbled Brown. Llantrisant (John); scarce at Penllergaer (Robertson).
- Pheosia tremula**, L. Swallow Prominent. Llantrisant (John); Swansea (Robertson); Port Talbot (Vivian); at electric light at Cardiff (Reece).
- Pheosia dictæoides**, Esp. Lesser Swallow Prominent. Llantrisant (John); Glamorgan (Vivian); Sketty Park, scarce in traps (Robertson); at electric light at Cardiff (Reece).
- Notodonta ziczac**, L. Pebble Prominent. Llantrisant (John); Glamorgan (Vivian); at light and larvæ by Killay (Robertson); Penarth (Howe); at electric light in Cardiff (Reece).
- Notodonta dromedarius**, L. Iron Prominent. Llantrisant (John); larvæ beaten at Penllergaer (Robertson).
- Notodonta trepida**, Esp. Great Prominent. Barry, one specimen (Howe).
- Lophopteryx camelina**, L. Coxcomb Prominent. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson); Penarth (Howe).
- Pterostoma palpina**, L. Pale Prominent. Port Talbot (Vivian); scarce in traps and at Penllergaer (Robertson).
- Phalera bucephala**, L. Buff Tip. Common, Llantrisant (John); Port Talbot (Vivian); Common in traps in Sketty Park (Robertson); The larvæ are sometimes so plentiful in Penarth as to defoliate the lime trees planted in the streets.
- Pygæra pigra**, Hufn. Small Chocolate Tip. Llantrisant (John); Port Talbot (Vivian); larvæ at Penllergaer and in colliery meadows (Robertson).

- Habrosyne derasa, L.** Buff Arches. Fairly common, Llantrisant (John); Port Talbot (Vivian); fairly common at sugar in woods below Sketty Park (Robertson); Penylan, Cardiff (Reece); Penarth (Howe).
- Thyatira batis, L.** Peach Blossom. Not very common, Llantrisant (John); fairly common at sugar and light at Sketty (Robertson); Port Talbot (Vivian); Penylan, 1906 (Reece); Penarth (Birkenhead), etc.
- Palimpsestis octogesima, Hb.** Figure of Eighty. Penarth (Howe).
- Palimpsestis or, F.** Poplar Lutestring. Porthkerry (John).
- Palimpsestis duplaris, L.** Lesser Satin Lutestring. Llantrisant (John); Port Talbot, May, 1894, a fine melanic form (Vivian).
- Palimpsestis fluctuosa, Hb.** Satin Carpet. Two examples were taken at Gwaelodygarth in 1918 by Mr. E. U. David.
- Asphalia diluta, F.** Lesser Lutestring. Fairly common at Sketty in 1892 (Robertson).
- Polyploca flavicornis, L.** Yellow Horned. Llantrisant (John); Clyne Wood, one taken at rest, 28th March, 1893 (Robertson); common at Merthyr Tydfil (Reece).
- Orgyia antiqua, L.** Vapourer. Llantrisant (John); Sketty Park, scarce (Robertson); Newport Road, Cardiff, but apparently only between the Infirmary and Four Elms Road (Reece).
- Dasychira pudibunda, L.** Pale Tussock. Llantrisant (John); common in Sketty Park Woods and traps (Robertson); Port Talbot (Vivian); larvæ common in Vale of Neath.
- Euproctis chrysorrhœa, L.** Brown Tail. Porthkerry (Allen).
- Porthesia similis, Fuess.** Gold Tail. Llantrisant (John); abundant at electric light in Cardiff (Reece); Penarth, Dinas Powis, etc.
- Lymantria monacha, L.** Black Arches. Porthkerry (Allen); Port Talbot (Vivian); Penllergaer and Sketty Park, scarce (Robertson).
- Malacosoma neustria, L.** Lackey. Porthkerry (Allen); Merthyr Mawr and Port Talbot (Vivian); Oxwich Bay, common in larval state (Robertson); Peterston, abundant in 1912 (Reece).
- Lasiocampa quercus, L.** Oak Eggar. Llantrisant (John); Port Talbot (Vivian); Langland Bay, 1893 (Nash); Sully, Vale of Neath, var. *callunæ*, Palmer. Llanmadoc (Wakefield).
- Lasiocampa trifolii, Esp.** Grass Eggar. Llantrisant (John).
- Macrothylacia rubi, L.** Fox Moth. Llantrisant (John); Port Talbot (Vivian); Pontneathvaughan, common, Swansea, common (Robertson). It is common in all suitable localities.

- Cosmotriche potatoaria**, L. Drinker. Llantrisant, Common (John); Swansea, ova found by colliery meadows (Robertson); Cardiff (Reece); Penarth.
- Gastropacha quercifolia**, L. Lappet. Has been taken in Glamorgan (John).
- Saturnia pavonia**, L. Emperor. Llantrisant (John); Hendrefoilan in larval state (Robertson); Barry Island (Birkenhead).
- Drepana falcataria**, L. Pebble Hook Tip. Llantrisant (John); Port Talbot (Vivian); Sketty Park and Penllergaer (Robertson); Penarth (Howe).
- Drepana binaria**, Hufn. Oak Hook Tip. Llantrisant (John); Penarth (Howe); Cwrt-yr-ala (Birkenhead).
- Drepana cultraria**, F. Barred Hook Tip. Castell Coch (John); Penarth (Howe).
- Drepana lacertinaria**, L. Scalloped Hook Tip. Llantrisant (John); Port Talbot (Vivian); Sketty Park and Penllergaer (Robertson).
- Cilix glaucata**, Scop. Chinese Character. Llantrisant (John); Sketty Park and Penllergaer (Robertson); Port Talbot (Vivian); Cardiff, at electric light (Reece).
- Nola cucullatella**, L. Short Cloaked. Porthkerry (Allen); Sketty Park, common in 1892, rare in 1893 (Robertson).
- Nola confusalis**, H-S. Least Black Arches. Porthkerry (Allen); fairly common at Penllergaer and Clyne (Robertson).
- Nola centonalis**, Hb. Scarce Black Arches. Has been taken in Glamorgan (John).
- Hylophila prasinana**, L. Green Silver Lines. Llantrisant (John); Swansea, beaten from trees by Colliery Meadows (Robertson); Cwrt-yr-ala, Taff's Well (Hallett).
- Hylophila bicolorana**, Fuess. Scarce Silver Lines. Porthkerry (Allen).
- Sarothripa revayana**, Tr. Large Marbled Tortrix. Has been taken in Glamorgan (John).
- Spilosoma menthastri**, Esp. White Ermine. Llantrisant (John); Port Talbot (Vivian); common in moth traps, Sketty Park (Robertson); Penarth, etc., common.
- Spilosoma urticae**, Esp. Water Ermine. Has been taken in Glamorgan (John).
- Spilosoma lubricipeda**, Esp. Buff Ermine. Abundant everywhere, even in towns. Llantrisant (John); Sketty (Robertson); Penarth, etc.
- Diaphora mendica**, Clerck. Muslin. Llantrisant (John); Port Talbot (Vivian); Sketty Park (Robertson); Peterston (Reece); Penarth, var. *rusticata*, Hb. Port Talbot (Vivian).

- Phragmatobia fuliginosa, L.** Ruby Tiger. Llantrisant, not uncommon (John); Penllergaer and Cutliffes (Robertson); Horton, Gower.
- Parasemia plantaginis, L.** Wood Tiger. Llantrisant (John); Port Talbot (Vivian); common at Penllergaer, 1893 (Robertson).
- Diacrisia sanio, L.** Clouded Buff. Llantrisant (John); Port Talbot (Vivian); Swansea, one male taken in colliery meadows, 7th June, 1893 (Robertson); Pontneathvaughan (Birkenhead).
- Arctia caia, L.** Tiger Moth. Common, Llantrisant (John); Swansea (Robertson); Penarth, etc.
- Arctia villica, L.** Cream Spot Tiger. Llantrisant (John); Penarth, Sully, etc., not uncommon (Hallett).
- Callimorpha dominula, L.** Scarlet Tiger. Llantrisant (John).
- Deiopeia pulchella, L.** Crimson Speckled. Taken on the wing at Porthkerry, 8th June, 1892 (O. H. Jones). See Ent. Record, 1892, p. 226. This specimen is in the Vivian Collection in the National Museum of Wales.
- Hipocrita jacobææ, L.** Cinnabar. Very common, Llantrisant (John); Swansea (Robertson); Penarth, Porthcawl, Gower, etc.
- Atolmis rubricollis, L.** Red-necked Footman. Llantrisant (John).
- Nudaria mundana, L.** Muslin. Llantrisant (John); Sketty Park, rare in trap (Robertson); Peterston (Reece).
- Comacta senex, Hb.** Round-winged Muslin. Llantrisant (John); Sketty Park, rare in trap (Robertson).
- Miltochrista miniata, Forster.** Rosy Footman. Llantrisant (John); Port Talbot (Vivian).
- Cybosia mesomella, L.** Four-dotted Footman. Llantrisant (John).
- Lithosia lurideola, Zincken.** Common Footman. Llantrisant (John); Port Talbot (Vivian).
- Lithosia complana, L.** Scarce Footman. Port Talbot (Vivian).
- Demas coryli, L.** Nut-tree Tussock. Merthyr Mawr (Nicholl); Swansea, (Robertson).
- Acronycta leporina, L.** The Miller. Llantrisant (John); Sketty Park, one at sugar, 1st July, 1894 (Robertson); Newport Road, Cardiff, one full-fed larva about 20 years ago (Reece).
- Acronycta megacephala, F.** Poplar Grey. Merthyr Mawr and Port Talbot (Vivian); Sketty Park, fairly common (Robertson).
- Acronycta alni, L.** The Alder. Llantrisant (John); pupæ found at Derwen, 1892 (Robertson); Penarth (Howe).
- Acronycta tridens, Schiff.** Dark Dagger. Scarce in the larval state on sandhills (Robertson).

- Acronycta psi, L.** Grey Dagger. Common, Llantrisant (John); Port Talbot (Vivian); Sketty Park (Robertson); Penarth, etc.
- Acronycta menyanthidis, View.** Light Knot-grass. Llantrisant (John).
- Acronycta rumicis, L.** Knot-grass. Llantrisant (John); Port Talbot (Vivian); Swansea, common (Robertson); Cardiff, 1906 (Reece), Penarth, (Hallett).
- Craniophora ligustri, L.** Coronet. Llantrisant (John); Port Talbot (Vivian); pupæ at Gower (Robertson).
- Bryophila perla, F.** Marbled Beauty. Llantrisant (John); Port Talbot (Vivian); Swansea, common (Robertson); Cardiff, common (Reece); Penarth, etc., very common.
- Bryophila glandifera, Hb.** Marbled Green. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common (Robertson); Cardiff common, especially at electric lights (Reece); Penarth, not uncommon.
- Agrotis segetum, Schiff.** Turnip Moth. Very abundant throughout the County.
- Agrotis vestigialis, Hufn.** Archer's Dart. Port Talbot and Merthyr Mawr (Vivian); Swansea, not uncommon by beating sand rush (Robertson).
- Agrotis corticea, Hb.** Heart and Club. Llantrisant (John); Swansea, common at sugar on the sandhills (Robertson); Penarth.
- Agrotis cinerea, Hb.** Light Feathered Rustic. Penllergaer (Llewelyn); Port Talbot (Vivian); Sketty Park, one in moth trap, 11th May, 1893 (Robertson).
- Agrotis puta, Hb.** Shuttle-shaped Dart. Port Talbot and Merthyr Mawr (Vivian); Swansea, not common at sugar (Robertson).
- Agrotis lunigera, Steph.** Crescent Dart. Port Talbot (Vivian); Merthyr Mawr (John).
- Agrotis cursoria, Borkh.** Coast Dart. Port Talbot (Vivian).
- Agrotis nigricans, L.** Garden Dart. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sugar (Robertson).
- Agrotis tritici, L.** White Line Dart. Porthcawl (John); Swansea, common by beating sand rush (Robertson).
var. **aquilina, Hb.** Swansea (Robertson).
- Agrotis exclamationis, L.** Heart and Dart. Abundant everywhere.
- Agrotis ypsilon, Rott.** Dark Sword Grass. Llantrisant (John); Port Talbot (Vivian); Sketty Park, abundant at sugar, 1892 (Robertson); Penylan, abundant at sugar, 1906 (Reece); Penarth, very abundant in 1900 (Howe).
- Agrotis ripæ, Hb.** Sand Dart. Swansea (Llewelyn and Robertson); Port Talbot (Vivian); Penarth (Birkenhead); Porthcawl, larvæ abundant in 1906, and probably every year (Reece).

- Agrotis strigula**, **Thunb.** True Lover's Knot. Llantrisant (John); Sketty Park, scarce at sugar, 1893 (Robertson).
- Agrotis præcox**, **L.** Portland Moth. Penllergaer (Llewelyn); Sketty Park, scarce at light, and Mumbles by beating Sand Rush (Robertson); Port Talbot (Vivian).
- Agrotis saucia**, **Hb.** Pearly Underwing. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common (Robertson); Penarth, very abundant in 1900 (Howe).
- Agrotis lucerneæ**, **L.** Northern Rustic. Llantrisant (John); Port Talbot (Vivian); Langland Bay, one taken at light by Rev. A. Nash, 19th July, 1893 (Robertson); Swansea is given by Morris, (Vol. II., p. 134) as a locality for this moth.
- Agrotis ashworthii**, **Dbl.** Ashworth's Rustic. Mr. Evan John saw a specimen of what he believes was this moth at rest on the mountain side near Llantrisant some years ago.
- Noctua augur**, **F.** Double Dart. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at sugar, 1893 (Robertson).
- Noctua glareosa**, **Esp.** Autumnal Rustic. Llantrisant (John); Sketty Park, scarce at sugar (Robertson).
- Noctua castanea**, **Esp.** Grey Rustic. Swansea, scarce at sugar, 1892 (Robertson).
- var. **neglecta**, **Hb.** Swansea (Robertson).
- Noctua baja**, **F.** Dotted Clay. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar (Robertson).
- Noctua depuncta**, **L.** Plain Clay. Penllergaer (Llewelyn); Sketty Park, one at sugar, 25th July, 1893 (Robertson).
- Noctua c-nigrum**, **L.** Setaceous Hebrew Character. Llantrisant (John); Sketty Park, not common at sugar, 1892 and 1893, Cardiff, etc., common (Reece).
- Noctua ditrapezium**, **Borkh.** Triple Spotted Clay. Llantrisant (John); Port Talbot (Vivian); Sketty Park, a few at moth traps, 1892 (Robertson); near Swansea (Barrett).
- Noctua triangulum**, **Hb.** Double-spotted Clay. Llantrisant (John); Port Talbot (Vivian).
- Noctua brunnea**, **F.** Purple Clay. Llantrisant (John); Penarth (Williams); Sketty Park, not common at sugar (Robertson).
- Noctua primulæ**, **Esp.** Ingrailed Clay. Llantrisant (John); Sketty Park, common at sugar and light, 1892 and 1893 (Robertson); Penylan, common at sugar, 1906 (Reece); Penarth (Howe).
- Noctua dahlii**, **Hb.** Barred Chestnut. Glamorgan (John).

- Noctua rubi**, **View.** Small Square Spot. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar and light in 1892 and 1893 (Robertson).
- Noctua umbrosa**, **Hb.** Six-striped Rustic. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar and light in 1892 and 1893 (Robertson).
- Noctua xanthographa**, **F.** Square Spot Rustic. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar, 1892 (Robertson).
- Noctua plecta**, **L.** Flame Shoulder. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common at sugar, 25th July, 1893 (Robertson); Penarth (Birkenhead); Cardiff, etc., common everywhere (Reece).
- Axylia putris**, **L.** Flame. Llantrisant (John); Port Talbot (Vivian); Sketty Park, scarce at sugar in 1893 (Robertson).
- Triphæna comes**, **Hb.** Lesser Yellow Underwing. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar, 1892 and 1893 (Robertson); Penarth (Birkenhead); "abundant in our garden at Roath" (Reece).
- Triphæna pronuba**, **L.** Yellow Underwing. Abundant everywhere. A beautiful variety, fore wings nearly pure white, hind ones cream colour, with a pink tint, was taken at Swansea, 21st July, 1892, by W. Holland.
- Triphæna fimbria**, **L.** Broad-bordered Yellow Underwing. Llantrisant (John); Sketty Park, fairly common at sugar, 1892 (Robertson); Penarth (Birkenhead).
- Triphæna ianthina**, **Esp.** Lesser Broad Border. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common at sugar, 1892 and 1893 (Robertson); Penarth (Birkenhead).
- Triphæna interjecta**, **Hb.** Least Yellow Underwing. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce (Robertson).
- Eurois prasina**, **F.** Green Arches. Llantrisant (John); Swansea, scarce at sugar in wood below Park (Robertson).
- Eurois occulta**, **L.** Great Brocade. Neath (Llewelyn).
- Aplecta tincta**, **Brahm.** Silvery Arches. Glamorgan (John).
- Aplecta advena**, **F.** Pale Shining Brown. Llantrisant (John).
- Aplecta nebulosa**, **Hb.** Grey Arches. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar in wood below Park in 1892 (Robertson); Castell Coch (Williams); Penylan, 1906, abundant at sugar (Reece).
- Barathra brassicæ**, **L.** Cabbage Moth. Only too common throughout the County.

- Mamestra persicariæ, L.** The Dot. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common on sandhills, 1892 and 1893 (Robertson); Cwrt-yr-ala, 1890 (Birkenhead); Penarth.
- Mamestra albicolon, Hb.** White Colon. Port Talbot (Vivian); Swansea (Llewelyn); scarce at sugar and by beating Sand Rush in 1892 and 1893 (Robertson).
- Mamestra oleracea, L.** Bright Line Brown Eye. Very common and generally distributed.
- Mamestra genistæ, Borkh.** Light Brocade. Llantrisant (John); Port Talbot (Vivian); Swansea (Robertson); Penarth (Birkenhead).
- Mamestra dissimilis, Knoch.** The Dog's Tooth. Port Talbot (Vivian); Swansea, rare at sugar, 1893 (Robertson); Cwrt-yr-ala (Williams).
- Mamestra thalassina, Rott.** Pale Shouldered Brocade. Llantrisant (John); Port Talbot (Vivian); Common at sugar and light at Sketty Park, 1892 and 1893 (Robertson); Penarth (Birkenhead).
- Mamestra contigua, Vill.** Beautiful Brocade. Llantrisant (John); Port Talbot (Vivian); Cardiff, 1906, at electric light (Reece).
- Mamestra pisi, L.** Broom Moth. Llantrisant (John); Port Talbot (Vivian); Swansea, common at light in Park (Robertson).
- Mamestra trifolii, Rott.** The Nutmeg. Port Talbot (Vivian).
- Mamestra glauca, Hb.** Glaucous Shears. Port Talbot, several at light, 1893 (Vivian).
- Mamestra dentina, Esp.** The Shears. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar and flowers, 1892 and 1893 (Robertson).
- Dianthœcia conspersa, Esp.** Marbled Coronet. Llantrisant (John); Port Talbot (Vivian); Swansea, larvæ not uncommon on *Lychnis flos-cuculi*, 1892 (Robertson).
- Dianthœcia capsicola, Hb.** Lychnis. Llantrisant (John); Swansea, larvæ common on *Silene* (Robertson).
- Dianthœcia cucubali, Fuess.** Champion. Llantrisant (John); Port Talbot (Vivian); Swansea, larvæ scarce in *Silene* (Robertson); Penarth (Howe).
- Dianthœcia carpophaga, Bork.** Tawny Shears. Llantrisant (John); Port Talbot (Vivian); Sketty Park, one at light, 14th May, 1893 (Robertson).
- Dianthœcia capsophila, Dup.** The Pod Lover. Swansea, one taken at light, 26th August, 1893, and several larvæ in seed heads of *Silene maritima* at Langland Bay (Robertson).
- Hecatera chrysozona, Bork.** Small Ranunculus. Penllergaer (Llewelyn).
- Hecatera serena, F.** Broad Barred White. Llantrisant (John).

- Neuria reticulata**, Vill. Bordered Gothic. Glamorgan (John); Penarth (Williams).
- Epineuronia popularis**, F. Feathered Gothic. Llantrisant (John); Swansea, very common at moth traps, 1892 (Robertson); Penarth (Birkenhead); Peterston, common, 1912 (Reece).
- Tholera cespitis**, F. Hedge Rustic. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at moth traps, 1892 (Robertson).
- Charæas graminis**, L. Antler. Common. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common in moth traps, 1892 and 1893 (Robertson); Penarth.
- Xylomiges conspicillaris**, L. Silver Cloud. Gower, 1875 (Barrett, Brit. Lepid., Vol. IV., p. 145).
- Eumichtis adusta**, Esp. Dark Brocade. Glamorgan (John).
- Eumichtis protea**, Bork. Brindled Green. Llantrisant (John); Sketty Park, 1892, not uncommon at sugar (Vivian); Leckwith (Birkenhead); Penarth (Williams, Howe, etc.).
- Bombycia viminalis**, F. Minor Shoulder Knot. Llantrisant (John); Port Talbot (Vivian).
- Diloba cæruleocephala**, L. Figure of Eight. Porthkerry (Allen); Penarth (Howe); Peterston, 1915 (Reece).
- Valeria oleagina**, F. Green Brindled Dot. Mr. C. W. Williams tells me he took the larva at Castell Coch in 1898, from which he reared the moth. First recorded for this country by E. Donovan, July, 1800, near Fishguard, Pem. (Barrett, Vol. IV., p. 330).
- Luperina testacea**, Hb. Flounced Rustic. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at traps, 1892 (Robertson); common (Reece).
- Cerigo matura**, Hufn. Straw Underwing. Llantrisant (John); Port Talbot (Vivian); Penarth (Williams, Birkenhead).
- Calæna haworthii**, Curt. Haworth's Minor. Glamorgan (John); common near Onllwyn Colliery (Robertson).
- Hama sordida**, Bork. Large Nutmeg. Porthkerry (Allen); Swansea, one at sugar on sandhills, 1st June, 1893 (Robertson).
- Hama furva**, Hb. The Confused. Gower (John); Port Talbot (Vivian).
- Apamea gemina**, Hb. Dusky Brocade. Llantrisant (John); Swansea, common at sugar and flowers, 1892 and 1893 (Robertson); Port Talbot (Vivian).
- var. **remissa**, Tr. Swansea (Robertson).

- Apamea basilinea, F.** Rustic Shoulder Knot. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at sugar on sandhills (Robertson); Peterston, 1912 (Reece).
- Apamea unanymis, Tr.** Small Clouded Brindle. Llantrisant (John); Port Talbot (Vivian); Swansea, one at sugar, 1893 (Robertson).
- Apamea pabulatricula, Brahm.** Union Rustic. Llantrisant, at light, 1914 (John).
- Apamea secalis, L.** Common Rustic. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar and flowers, 1892 and 1893 (Robertson); Penarth (Lamb).
- Miana strigilis, Clerck.** Marbled Minor. Llantrisant (John); Swansea, common at sugar and flowers in 1892 and 1893 (Robertson); Penarth (Howe); Peterston, 1912, swarming at sugar (Reece).
- Miana fasciuncula, Haw.** Middle Barred Minor. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar and flowers, 1892 and 1893 (Robertson).
- Miana literosa, Haw.** Rosy Minor. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sugar on sandhills, 1893 (Robertson).
- Miana bicoloria, Vill.** Cloaked Minor. Llantrisant (John); Swansea, common at sugar and flowers, 1892 and 1893 (Robertson).
- Xylophasia rurea, F.** Cloud-bordered Brindle. Llantrisant (John); Port Talbot (Vivian); Swansea, common at flowers and sugar, 1893 (Robertson).
- var. **combusta, Duponchel.** Swansea (Robertson).
- Xylophasia lateritia, Hufn.** Taken at Porthkerry by Mr. W. E. R. Allen, and was an addition to the British List, see Barrett, Brit. Lepid., Vol VII., p. 322. The specimen is in the H. W. Vivian Collection at the National Museum of Wales.
- Xylophasia lithoxylea, F.** Light Arches. Llantrisant (John); Port Talbot (Vivian); Swansea, common (Robertson).
- Xylophasia monoglypha, Hufn.** Dark Arches. Abundant everywhere throughout the County.
- Xylophasia hepatica, L.** Clouded Brindle. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar in 1892 (Robertson).
- Xylophasia scolopacina, Esp.** Slender Brindle. Llantrisant (John); Sketty, scarce at sugar in wood below Park, 1892 and 1893 (Robertson).
- Cloantha polyodon, Clerck.** Purple Cloud. Port Talbot (Vivian); Penarth.

- Aporophyla lutulenta**, Bork. Deep Brown Dart. Glamorgan (John); Neath (Barrett, IV., p. 280, probably the same record); Llandaff (Williams).
- Aporophyla nigra**, Haw. Black Rustic. Port Talbot and Merthyr Mawr (Vivian).
- Epunda lichenea**, Hb. Feathered Ranunculus. Gower (John); Port Talbot (Vivian).
- Dasypolia templi**, Thunb. Brindled Ochre. Penllergaer (Llewelyn); Port Talbot (Vivian); Porthkerry (Birkenhead); Penarth (Howe); Swansea, one taken by Thos. Griffith, 1895, this was taken whilst a truck of coal from Staffordshire was being discharged, and the moth may have come from there, having gone into the coal to hibernate (Robertson).
- Polia flavicincta**, F. Large Ranunculus. Llandaff (David); Penarth, 1900 (Howe); not rare in September, 1919 (Hallett).
- Polia chi**, L. The Grey Chi. Llantrisant (John).
- Brachionycha sphinx**, Hufn. The Sprawler. Porthkerry (Allen); Port Talbot (Vivian); Penarth (Howe).
- Miselia oxyacanthæ**, L. Green Brindled Crescent. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar, 1892 (Robertson); Penylan, 1906, common at sugar (Reece); Penarth, freely at sugar and ivy (Birkenhead).
- var. **capucina**, Mill. Swansea (Robertson); Penylan, 1906, nearly as abundant as the type (Reece).
- Agriopis aprilina**, L. Merveille-du-jour. Llantrisant (John); Port Talbot (Vivian); Penllergaer, 1892 (Robertson); Cardiff; Penarth, common in 1900 (Howe).
- Euplexia lucipara**, L. Small Angle Shades. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar in Park and on sandhills (Robertson); Penylan, 1906, common (Reece); Penarth (Howe).
- Phlogophora meticulosa**, L. Angle Shades. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar and on sandhills (Robertson); common everywhere, the larva is an omnivorous feeder (Reece); Penarth, Hirwain, Porthcawl, etc. (Hallett).
- Mormo maura**, L. Old Lady. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common at sugar (Robertson); Pontneathvaughan, Penarth, etc. (Hallett).
- Nænia typica**, L. The Gothic. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar (Robertson); Penarth (Hallett).
- Helotropha leucostigma**, Hb. The Crescent. Port Talbot (Vivian); Neath (Barrett, Brit. Lep., Vol. V., p. 61).

- Hydroecia nictitans**, Borkh. The Ear Moth. Llantrisant (John); Port Talbot (Vivian); Sketty Park, very common at sugar and light (Robertson); Cardiff (Reece). These records probably all contain a proportion of the next species.
- Hydroecia paludis**, Tutt. Mr. F. N. Pierce has examined the whole of the specimens in the National Museum of Wales belonging to the Vivian, Howe, and Birkenhead collections, standing under the name of the previous species, and finds that this is apparently the ordinary more inland species in Glamorgan, and that **Hydroecia nictitans** seems to be that species which is recorded from the sandhills. There are local specimens of both species in the three collections.
- Hydroecia micacea**, Esp. Rosy Rustic. Llantrisant (John); Port Talbot (Vivian); Sketty Park, scarce at light and sugar (Robertson); Penarth (Birkenhead).
- Hydroecia petasitis**, Dbl. Butterbur. Has been taken in Glamorgan (John); Neath (Barrett, Brit. Lepid., Vol. V., p. 73).
- Ochria ochracea**, Hb. Frosted Orange. Llantrisant (John); Port Talbot (Vivian); Swansea, pupæ in stems of hemp agrimony and foxglove in colliery meadows (Robertson); larvæ usually abundant in the stems of Foxgloves, which is the commonest food plant in this district (Reece).
- Nonagria typhæ**, Esp. The Bulrush. Penllergaer (Llewelyn and Robertson); Port Talbot (Vivian).
- Cænobia rufa**, Haw. Small Rufous. Llantrisant (John); Sketty Park, three taken in moth traps, 10th August, 1893 (Robertson).
- Tapinostola fulva**, Hb. Small Wainscot. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at light, 1892 (Robertson); Penarth, 1900 (Howe).
- Calamia lutosa**, Hb. Large Wainscot. Cardiff (John); Penarth (Howe); Port Talbot (Vivian).
- Leucania pallens**, L. Common Wainscot. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at sugar and light (Robertson); Cardiff district, common (Reece).
- Leucania impura**, Hb. Smoky Wainscot. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at sugar and light (Robertson); Barry Island (Birkenhead).
- Leucania straminea**, Tr. Southern Wainscot. Port Talbot (Vivian).
- Leucania impudens**, Hb. Striped Wainscot. Llantrisant (John); Port Talbot (Vivian); near Neath (Barrett); Sketty Park, one at light, 10th June, 1893 (Robertson).
- Leucania littoralis**, Curt. Shore Wainscot. Port Talbot (Vivian); larvæ very common in 1892 at Port Talbot and Swansea (Robertson); Barry Island (Birkenhead).

- Leucania comma, L.** Shoulder-striped Wainscot. Llantrisant (John); Port Talbot (Vivian); Swansea, 1892 and 1893, scarce at sugar (Robertson); Barry Island (Birkenhead); common at sugar, Penylan, in 1906 (Reece).
- Leucania putrescens, Hb.** Devonshire Wainscot. Mumbles (John); Swansea (Birkenhead and Llewelyn).
- Leucania unipuncta, Haw.** White Neck. Port Talbot and Merthyr Mawr (Vivian); near Neath, 1869 (Barrett, Vol. V., p. 163).
- Leucania lithargyria, Esp.** The Clay. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar and light (Robertson); Cardiff, common (Reece).
- Leucania conigera, F.** Brown Line Bright-eye. Llantrisant (John); Swansea, scarce at sugar (Robertson); Barry Island (Birkenhead)
- Leucania turca, L.** Double Line. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sugar (Robertson).
- Grammesia trigrammica, Hufn.** Treble Lines. Llantrisant (John); Port Talbot (Vivian); Swansea, common at moth traps, 1892 and 1893 (Robertson).
- var. **bilinea, Hb.** Swansea, one at sugar, 1890 (Robertson).
- Stilbia anomala, Haw.** The Anomalous. Port Talbot and Merthyr Mawr (Vivian).
- Caradrina morpheus, Hufn.** Mottled Rustic. Port Talbot (Vivian); Swansea, common at moth traps, with the black variety, in 1892 and 1893 (Robertson).
- Caradrina alsines, Brahm.** The Uncertain. Port Talbot (Vivian); Swansea, common at moth traps (Robertson).
- Caradrina taraxaci, Hb.** The Rustic. Port Talbot (Vivian); Swansea, common at moth traps (Robertson).
- Caradrina quadripunctata, F.** Pale Mottled Willow. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at sugar (Robertson); common in our garden at Roath (Reece).
- Caradrina exigua, Hb.** Small Mottled Willow. This species occurred in numbers at light a few years ago at the Electric Power Station, Lower Penarth (Williams, etc.)
- Petilampa arcuosa, Haw.** Small Dotted Buff. Llantrisant (John); Port Talbot (Vivian); Swansea, common at moth traps (Robertson).
- Rusina tenebrosa, Hb.** Brown Rustic. Llantrisant (John); Swansea abundant, with fine dark forms (Robertson); Port Talbot (Vivian); Caſtell Coch (Williams).
- Amphipyra pyramidea, L.** Copper Underwing. Llantrisant (John); Port Talbot (Vivian); abundant at sugar in Sketty Park and Wood (Robertson); Penarth.

- Amphipyra tragopogonis, L.** The Mouse. Llantrisant (John); Port Talbot (Vivian); abundant at sugar at Sketty Park and Wood (Robertson).
- Panolis griseo-variegata, Goeze.** Pine Beauty. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sallow, 1892 and 1893 (Robertson); Penarth (Birkenhead, Howe).
- Pachnobia leucographa, Hb.** White Marked. Llantrisant (John); Port Talbot (Vivian).
- Pachnobia rubricosa, F.** Red Chestnut. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sallow (Robertson); Cardiff (Reece).
- Tæniocampa gothica, L.** Hebrew Character. Llantrisant (John); Port Talbot (Vivian); Swansea, abundant at sallow (Robertson); abundant everywhere on sallow bloom in March (Reece).
- Tæniocampa miniosa, F.** Blossom Underwing. Port Talbot (Vivian).
- Tæniocampa pulverulenta, Esp.** Small Quaker. Llantrisant (John); Port Talbot (Vivian); Neath (Llewelyn); Swansea, common at sallows and light (Robertson).
- Tæniocampa stabilis, View.** Common Quaker. Common throughout the County.
- Tæniocampa populeti, F.** Lead Coloured Drab. Llantrisant and Merthyr Mawr (John); Port Talbot (Vivian); Swansea, not rare at sallows (Robertson.)
- Tæniocampa incerta, Hufn.** Clouded Drab. Llantrisant (John); Port Talbot (Vivian); Swansea, abundant at sallows (Robertson).
- Tæniocampa munda, Esp.** Twin-spotted Quaker. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sallows (Robertson); Penarth (Birkenhead); Llanedarne at sallows, 1907 (Reece).
- Tæniocampa opima, Hb.** Northern Drab. Llantrisant (John); Port Talbot (Vivian); Penarth (Birkenhead); common at sallows in Brynmill Park (Nelson Richardson).
- Tæniocampa gracilis, F.** Powdered Quaker. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sallow and light (Robertson); Penarth (Birkenhead); Penylan at sallows, 1907 (Reece).
- Dicyla oo, L.** Heart Moth. Penarth, 3rd September, 1895 (Howe).
- Calymnia pyralina, View.** Lunar Spotted Pinion. Port Talbot (Vivian); Swansea, fairly common at sugar and light (Robertson).
- Calymnia affinis, L.** Lesser Spotted Pinion. Penllergaer (Llewelyn); Port Talbot (Vivian); Swansea, one only at sugar, 1892 (Robertson).
- Calymnia diffinis, L.** White Spotted Pinion. Penllergaer (Llewelyn).

- Calymnia trapezina, L.** Dun Bar. Llantrisant (John); Port Talbot (Vivian); Swansea, common at sugar and light, 1892-3 (Robertson).
- Dyschorista suspecta, Hb.** The Suspected. Swansea, scarce at sugar in wood below Sketty Park (Robertson).
- Dyschorista fissipuncta, Haw.** Dingy Shears. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sugar on sandhills (Robertson).
- Plastenis retusa, L.** Double Kidney. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at light, 1892 and 1893 (Robertson).
- Plastenis subtusa, F.** The Olive. Llantrisant (John); Port Talbot (Vivian); Swansea, larvæ not uncommon in woods (Robertson).
- Cirrhoedia xerampelina, Hb.** Centre Barred Sallow. Llantrisant, common (John); Port Talbot (Vivian); Gower (Barrett); larvæ not uncommon at Gower, 1892 and 1893 (Robertson); Merthyr Mawr (E. U. David); Penarth, 1896 (Hallett); and one in 1900 (Howe).
- Omphaloscelis lunosa, Haw.** Lunar Underwing. Llantrisant (John); Port Talbot (Vivian); Swansea, abundant at moth traps (Robertson); Penarth (Birkenhead).
- Amathes lota, Clerck.** Red Line Quaker. Llantrisant (John); Port Talbot (Vivian); Sketty Park, scarce on ivy (Robertson); Penarth in 1900 (Howe).
- Amathes macilenta, Hb.** Yellow Line Quaker. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common on ivy, 1893 and 1893 (Robertson).
- Amathes circellaris, Hufn.** The Brick. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at sugar (Robertson).
- Amathes helvola, L.** Flounced Chestnut. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sugar, 1892 (Robertson).
- Amathes lychnidis, F.** Beaded Chestnut. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at sugar (Robertson); Cardiff abundant on ivy (Reece).
- Amathes litura, L.** Brown Spot Pinion. Llantrisant (John); Sketty Park, scarce at sugar (Robertson).
- Cirrhia citrigo, L.** Orange Sallow. Port Talbot (Vivian).
- Xanthia aurago, F.** Barred Sallow. Penllergaer (Llewelyn); Penarth (Birkenhead); common in 1900 (Howe).
- Xanthia lutea, F.** Pink Barred Sallow. Llantrisant (John); Swansea, abundant as larvæ in catkins (Robertson).
- Xanthia fulvago, L.** The Sallow. Llantrisant (John); Swansea, not rare in catkins as larvæ (Robertson); Penarth (Birkenhead); Taff's Well (Hallett); common at Penarth in 1900 (Howe).

- Xanthia gilvago**, Esp. Dusky Lemon Sallow. Glamorgan (John).
- Xantholeuca croceago**, F. Orange Upperwing. Llantrisant (John).
- Orrhodia vaccinii**, L. Chestnut. Llantrisant (John); Port Talbot (Vivian); Swansea, abundant at ivy, sugar, and light (Robertson); Penylan, 1906, swarming at sugar (Reece).
- Orrhodia ligula**, Esp. Dark Chestnut. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at ivy, 1892 (Robertson); Penylan, 1906, common at sugar (Reece).
- Orrhodia rubiginea**, F. Dotted Chestnut. Llantrisant (John); Port Talbot (Vivian); Penarth, one at sugar (Howe).
- Eupsilia satellitia**, L. Satellite. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at ivy, sugar, and light (Robertson); Penarth (Birkenhead); larvæ beaten at Roath in 1906 (Reece).
- Lithophane semibrunnea**, L. Tawny Pinion. Llantrisant (John).
- Lithophane socia**, Rott. Pale Pinion. Llantrisant (John); Port Talbot (Vivian).
- Lithophane furcifera**, Hufn. The Conformist. Pontypridd and Llantrisant (John); Port Talbot (Vivian); Mr. John's first captures added this moth to the British List, see Ent. Annual, 1862, p. 108.
- Graptolitha ornithopus**, Rott. Grey Shoulder Knot. Llantrisant (John); Port Talbot (Vivian); Swansea, not rare at sugar and at rest on trees (Robertson); Penarth, one in 1900 (Howe).
- Xylocampa areola**, Esp. Early Grey. Llantrisant (John); Port Talbot (Vivian); Swansea, common at rest on trees and posts (Robertson).
- Calocampa exoleta**, L. Sword Grass. Llantrisant (John); Port Talbot (Vivian); Swansea, common at ivy, sugar, and shallows, one at light (Robertson); Penarth, one in 1900 (Howe).
- Calocampa vetusta**, Hb. Red Sword Grass. Llantrisant (John); Port Talbot (Vivian); Swansea, common at ivy and sugar, and one at light (Robertson); Penarth (Howe).
- Cucullia verbasci**, L. The Mullein. Llantrisant (John); Swansea, common as larvæ (Robertson); Penarth (Howe, Birkenhead).
- [**Cucullia scrophulariæ**, Esp. Water Betony. Port Talbot (Vivian). This record must refer to either **Cucullia verbasci** or **Cucullia lychnitis**, as there seems to be no such species as **Cucullia scrophulariæ**.]
- Cucullia asteris**, Schiff. Star-wort. Glamorgan (John).
- Cucullia umbratica**, L. The Shark. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at flowers—pinks (Robertson); Penarth (Birkenhead).

- Cucullia chamomillæ, Schiff.** Chamomile Shark. Port Talbot (Vivian); Sketty Park, one at moth trap, 16th April, 1893 (Robertson).
- Cucullia absinthii, Hb.** Wormwood Shark. Llantrisant (John); Port Talbot (Vivian); larvæ not uncommon on wormwood at Pwll Dhu Bay (Robertson).
- Anarta myrtilli, L.** Beautiful Yellow Underwing. Llantrisant (John).
- Heliaca tenebrata, Scop.** Small Yellow Underwing. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce on flowers in colliery meadows (Robertson); Castell Coch (Howe).
- Pyrrhia umbra, Hufn.** Bordered Sallow. Llantrisant (John); Penarth.
- Heliothis peltigera, Schiff.** Bordered Straw. Penllergaer (Llewelyn); Neath, Glamorgan Coast (Barrett).
- Heliothis armigera, Hb.** Scarce Bordered Straw. Penllergaer (Llewelyn).
- [**Thalpochares ostrina, Hb.** Purple Marbled. Glamorgan (Barrett); this no doubt refers to Sir John Llewelyn's capture at Pembrey, which is in Carmarthen, see Barrett, Brit. Lepid. Vol. VI., p. 194, 195.]
- Hapalotis fasciana, L.** Marbled White Spot. Llantrisant (John)
- Hydrelia uncula, Clerck.** Silver Hook. Llantrisant (John); Port Talbot (Vivian); Swansea, common in Cutliffe's in 1892, scarce in 1893 (Robertson).
- Erastria venustula, Hb.** Rosy Marbled. Port Talbot (Vivian).
- Rivula sericealis, Scop.** Straw Dot. Llantrisant (John); Swansea, scarce in colliery meadows (Robertson).
- Prothymnia viridaria, Clerck.** Small Purple Barred. Llantrisant (John); Port Talbot (Vivian); Swansea, common in colliery meadows (Robertson).
- Scoliopteryx libatrix, L.** The Herald. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at sugar (Robertson); Penarth, not rare.
- Plusia moneta, F.** Golden Plusia. Pontsarn, Miskin (E. U. David).
- Plusia chrysis, L.** Burnished Brass. Llantrisant (John); Port Talbot (Vivian); Swansea, not common at flowers (Robertson); Cardiff, etc.
- Plusia chryson, Esp.** Scarce Burnished Brass. Penllergaer (Llewelyn); Swansea, larvæ fairly common in 1892, scarce in 1893 (Robertson); Tongwynlais (Ekins).
- Plusia bractea, F.** Golden Spangle. Penllergaer (Llewelyn).
- Plusia festucae, L.** Gold Spot. Llantrisant (John); Llanmadoc, plentiful in 1914 (E. U. David).

- Plusia iota**, L. Golden Y. Llantrisant (John); Swansea, not common at flowers (Robertson); Barry Island (Birkenhead); Penarth.
- Plusia pulchrina**, Haw. Beautiful Golden Y. Llantrisant (John); Port Talbot (Vivian); Swansea, not common at flowers and light, 1892 (Robertson).
- Plusia gamma**, L. Silver Y. Only too common throughout the County.
- Abrostola triplasia**, L. Dark Spectacle. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at flowers, 1892 (Robertson).
- Abrostola tripartita**, Hufn. Light Spectacle. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at flowers (Robertson).
- Euclidia mi**, Clerck. Mother Shipton. Llantrisant (John); Port Talbot (Vivian); Swansea, common in colliery meadows (Robertson); Penarth (Birkenhead); Peterston (Reece).
- Euclidia glyphica**, L. Burnet Companion. Llantrisant (John); Port Talbot (Vivian); Swansea, common with the last (Robertson); Penarth (Birkenhead).
- Catocala nupta**, L. Red Underwing. Llantrisant (John); Penarth (Williams).
- Toxocampa pastinum**, Tr. Black Neck. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce in colliery meadows, 1892 (Robertson); Porthkerry (Allen); Penarth (Howe).
- Zanclognatha tarsipennalis**, Tr. Fanfoot. Llantrisant (John); Sketty Park, fairly common in garden (Robertson).
- Zanclognatha grisealis**, Hb. Small Fanfoot. Llantrisant (John); Sketty Park, common in garden (Robertson).
- Hypena proboscidalis**, L. The Snout. Llantrisant (John); Swansea, fairly common by Derwen (Robertson); Penarth.
- Hypenodes tænalis**, Haw. White Line Snout. Llantrisant (John).
- Hypenodes costæstrigalis**, Steph. Pinion-streaked Snout. Llantrisant (John); Sketty Park, fairly common at light in 1892 (Robertson).
- Brephos parthenias**, L. Orange Underwing. Llantrisant (John); Clyne, one taken 28th March, 1893, and several seen at Penllergaer in 1893 (Robertson).
- Pseudoterpna pruinata**, Hufn. Grass Emerald. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common at traps and at Langland Bay (Robertson).
- Geometra papilionaria**, L. Large Emerald. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce at light, 1892 (Robertson); Penarth, 1898 (Howe); Penylan (E. Heath); Pontneathvaughan, 1906, not uncommon (Hallett).
- Geometra vernaria**, Hb. Small Emerald. Llantrisant (John); Port Talbot (Vivian); Penarth (Birkenhead).

- Euchloris pustulata**, **Hufn.** Blotched Emerald. Porthkerry, Entom., Vol. XXI., p. 116 (John); Port Talbot (Vivian).
- Iodis lactearia**, **L.** Little Emerald. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common at traps (Robertson).
- Hemithea strigata**, **Muller.** Common Emerald. Llantrisant (John); Port Talbot (Vivian).
- Acidalia virgularia**, **Hb.** Dusky Wave. Glamorgan (John).
- Acidalia interjectaria**, **Hb.** Dusky Cream Wave. Sketty Park, fairly common in garden and traps (Robertson).
- Acidalia aversata**, **L.** Ribband Wave. Llantrisant (John); Port Talbot (Vivian); Swansea, common in woods and traps (Robertson).
- var. **spoliata**, **Staudinger.** Common with the type (Robertson).
- Acidalia bisetata**, **Hufn.** Small Fan-footed Wave. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common in garden and traps (Robertson).
- Acidalia dimidiata**, **Hufn.** Single Spotted Wave. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common in garden and traps (Robertson); plentiful (Barrett).
- Acidalia trigeminata**, **Haw.** Treble Brown Spot. Port Talbot (Vivian).
- Acidalia remutaria**, **Hb.** Cream Wave. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in woods and traps (Robertson).
- Acidalia immutata**, **L.** Lesser Cream Wave. Llantrisant (John); Swansea, fairly common in colliery meadows in 1892 (Robertson).
- Acidalia marginepunctata**, **Goeze.** Mullein Wave. Gower (John).
- Acidalia imitaria**, **Hb.** Small Blood Vein. Llantwit Major (John); Llandaff (Vivian); Sketty Park, one only in moth trap, 7th July, 1893 (Robertson).
- Acidalia rubiginata**, **Hufn.** Tawny Wave. Penarth (Williams).
- Ania emarginata**, **L.** Small Scallop. Llandaff (Vivian).
- Timandra amata**, **L.** Blood Vein. Llantrisant (John).
- Ephyra porata**, **F.** False Mocha. Llantrisant (John); Port Talbot (Vivian); Sketty Park, scarce at traps (Robertson).
- Ephyra punctaria**, **L.** Maiden's Blush. Swansea (Robertson).
- Ephyra linearia**, **Hb.** Clay Triple-lines. Merthyr Mawr (Vivian).
- Ephyra annulata**, **Schulz.** Mocha. Porthkerry (Allen); Leckwith (Birkenhead); Penarth, 1898 (Howe).
- Ephyra orbicularia**, **Hb.** Dingy Mocha. Llantrisant (John); Port Talbot (Vivian).
- Ephyra pendularia**, **Clerck.** Birch Mocha. Glamorgan (John).

- Sterrha sacraria*, L.** The Vestal. Neath, 9th August, 1867 (Llewelyn); some six examples being taken, and again in 1869 and 1874; Ynys-y-gerwyn (Vivian).
- Ortholitha plumbaria*, F.** Lead Belle. Llantrisant (John); Port Talbot (Vivian); Swansea, common in colliery meadows (Robertson).
- Ortholitha cervinata*, Schiff.** Mallow. Llantrisant (John); Port Talbot (Vivian); Penarth (Howe).
- Ortholitha limitata*, Scop.** Shaded Broad Bar. Llantrisant (John); Port Talbot (Vivian); Swansea, common in colliery meadows (Robertson).
- Ortholitha bipunctaria*, Schiff.** Chalk Carpet. Langland Bay, fairly common (Robertson); Penarth, 1898 (Howe).
- Mesotype virgata*, Rott.** Oblique Striped. Porthcawl (John); Port Talbot (Vivian); Swansea, abundant on sandhills by Blackpill (Robertson).
- Minoa murinata*, Scop.** Drab Looper. Llantrisant (John); Glamorgan (Vivian).
- Odezia atrata*, L.** The Sweep. Llantrisant (John).
- Anaitis plagiata*, L.** Treble Bar. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at traps (Robertson); Castell Coch, etc.
- Chesias spartiata*, Fuess.** The Streak. Llantrisant (John); Port Talbot (Vivian).
- Chesias rufata*, F.** Broom Tip. Llantrisant (John); Castell Coch (Williams).
- Lobophora carpinata*, Borkh.** Early Tooth-striped. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Lobophora viretata*, Hb.** Yellow Barred Brindle. Llantrisant (John); Neath (Llewelyn); Port Talbot (Vivian); Sketty Park, scarce at rest and in traps (Robertson).
- Lobophora halterata*, Hufn.** Seraphim. Porthkerry (Allen); Port Talbot (Vivian).
- Lobophora sexalisata*, Hb.** Small Seraphim. Llantrisant (John); Glamorgan (Vivian).
- Cheimatobia brumata*, L.** Winter Moth. Llantrisant (John); Port Talbot (Vivian); Sketty Park, abundant (Robertson).
- Cheimatobia boreata*, Hb.** Northern Winter Moth. Port Talbot (Vivian); scarce at Clyne (Robertson).
- Triphosa dubitata*, L.** The Tissue. Llantrisant (John); Port Talbot (Vivian); Sketty Park, fairly common in traps (Robertson).
- Eucosmia certata*, Hb.** Scarce Tissue. Llantrisant (John).

- Eucosmia undulata**, L. Scallop Shell. Llantrisant (John); Sketty Park, scarce in traps (Robertson); Castell Coch (Williams).
- Scotosia vetulata**, Schiff. Brown Scallop. Porthkerry, Port Talbot (Vivian).
- Scotosia rhamnata**, Schiff. Dark Umber. Port Talbot (Vivian); Porthkerry (Allen).
- Eustroma silaceata**, Hb. Small Phoenix. Llantrisant (John); Port Talbot (Vivian); common in traps at Sketty Park and Penllergaer (Llewelyn).
- Lygris prunata**, L. Phoenix. Llantrisant (John); Sketty Park, scarce at traps (Robertson).
- Lygris testata**, L. Chevron. Port Talbot (Vivian); Sketty Park at traps (Robertson); Penarth (Howe).
- Lygris populata**, L. Northern Spinach. Port Talbot (Vivian).
- Lygris associata**, Borkh. Spinach. Llantrisant (John); Port Talbot (Vivian).
- Cidaria pyraliata**, L. Barred Straw. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson); Penarth (Lamb).
- Cidaria fulvata**, Forster. Barred Yellow. Llantrisant (John); Port Talbot (Vivian); Swansea, common on rose on sandhills (Robertson).
- Cidaria corylata**, Thnb. Broken Barred Carpet. Llantrisant (John); Swansea, scarce in woods and traps (Robertson); Vale of Neath (Birkenhead).
- Cidaria truncata**, Hufn. Common Marbled Carpet. Llantrisant (John); Swansea, common, flying over flowers (Robertson).
- Cidaria immanata**, Haw. Dark Marbled Carpet. Llantrisant (John); Port Talbot (Vivian); Swansea, common flying over flowers (Robertson).
- Cidaria siterata**, Hufn. Red-green Carpet. Merthyr Mawr (Vivian).
- Cidaria miata**, L. Autumnal Green Carpet. Porthkerry (Allen); Penarth (Birkenhead); Cardiff, on ivy blossom (Reece).
- Thera obeliscata**, Hb. Grey Pine Carpet. Llantrisant (John); Sketty Park, scarce on firs (Robertson).
- Thera cognata**, Hb. Chestnut coloured Carpet. Port Talbot (Vivian); Glamorgan coast (Allen).
- Thera firmata**, Hb. Pine Carpet. Swansea (Robertson).
- Lampropteryx suffumata**, Hb. Water Carpet. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common at traps (Robertson).
- Coremia munitata**, Hb. Red Carpet. Llantrisant (John).

- Coremia unidentaria, Haw.** Dark Barred Twin-spot. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Coremia ferrugata, Clerck.** Red Twin-spot. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson)
- Coremia designata, Hufn.** Flame Carpet. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Amoebe olivata, Borkh.** Beech-green Carpet. Merthyr Mawr (Vivian).
- Amoebe viridaria, F.** Green Carpet. Llantrisant (John); Sketty Park, scarce in woods (Robertson); Castell Coch (Williams).
- Malenydris salicata, Hb.** Striped Twin-spot Carpet. Neath (Llewelyn); Port Talbot (Vivian); Sketty Park, one taken in wood, 1892 (Robertson).
- Malenydris multistrigaria, Haw.** Mottled Grey. Llantrisant (John); Port Talbot (Vivian); Swansea, common in traps in Park (Robertson).
- Malenydris didymata, L.** Twin-spot Carpet. Llantrisant (John); Swansea, abundant in woods and traps (Robertson).
- Oporabia dilutata, Borkh.** November Moth. Llantrisant (John); Port Talbot (Vivian); Swansea, abundant in woods and traps (Robertson).
- Xanthorhoe montanata, Borkh.** Silver Ground Carpet. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce in woods (Robertson); Penarth.
- Xanthorhoe fluctuata, L.** Garden Carpet. Llantrisant (John); Port Talbot (Vivian); Swansea, common everywhere (Robertson); Penarth.
- Xanthorhoe galiata, Hb.** Galium Carpet. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce on sandhills (Robertson); abundant (Barrett).
- Xanthorhoe rivata, Hb.** Wood Carpet. Port Talbot (Vivian); Swansea (Robertson).
- Xanthorhoe sociata, Borkh.** Common Carpet. Common throughout the County.
- Xanthorhoe tristata, L.** Small Argent and Sable. Llantrisant (John); Port Talbot (Vivian); Vale of Neath (Birkenhead).
- Xanthorhoe unangulata, Haw.** Sharp Angled Carpet. Llantrisant (John); Glamorgan (Vivian).
- Euphyia picata, Hb.** Cloaked Carpet. Merthyr Mawr (Vivian).
- Eulype hastata, L.** Argent and Sable. Llantrisant (John); Port Talbot (Vivian); Clyne Woods, scarce (Robertson); Penarth (Howe); Pontneathvaughan, plentiful (Hallett).

- Mesoleuca albicillata, L.** Beautiful Carpet. Llantrisant (John); Sketty Park, scarce at traps (Robertson); Castell Coch (Williams).
- Mesoleuca ocellata, L.** Purple Bar. Llantrisant (John); Sketty Park abundant in 1892, scarce in 1893 (Robertson).
- Mesoleuca bicolorata, Hufn.** Blue Bordered Carpet. Llantrisant (John); Port Talbot (Vivian); Swansea, not common by old tramway, Clyne Valley (Robertson).
- Melanthia procellata, F.** Pretty Chalk Carpet. Coast of Glamorgan (Vivian); Penarth (Garrett).
- Perizoma affinitata, Steph.** Rivulet. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce in traps (Robertson).
- Perizoma alchemillata, L.** Small Rivulet. Llantrisant (John); Port Talbot (Vivian); scarce at Penllergaer (Robertson).
- Perizoma flavofasciata, Thnb.** Sandy Rivulet. Llantrisant (John); Port Talbot (Vivian); Sketty Park, not common in traps (Robertson).
- Perizoma albulata, Schiff.** Grass Rivulet. Llantrisant (John); Port Talbot (Vivian); common at Penllergaer, etc. (Robertson).
- Perizoma bifasciata, Haw.** Barred Rivulet. Port Talbot (Vivian); Swansea (Robertson).
- Perizoma blandiata, Hb.** Pretty Pinion. Glamorgan (John).
- Campptogramma bilineata, L.** Yellow Shell. Common throughout the County.
- Hydriomena furcata, Prout.** July High Flyer. Llantrisant (John); Port Talbot (Vivian); Swansea, common (Robertson).
- var. **infuscata, Staudinger.** Swansea (Robertson).
- Hydriomena impluviata, Hb.** May High Flyer. Llantrisant (John); Swansea, fairly common at traps and at Singleton, Gower (Robertson).
- Hydriomena ruberata, Frey.** Ruddy High Flyer. Llantrisant (John); Swansea, scarce in traps and at Singleton (Robertson).
- Anticlea cucullata, Hufn.** Royal Mantle. Swansea (Robertson).
- Anticlea badiata, Hb.** Shoulder Stripe. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Anticlea rubidata, F.** The Flame. Porthkerry (Allen).
- Anticlea nigrofasciaria, Goze.** The Streamer. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Euchœcea obliterated, Hufn.** Dingy Shell. Llantrisant, common (John); Port Talbot (Vivian); fairly common in woods at Killay (Robertson).

- Asthena candidata, Schiff.** Small White Wave. Port Talbot (Vivian); scarce in woods below Sketty Park (Robertson).
- Asthena luteata, Schiff.** Small Yellow Wave. Llantrisant (John); Penllergaer, fairly common (Robertson).
- Asthena testaceata, Don.** Waved Carpet. Llantrisant (John); Sketty Park, one at rest, 1892 (Robertson).
- Asthena blomeri, Curt.** Blomer's Rivulet. Port Talbot and Merthyr Mawr (Vivian).
- Eupithecia oblongata, Thnb.** Lime Speck. Llantrisant (John); Port Talbot (Vivian); Sketty Park, not common in traps (Robertson).
- Eupithecia pulchellata, Steph.** Foxglove Pug. Llantrisant (John); Port Talbot (Vivian); Penllergaer, May, 1865 (Llewelyn); Sketty Park, larvæ in foxgloves (Robertson).
- [**Eupithecia linariata.** Should occur in the County; it is very like the previous species, which is considered scarce.]
- Eupithecia irriguata, Hb.** Marbled Pug. Porthkerry (Allen); Port Talbot (Vivian).
- Eupithecia indigata, Hb.** Ochreous Pug. Port Talbot (Vivian); Clyne Wood, one on 30th May, 1893 (Robertson).
- Eupithecia venosata, F.** Netted Pug. Llantrisant (John); Port Talbot (Vivian).
- Eupithecia distinctaria, H.-S.** Thyme Pug. Gower (Vivian).
- Eupithecia expallidata, Guenee.** Bleached Pug. Penllergaer (Llewelyn); Port Talbot (Vivian).
- Eupithecia assimilata, Guenee.** Currant Pug. Llantrisant (John); Sketty Park, taken in moth traps, 1893, and identified by Mr. S. Webb (Robertson).
- Eupithecia absinthiata, Clerck.** Wormwood Pug. Penllergaer (Llewelyn); Port Talbot (Vivian); Swansea, larvæ on ragwort and imagines in trap (Vivian).
- Eupithecia goossensiata, Mab.** Ling Pug. Port Talbot (Vivian).
- Eupithecia albipunctata, Haw.** White Spotted Pug. Port Talbot (Vivian);
var. **angelicata, Barrett.** Port Talbot (Vivian); Sketty Park, scarce in traps (Robertson).
- Eupithecia vulgata, Haw.** Common Pug. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Eupithecia virgaureata, Dbl.** Golden Rod Pug. Port Talbot, with a melanic form (Vivian); Sketty Park, taken in moth traps, 1893, identified by Mr. S. Webb (Robertson).
- Eupithecia trisignaria, H.-S.** Triple Spotted Pug. Port Talbot (Vivian).

- Eupithecia lariciata**, Frey. Larch Pug. Llantrisant (John); scarce in Clyne Woods, 1893 (Robertson).
- Eupithecia castigata**, Hb. Grey Pug. Llantrisant (John); Port Talbot with a fine black varietal form (Vivian); Sketty Park, not common in traps (Robertson).
- Eupithecia subnotata** Hb. Plain Pug. Port Talbot (Vivian).
- Eupithecia satyrata**, Hb. Satyr Pug. Llantrisant (John).
- Eupithecia succenturiata**, L. Bordered Pug. Llantrisant (John).
- Eupithecia subfulvata**, Haw. Tawny Speckled Pug. Llantrisant (John); Port Talbot (Vivian); Sketty Park, not common in traps (Robertson).
- Eupithecia scabiosata**, Borkh. Shaded Pug. Glamorgan (Vivian).
- Eupithecia haworthiata**, Sta. Haworth's Pug. Llantrisant (John).
- Eupithecia plumbeolata**, Haw. Lead Coloured Pug. Llantrisant (John); Port Talbot (Vivian).
- Eupithecia tenuiata**, Hb. Slender Pug. Llantrisant (John); Swansea (Robertson).
- Eupithecia inturbata**, Hb. Maple Pug. Gower (John); Port Talbot (Vivian); Porthkerry (Allen).
- Eupithecia fraxinata**, Crewe. Ash Pug. Llantrisant (John); Port Talbot (Vivian).
- Eupithecia nanata**, Hb. Narrow-winged Pug. Llantrisant (John); Sketty Park, scarce in traps (Robertson).
- Eupithecia abbreviata**, Steph. Brindled Pug. Llantrisant (John); Port Talbot (Vivian); Clyne Wood, abundant (Robertson).
- Eupithecia dodoneata**, Guenee. Oak-tree Pug. Llantrisant (John); Port Talbot (Vivian).
- Eupithecia exiguata**, Hb. Mottled Pug. Port Talbot (Vivian); Sketty Park, scarce in traps (Robertson).
- Eupithecia sobrinata**, Hb. Juniper Pug. Gower (Vivian).
- Gymnoscelis pumilata**, Hb. Double-Striped Pug. Llantrisant (John); Port Talbot (Vivian); Sketty Park, not common in traps (Robertson).
- Chloroclystis coronata**, Hb. V.-Pug. Llantrisant (John); Sketty Park, not common in traps (Robertson).
- Chloroclystis rectangulata**, L. Green Pug. Llantrisant (John); Port Talbot (Vivian); Sketty Park, one on apple tree in the garden (Robertson).
- Chloroclystis debiliata**, Hb. Bilberry Pug. Port Talbot (Vivian).

- Pelurga comitata, L.** Dark Spinach. Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Phibalapteryx vitalbata, Hb.** Small Waved Umber. Glamorgan (Vivian).
- Phibalapteryx tersata, Hb.** The Fern. Port Talbot (Vivian).
- Coenocalpe vittata, Borkh.** Oblique Carpet. Port Talbot and Merthyr Mawr (Vivian).
- Percnoptilota fluviata, Hb.** The Gem. Llantrisant (John); Neath, 6th May, 1867 (Llewelyn); Port Talbot (Vivian); Sketty Park, one taken in trap, 19th August, 1892 (Robertson).
- Abraxas sylvata, Scop.** Clouded Magpie. Llantrisant (John); Port Talbot (Vivian); Pontneathvaughan, abundant.
- Abraxas grossulariata, L.** Magpie. Very common and recorded for all districts.
- Lomaspilis marginata, L.** Clouded Border. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common in woods (Robertson); Vale of Neath (Birkenhead).
- Ligdia adustata, Schiff.** Scorched Carpet. Llantrisant (John); Port Talbot (Vivian); Castell Coch (Williams).
- Bapta bimaculata, Hb.** White spotted Pinion. Glamorgan (John).
- Bapta temerata, Hb.** Clouded Silver. Glamorgan (John).
- Cabera pusaria, L.** Common White Wave. Llantrisant (John); Port Talbot (Vivian); Swansea, common in woods and traps (Robertson).
- Cabera exanthemata, Scop.** Common Wave. Llantrisant (John); Port Talbot (Vivian); Swansea, common in woods and traps (Robertson); Vale of Neath (Birkenhead).
- Cabera rotundaria, Haw.** Round-winged White Wave. Glamorgan (Vivian).
- Numeria pulveraria, L.** Barred Umber. Llantrisant (John); Port Talbot (Vivian); Swansea, fairly common in woods and traps (Robertson).
- Ellopia prosapiaria, L.** Barred Red. Port Talbot and Merthyr Mawr (Vivian); Swansea, fairly common in woods and traps (Robertson).
- Metrocampa margaritaria, L.** Light Emerald. Llantrisant (John); common in woods below Sketty Park and in traps (Robertson); Penarth (Birkenhead).
- Ennomos quercinaria, Hufn.** August Thorn. Sketty Park, scarce at light (Robertson); Merthyr Mawr (Vivian); Porthkerry (Allen).
- Ennomos alniaria, L.** Canary Shouldered Thorn. Port Talbot and Merthyr Mawr (Vivian); Sketty Park, scarce in traps (Robertson); Penarth (Birkenhead).

- Ennomos fuscantaria**, Haw. Dusky Thorn. Llantrisant (John); Sketty Park, two at light (Robertson); Penarth (Birkenhead).
- Ennomos erosaria**, Borkh. September Thorn. Llantrisant (John); Sketty Park, scarce in traps (Robertson).
- Selenia bilunaria**, Esp. Early Thorn. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson).
- Selenia lunaria**, Schiff. Lunar Thorn. Penllergaer (Llewelyn); Port Talbot (Vivian); Sketty Park, fairly common in traps (Robertson); Penarth, 1898 (Howe).
- Selenia tetralunaria**, Hufn. Purple Thorn. Llantrisant (John); Penllergaer (Llewelyn); Port Talbot (Vivian); Sketty Park, fairly common in traps.
- Hygrochroa syringaria**, L. Lilac Beauty. Llantrisant (John); larvæ on privet at Derwen (Robertson); Penarth; 1898 (Howe).
- Gonodontis bidentata**, Clerck. Scalloped Hazel. Llantrisant (John); Port Talbot (Vivian); Sketty Park, very common in traps (Robertson).
- Himera pennaria**, L. Feathered Thorn. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common in traps (Robertson); Penarth (Howe, Birkenhead).
- Crocallis elinguarina**, L. Scalloped Oak. Llantrisant (John); Port Talbot (Vivian); Sketty Park, very common in traps (Robertson); Penarth.
- Angerona prunaria**, L. Orange Moth. Llantrisant (John); Penarth (Howe).
- Ourapteryx sambucaria**, L. Swallow-Tailed Moth. Llantrisant (John); Port Talbot (Vivian); Swansea (Robertson); Cardiff, Penarth, etc.
- Eurymene dolobraria**, L. Scorched Wing. Llantrisant (John); Port Talbot (Vivian); Sketty, scarce in woods and traps (Robertson).
- Opisthograptis luteolata**, L. Brimstone Moth. Llantrisant (John); Port Talbot (Vivian); Sketty Park, common and very large, in garden, etc. (Robertson); Penarth, etc.
- Epione apiciaria**, Schiff. Bordered Beauty. Llantrisant (John); Port Talbot (Vivian); Swansea, scarce on sandhills and in traps in Sketty Park (Robertson); Penarth (Howe).
- Epione parallelaria**, Schiff. Dark Bordered Beauty. Glamorgan (John).
- Epione advenaria**, Hb. Little Thorn. Scarce in woods by Killay (Robertson); Penarth (Howe).
- Venilia macularia**, L. Speckled Yellow. Draethen Wood, near Cardiff (Reece); Penarth (Garrett).

- Semiothisa notata**, L. Peacock Moth. Penllergaer (Llewelyn); Sketty Park, one in trap, 5th June, 1893 (Robertson).
- Semiothisa alternata**, Hb. Sharp Angled Peacock. Llantrisant (John); Port Talbot (Vivian); Neath (Llewelyn).
- Semiothisa liturata**, Clerck. Tawny Barred Angle. Llantrisant (John); scarce at Penllergaer, 1893 (Robertson).
- Hybernia rupicaprararia**, Hb. Early Moth. Llantrisant (John); Swansea, fairly common in lanes, etc. (Robertson).
- Hybernia leucopheararia**, Schiff. Spring Usher. Llantrisant (John); Swansea, common in woods, and at light (Robertson).
- Hybernia aurantiaria**, Esp. Scarce Umber. Port Talbot (Vivian); Swansea, common in woods and at light (Robertson); Penarth (Birkenhead).
- Hybernia marginaria**, Borkh. Dotted Border. Llantrisant (John); Port Talbot (Vivian); Swansea, common in woods, and at light (Robertson); Penarth (Birkenhead).
- Hybernia defoliaria**, Clerck. Mottled Umber. Llantrisant (John); Port Talbot (Vivian); Swansea, common in woods and at light (Robertson); Penllergaer, a beautiful variety was taken at light in 1891 by Sir John Llewelyn: quite black with red nervures (Ent. Record, 1891, p. 39); Penarth (Birkenhead).
- Anisopteryx æscularia**, Schiff. March Moth. Llantrisant (John); Swansea, common in woods, and at light (Robertson).
- Phigalia pedaria**, F. Pale Brindled Beauty. Port Talbot (Vivian); scarce in Clyne Woods, one black variety, 12th March, 1893 (Robertson); Penarth, 1898 (Howe).
- Biston hirtaria**, Clerck. Brindled Beauty. Penarth (Howe).
- Pachys strataria**, Hufn. Oak Beauty. Llantrisant (John); Sketty Park, fairly common at traps and at rest at Clyne (Robertson); Penarth, 1898 (Howe).
- Pachys betularia**, L. Peppered Moth. Llantrisant (John); Port Talbot (Vivian); Penllergaer, scarce (Robertson); Penarth, 1898, plentiful (Howe); at electric light in Cardiff, 1906 (Reece).
- Hemerophila abruptaria**, Thnb. Waved Umber. Llantrisant (John); Port Talbot (Vivian); Swansea (Robertson).
- Boarmia gemmaria**, Brahm. Willow Beauty. Llantrisant (John); Sketty Park, abundant in garden (Robertson); Penarth, 1898 (Howe).
- Boarmia repandata**, L. Mottled Beauty. Llantrisant (John); Sketty Park, scarce in woods and traps (Robertson); Penarth, plentiful in 1898 (Howe).
- var. **conversaria**, Hb. Sketty Park, scarce in woods and traps (Robertson).

- Cleora lichenaria**, Hufn. Brussels Lacc. Merthyr Mawr (Vivian); Porthkerry (Allen).
- Cleora jubata**, Thnb. Dotted Beauty. Llantrisant (John).
- Tephrosia bistortata**, Goeze. Engrailed. Llantrisant (John); Port Talbot and Swansea, fairly common, with black forms, 1893 (Robertson); Penarth 1898 (Howe).
- Tephrosia crepuscularia**, Hb. Small Engrailed. Llantrisant (John); Swansea, fairly common in woods, with black forms; "the black form used to be common at the back of Mr. Vivian's house, Taibach, but is now probably extinct." (Robertson).
- Tephrosia consonaria**, Hb. Square Spot. Llantrisant (John); Vale of Neath (Birkenhead); Clyne Wood, abundant in 1892, scarce, 1893 (Robertson); Penarth, 1898 (Howe).
- Tephrosia punctularia**, Hb. Grey Birch. Llantrisant (John); Port Talbot (Vivian); abundant, with dark forms, at Clyne and Penllergaer (Robertson); Penarth, 1898 (Howe).
- Gnophos obscurata**, Hb. Annulet. Llantrisant (John); Port Talbot (Vivian); Penarth, 1898 (Howe).
- Ematurga atomaria**, L. Common Heath. Llantrisant (John); Port Talbot (Vivian); common, Penllergaer, Clyne, etc. (Robertson); Vale of Neath (Birkenhead).
- Bupalus piniaria**, L. Bordered White. Llantrisant (John); Port Talbot (Vivian); abundant at Penllergaer (Robertson); Penarth, 1898 (Howe).
- Thamnonoma wauaria**, L. The V. Moth. Llantrisant (John); Port Talbot (Vivian); common as larvæ at Gower, and imagines at trap, 1892 (Robertson).
- Thamnonoma brunneata**, Thnb. Rannoch Looper. Glamorgan (John).
- Lozogramma petrarica**, Hb. Brown Silver Line. Llantrisant (John); Port Talbot (Vivian); abundant at Sketty Park, Clyne, etc. (Robertson).
- Chiasmia clathrata**, L. Latticed Heath. Llantrisant (John); Port Talbot (Vivian); Sketty Park, scarce in traps (Robertson); Penarth (Lamb).
- Aspilates ochrearia**, Rossi. Yellow Belle. Port Talbot (Vivian).
- Zygæna trifolii**, Esp. Five Spot Burnet. Llantrisant (John); Swansea, by colliery meadows, common in 1892, rare in 1893 (Robertson); Penarth (Birkenhead); Porthcawl.
- Zygæna loniceræ**, Esp. Narrow Bordered Burnet. Port Talbot (Vivian); Penarth (Birkenhead).

- Zygæna filipendulæ, L.** Six Spot Burnet. Llantrisant (John); Swansea, by colliery meadows, common in 1892, rare in 1893 (Robertson); Penarth (Birkenhead); Peterston, common (Reece); Gower, Porthcawl.
- Ino statices, L.** Green Forrester. Llantrisant (John); Pontneath-vaughan (Birkenhead).
- Cossus cossus, L.** Goat Moth. Llantrisant (John); Sketty Park, larvæ, two bred in June (Robertson); Sully, Penarth, Llandaff, etc.
- Zeuzera pyrina, L.** Leopard Moth. Llandaff (John); Penarth (Howe); Cardiff (P. E. Campbell Taylor, see Barrett, Brit. Lep.); Mr. H. M. Salmon has taken this moth in Richmond Road, Cardiff, on more than one occasion, the last being May, 1919.
- Trochilium apiformis, Clerck.** Poplar Hornet Clear Wing. Has been taken in the County by Sir J. T. D. Llewelyn.
- Trochilium crabroniformis, Lewin.** Osier Hornet Clear Wing. Merthyr Mawr (John); "Quite common in the larval state, but exceedingly difficult to rear" (Reece).
- Sesia sphegiformis, F.** White Barred Clear Wing. Penllergaer, one taken 11th May, 1893 (Stafford).
- Sesia andreniformis, Lasp.** One example was taken near Penarth in 1916 (Hallett). This specimen was identified by Mr. F. N. Pierce.
- Sesia tipuliformis, Clerck.** Currant Clear Wing. Llantrisant (John); Penarth (Birkenhead).
- Sesia vespiformis, Lasp.** Yellow-legged Clear Wing. There is a specimen in the Birkenhead collection labelled "Near Cardiff, 30th June, 1894."
- Sesia culiciformis, L.** Large Red-belted Clear Wing. Neath (John); Ynysybwl (Birkenhead).
- Hepialis humuli, L.** Ghost Swift. Llantrisant (John); common in meadows below Derwen (Robertson); Penarth, etc., very abundant.
- Hepialis sylvina, L.** Orange Swift. Llantrisant, common (John); Sketty Park, moderately common (Robertson); Langland Bay, 1893 (Nash); Penarth.
- Hepialis vellea, Hb.** Map Winged Swift. Llantrisant (John).
- Hepialis lupulina, L.** Common everywhere, the larvæ are common garden pests.
- Hepialis hecta, L.** Gold Swift. Llantrisant, common (John); Swansea, scarce in Barrow's fields, 1892 (Robertson); Vale of Neath (Birkenhead).
- Aglossa pinguinalis, L.** Llantrisant (John).
- Pyralis farinalis, L.** Llantrisant (John).

- Scoparia ambigualis**, Tr. Llantrisant (John); Penarth (Hallett).
Scoparia cembræ, Haw. Llantrisant (John).
Scoparia mercurella, L. Common at Penarth, and doubtless elsewhere.
Scoparia angustea, Steph. Llantrisant (John); Penarth (Hallett).
Nomophila noctuella, Schiff. Llantrisant (John); Penarth (Hallett).
Pyrausta purpuralis, L. Llantrisant (John); Glamorgan, common (Barrett).
Pyrausta ostrinalis, Hb. Llantrisant (John).
Herbula cespitalis, Schiff. Llantrisant (John).
Ennychia cingulata, L. Common on Glamorgan coast (Berrett).
Ennychia octomaculata, F. Llantrisant (John); Swansea (Robertson).
Endotricha flammealis, Schiff. Llantrisant (John).
Eurrhpara urticata, L. Llantrisant (John); Penarth, pupæ under bark (Hallett).
Scopula lutealis, Hb. Llantrisant (John); Penarth (Hallett).
Scopula olivalis, Schiff. Llantrisant (John); Penarth (Hallett).
Scopula prunalis, Schiff. Llantrisant (John).
Scopula ferrugalis, Hb. Llantrisant (John); Penarth (Hallett).
Botys flavalis, Schiff. Llantrisant (John).
Botys ruralis, Scop. Llantrisant (John); Penarth.
Botys fuscalis, Schiff. Llantrisant (John).
Botys asinalis, Hb. Porthkerry (Allen); Penarth (Williams).
Ebulea crocealis, Hb. Llantrisant (John).
Ebulea sambucalis, Schiff. Llantrisant (John).
Spilodes verticalis, L. Common at Penarth on nettles.
Pionea forficalis, L. Llantrisant (John); Penarth (Hallett).
Perinephele lancealis, Schiff. Llantrisant (John); Swansea (Robertson).
Cataclysta lemnata, L. Glamorgan (John).
Hydrocampa nymphæata, L. Llantrisant (John); Penarth (Williams).
Hydrocampa stagnata, Don. Glamorgan (John); Penarth (Williams).
Platyptilia ochrodactyla, Hb. Common in Glamorgan (Barrett).
Platyptilia gonodactyla, Schiff. Cardiff and Penarth (Hallett).
Mimæseoptilus pterodactylus, L. Penarth, common.
Leioptilus microdactylus, Hb. Swansea (Robertson).
Leioptilus osteodactylus, Zell. Glamorgan, 1865 (Horton).

- Aciptilia galactodactyla*, **Hb.** Glamorgan (Barrett).
Aciptilia pentadactyla, **L.** Glamorgan (Barrett), Penarth.
Crambus pratellus, **L.** Llantrisant (John).
Crambus pascuellus, **L.** Llantrisant (John).
Crambus margaritellus, **Hb.** Llantrisant (John).
Crambus pinellus, **L.** Llantrisant (John).
Crambus perlellus, **Scop.** Llantrisant (John).
Crambus selasellus, **Hb.** Llantrisant (John).
Crambus tristellus, **F.** Llantrisant (John); Penarth (Hallett).
Crambus geniculeus, **F.** Llantrisant (John); Penarth (Hallett).
Crambus culmellus, **L.** Llantrisant (John); Penarth (Hallett).
Crambus hortuellus, **Hb.** Llantrisant (John).
Eromene ocella, **Haw.** Glamorgan, March, 1861 (Barrett); Llantrisant (John).
Ilithya semirubella, **Scop.** Llantrisant (John).
Myelophila cribrum, **Schiff.** Porthkerry (John); Penarth (Howe).
Homœosoma binævella, **Hb.** Llantrisant (John).
Ephestia elutella, **Hb.** Llantrisant (John).
Ephestia kuhniella, **Zell.** Very abundant in flour mills in Cardiff—it seems to increase at a tremendous rate and is a very serious pest.
Cryptoblabes bistriga, **Haw.** Llantrisant (John).
Plodia interpunctella, **Hb.** Llantrisant (John).
Nephoteryx spissicella, **F.** Llantrisant (John).
Rodophæa consociella, **Hb.** Llantrisant (John).
Rodophæa advenella, **Zinck.** Porthkerry (Allen).
Rodophæa tumidella, **Zinck.** Penarth (Hallett).
Oncocera ahenella, **Zinck.** Llantrisant (John).
Galleria mellonella, **L.** A very destructive pest in bee hives, Llantrisant (John); Dinas Powis (Wakeford); etc.
Aphomia sociella, **L.** Llantrisant (John).
Achrœa grisella, **F.** Llantrisant (John).
Tortrix podana, **Scop.** Glamorgan (Barrett).
Tortrix xylostearia, **L.** Penarth, July, 1918 (Hallett).
Tortrix heparana, **Schiff.** Penarth (Hallett).
Tortrix ribeana, **Hb.** Penarth, July, 1918 (Hallett).

- Tortrix corylana**, F. Penarth (Hallett).
Tortrix unifasciana, Dup. Glamorgan (Barrett).
Tortrix viridana, L. Common throughout the County.
Tortrix forsterana, F. Glamorgan (Barrett).
Peronea sponsana, F. Penarth (Hallett).
Peronea schalleriana, L. Penarth (Hallett).
Peronea variegana, Schiff. Penarth (Hallett).
Teras contaminana, Hb. Glamorgan.
Dictyopteryx loeflingiana, L. Penarth (Hallett).
Argyrotoza conwayana, F. Penarth (Hallett).
Ptycholoma lecheana, L. Glamorgan.
Ditula semifasciana, Haw. Glamorgan (Barrett).
Penthina corticana, Hb. Glamorgan.
Penthina pruniana, Hb. Sully.
Penthina variegana, Hb. Penarth (Hallett).
Hedya ocellana, Hb. Penarth (Hallett).
Hedya aceriana, Dup. Penarth, July, 1918 (Hallett).
Hedya dealbana, Frolich. Common in Glamorgan (Barrett).
Hedya neglectana, Dup. Penarth (Hallett).
Spilonota incarnatana, Hb. Glamorgan (Barrett).
Spilonota trimaculana, Haw. Glamorgan (Barrett).
Spilonota rosæcolana, Doubleday. Glamorgan (Barrett).
Spilonota roborana, Tr. Glamorgan (Barrett).
Pardia tripunctana, F. Glamorgan (Barrett).
Sericoris cespitana, Hb. Common in Glamorgan (Barrett).
Sericoris rivulana, Scop. Plentiful in Glamorgan (Barrett).
Sericoris lacunana, Dup. Glamorgan (Barrett).
Sericoris urticana, Hb. Glamorgan.
Orthotænia striana, Schiff. Common in Glamorgan (Barrett).
Sciaphila subjectana, Gn. Penarth (Hallett).
Sciaphila virgaureana, Tr. Penarth (Hallett).
Sciaphila pascuana, Hb. Common at Penarth, July, 1918 (Hallett).
Sciaphila chrysanthæana, Dup. Penarth (Hallett).
Sphaleroptera ictericana, Haw. Penarth (Hallett).

- Bactra lanceolana*, **Hb.** Common in Glamorgan (Barrett).
- Phoxopteryx comptana*, **Frolich.** Glamorgan (Barrett).
- Phoxopteryx lundana*, **F.** Common in Glamorgan (Barrett).
- Grapholitha cinerana*, **Haw.** Glamorgan (Barrett).
- Grapholitha trimaculana*, **Don.** Common in Glamorgan (Barrett).
- Grapholitha penkleriana*, **Fisch.** Glamorgan (Barrett).
- Grapholitha nævana*, **Hb.** Common in Glamorgan (Barrett).
- Batodes angustiorana*, **Haw.** Penarth, July, 1918 (Hallett).
- Pædisca corticana*, **Hb.** Penarth, July, 1918 (Hallett).
- Ephippiphora cirsiaria*, **Zel.** Glamorgan.
- Ephippiphora pflugiana*, **Haw.** Glamorgan.
- Ephippiphora brunnichiana*, **Frolich.** Glamorgan.
- Ephippiphora nigricostana*, **Haw.** Penarth (Hallett).
- Ephippiphora signatana*, **Doug.** Glamorgan (Barrett).
- Semasia ianthinana*, **Dup.** Penarth (Hallett).
- Carpocapsa splendidana*, **Hb.** Penarth (Hallett).
- Carpocapsa pomonella*, **L.** Glamorgan.
- Stigmonota compositella*, **F.** Glamorgan (Barrett).
- Stigmonota regiana*, **Zel.** Cardiff, 1918 (Grimes); Llandaff, plentiful (David).
- Dicrorampha plumbagana*, **Tr.** Plentiful in Glamorgan (Barrett).
- Dicrorampha petiverella*, **L.** Penarth, July, 1918 (Hallett).
- Catoptria ulicetana*, **Haw.** Sully, 1st June, 1918 (Hallett).
- Catoptria cana*, **Haw.** Plentiful in Glamorgan (Barrett).
- Trycheris aurana*, **Fab.** Sully, 14th July, 1918 (Hallett).
- Symæthis oxyacanthella*, **L.** Abundant at Penarth and probably everywhere.
- Eupcecilia ambiguella*, **Hb.** Llantrisant (Barrett).
- Eupcecilia ciliella*, **Hb.** Sketty Park (Robertson).
- Xanthosetia hamana*, **L.** Llandaff (David).
- Argyrolepia hartmanniana*, **Clerck.** Neath, 1866 (Llewelyn); Swansea, 1892 (Holland).
- Argyrolepia cnicana*, **Doubleday.** Glamorgan (Barrett).
- Tortricodes hyemana*, **Hb.** Glamorgan.
- Diurnea fagella*, **F.** Swansea (Robertson).

- Psychoides verhuelella**, Heyd. Caerphilly Castle, larvæ feeding on *Asplenium Ruta-muraria* (R. Drane).
- Ochsenheimeria birdella**, Curt. Penarth (Hallett).
- Scardia granella**, L. Penarth, 2nd June, 1918 (Hallett).
- Blabophanes ferruginella**, Hb. Park Place, Cardiff, 25th June, 1919 (Hallett).
- Tinea tapetzella**, L. Penarth, common at times.
- Tinea pellionella**, L. Penarth, common.
- Tinea pallescentella**, Sta. Penarth, July, 1918 (Hallett).
- Tineola biselliella**, Hml. Penarth, abundant in houses (Hallett).
- Lampronia rubiella**, Bjerk. Cwrt-yr-ala, 2nd June, 1918 (Hallett).
- Micropteryx calthella**, L. Penarth, St. Fagans, etc.; excessively abundant in flowers of *Ranunculus* (Hallett).
- Adela fibulella**, Fab. Cwrt-yr-ala, 2nd June, 1918 (Hallett).
- Adela viridella**, L. Cwrt-yr-ala, common (Hallett).
- Swammerdamia pyrella**, Vill. Gwrt-yr-ala (Hallett).
- Hyponomeuta cagnagellus**, Hb. Penarth (Hallett).
- Hyponomeuta evonymellus**, L. Cwm Taff, 1918.
- Prays curtisellus**, Don. Penarth, July, 1918 (Hallett).
 var. rustica, Haw. Penarth (Hallett).
- Plutella cruciferarum**, Zell. Penarth, July, 1918 (Hallett).
- Cerostoma vittella**, L. Penarth (Hallett).
- Harpipteryx scabrella**, L. Penarth (Hallett).
- Phibalocera quercana**, F. Penarth, Caerphilly, &c. (Hallett).
- Depressaria costosa**, Haw. Neath, 1865 (Llewelyn); Penarth (Hallett).
- Depressaria subpropinquella**, Sta. Neath, 1865 (Llewelyn).
- Depressaria rhodochrella**, H.-S. Neath, 1865 (Llewelyn).
- Depressaria ocellana**, Fab. Neath, 1865 (Llewelyn).
- Depressaria yeatiana**, Fab. Neath, 1865 (Llewelyn).
- Depressaria aplana**, Fab. Penarth, 1916 (Hallett).
- Depressaria badiella**, Hb. Neath, 1865 (Llewelyn).
- Depressaria heracleana**, De G. Common at Penarth in *Heracleum*, etc. (Hallett).
- Bryotropha domestica**, Haw. Penarth, July, 1918 (Hallett).
- Teleia vulgella**, Hb. Penarth (Hallett).

- Poecilia nivea**, Haw. Penarth, not rare on railings round Roger Moor Wood (Hallett).
- Poecilia albiceps**, Zell. Penarth, July, 1918 (Hallett).
- Harpella geoffrella**, L. Old Cogan, 1916; Cwrt-yr-ala, abundant, 2nd June, 1918 (Hallett).
- Dasycera sulphurella**, Fab. Cwrt-yr-ala, 2nd June, 1918 (Hallett).
- Cecophora lunaris**, Haw. Abundant on Lime trees in Park Place, Cardiff, 24th June, 1919 (Hallett).
- Cecophora fuscescens**, Haw. Cardiff (Hallett).
- Cecophora pseudospretella**, Sta. Abundant at Penarth, Llandaff, etc. (Hallett).
- Endrosia fenestrella**, Scop. Common at Cardiff and Penarth (Hallett).
- Argyresthia nitidella**, Fab. Penarth, July, 1918 (Hallett).
- var. ossea**, Haw. Penarth (Hallett).
- Argyresthia gødartella**, L. Old Cogan, abundant, 1915 (Hallett).
- Gracilaria alchimiella**, Scop. Penarth (Hallett).
- Gracilaria syringella**, Fab. Abundant on privet hedges in Penarth (Hallett).
- Coleophora fuscedinella**, Zell. Penarth, July, 1918 (Hallett).
- Coleophora lutipennella**, Zell. Cwrt-yr-ala, July, 1918 (Hallett).
- Bedellia somnulentella**, Zell. Penarth (Hallett).
- Batrachedra præangusta**, Haw. Penarth (Hallett).
- Chauliodus illigerellus**, Hb. Cardiff, 1857 (Drane).
- Elachista atricomella**, Sta. Penarth, July, 1918 (Hallett).
- Elachista argentella**, Clerck. Common, Penarth, Sully, etc. (Hallett).
- Lithocolletis lantanella**, Schr. Penarth (Hallett).
- Lithocolletis quercifoliella**, Fisch. Penarth (Hallett).
- Lithocolletis messaniella**, Zell. Penarth (Hallett).
- Lithocolletis cramerella**, F. Common at Penarth (Hallett).
- Lyonetia clerckella**, L. Penarth (Hallett).
- Phyllocnistis suffusella**, Zell. Penarth (Hallett).
- Cemiostoma laburnella**, Heyd. Penarth, 2nd June, 1918 (Hallett).

A STORM BURST IN THE VALE OF NEATH AND ITS EFFECT.

AN ACCOUNT PUT TOGETHER

BY F. T. HOWARD, M.A., F.G.S.,

FROM NOTES COLLECTED BY MR. NEALE AND FAMILY.

The accompanying map indicates the distribution of rainfall in the region under review on Wednesday, July 26th, 1916. About that date the weather conditions of these islands were normal; a small anti-cyclone which covered most of Ireland and Scotland on the 21st moved off towards the N.E., and was closely followed by an extension from the Azores anti-cyclone. As a result, the weather in most districts continued to be fine, warm, and dry.

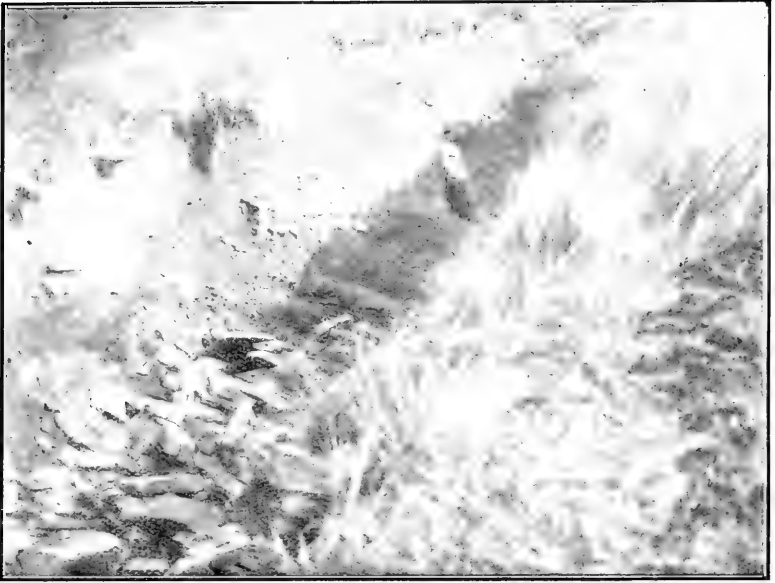
But during the movement of the small anti-cyclone away towards the North Sea, thundery conditions were set up, and storms occurred here and there, due to slight disturbances in the pressure, though, as a rule, characterised by little violence except in a few places on the 25th to 27th, and especially on the 26th.

In South Wales, slight showers occurred during the week, accompanying thunderstorms, *e.g.*, at Cardiff on the 27th, and the weather became more disturbed towards the close.

The records collected by the Society for years past show the wide variation in the annual rainfall within its district, rising steadily from the coast inland, and reaching its highest limits usually about Aberdare and Glyncoirwg. Geographical features alone will not explain this variation; indeed, Dr. Mill has shown clearly that such air movements as cyclones and those associated with thunderstorms, which bring much rain

in a short period, ignore surface features for the most part. Still, it is worth while pointing out that the area of the storm lay about the passes at the heads of the Tawe and Neath Rivers. Reference to any topographical map will show that the directions of these valleys imply a change of structure associated with the general type of N. to S. valley common in the eastern portion of the coalfield. The change is well exemplified by the Neath, which flows southwards to Pont-Neath-Vaughan and there turns S.S.W., parallel to features and lines of rock folding and faulting, as if earth movements had taken place since the stream began to flow, had thrown up obstacles in its course, and had caused it to turn aside along one of the hollows in the newly-folded region. The Tawe runs parallel to the Neath in a S.S.W. direction a little to the west. The double hollow, sunk deep in the plateau of Pennant grits, seems to allow the permanent winds from the ocean to carry their rains further inland. At any rate, the sandstone scarp of the Brecknock Beacons and Carmarthen Vans is much broken hereabouts as if by excessive aerial denudation. As a result, roads, new and old, and railways, converge upon the lower gaps in the ridge; the region is one where the old peoples of mid-Wales came into contact with those of the South in spite of the great forest between Devynock and Ystradfellte, Forest Vawr—the hunting ground of Celtic prince and Norman lord—the presence of which is suggestive at least of sufficient moisture and of milder weather conditions necessary for tree growth.

A reference to the geological structure may be useful. The two valleys cut right through the coalfield and its northern lip of Millstone Grit and Carboniferous Limestone on to the Old Red Sandstone here consisting in the main of clays which absorb but little of the rainfall. Put another way, most of the rainfall must escape seawards in surface streams which are consequently very liable to flood. It was in this part of the district that the storm occurred. Castell Mellte, a residence of Mr. Neale, our President for the year, and whose family



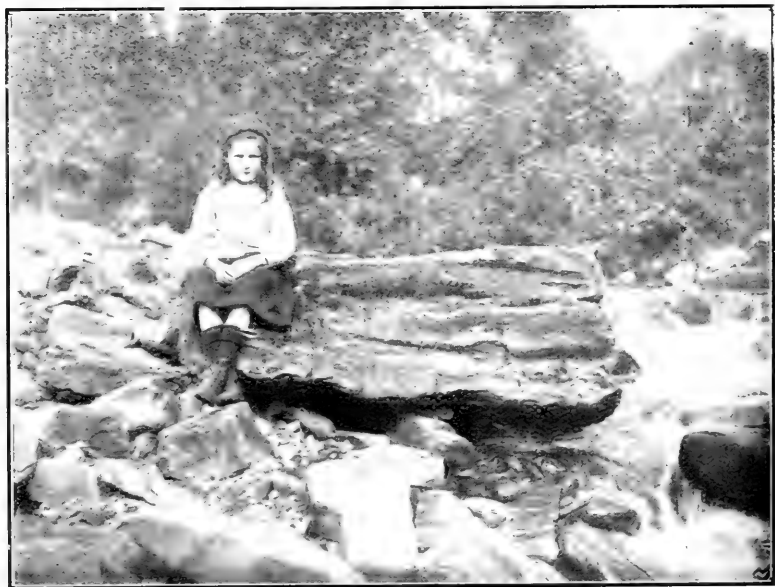
I. Newly excavated channel, high up on slope. East side of
T'ha Valley facing Llech Llia



II. The same channel but lower down the slope just
above the Fan.



III. The Fan at the bottom of the slope formed by the stream.



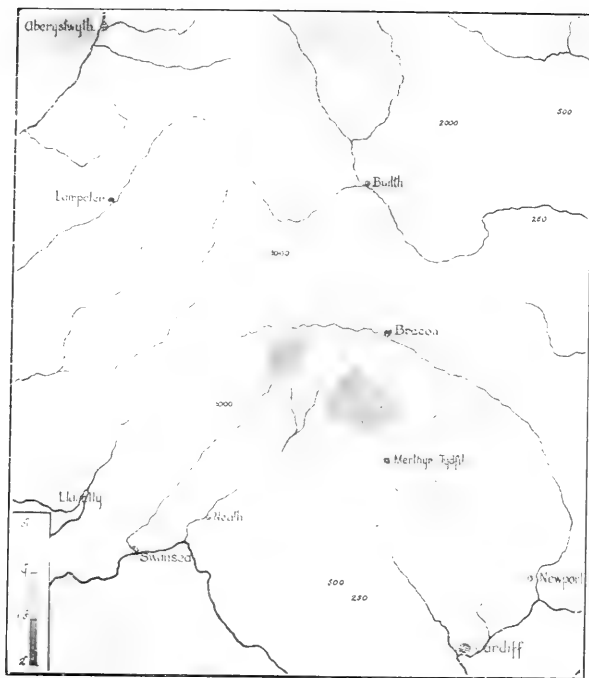
IV. Large boulder, weighing $1\frac{1}{2}$ tons, a little way above the Llia bridge, at Mellte Castell, undoubtedly shifted by the flood.



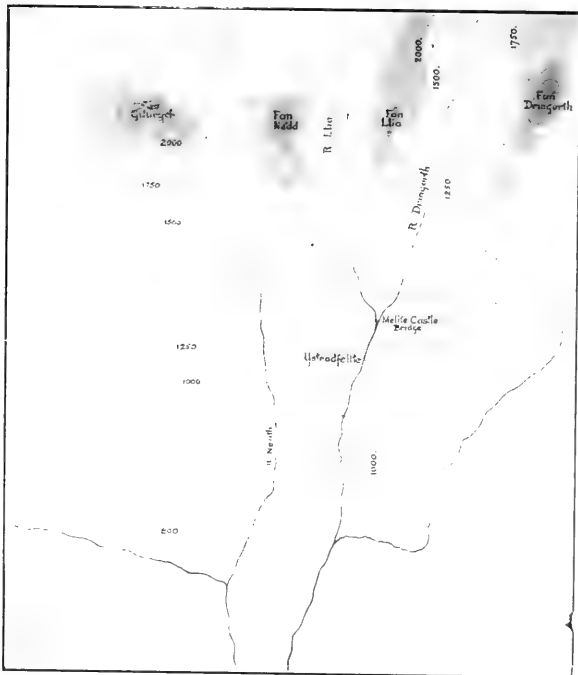
V. Mellte Castell bridge from South, showing debris left in the stream way by the flood. Note the dislodged supports to the bridge on the right.



VI. Boulder, $\frac{3}{4}$ ton, lifted at least three feet above ordinary stream level on to a bank at confluence of Llia and Dringarth rivers.



VII. Area affected by the storm of July 26th, 1916. The shading shows the intensity of rainfall.



VIII. Orographical Map of the Neath Valley district. Region of greatest denudation lies immediately east of Llia in R. Llia. The cottage, Llech Llia, is just to the west of the "a" in that word,

are responsible both for the observations and the photographs, stands near the junction of the Carboniferous Limestone and Old Red Sandstone at the point where the Dringarth and Llia join to form the Mellte. Each is crossed by a simple one-arched bridge, which suggests that hitherto their drainage areas have not been liable to excessive flooding. Clay districts are characterised, as a rule, by bridges with several arches in order to take the large volume of water under such circumstances.

Within $1\frac{1}{2}$ miles from Castell Mellte the ground rises to the north, from 900 feet to 1,400 feet, in saddle-back fashion between the two streams, and in the space of another mile reaches the 2,000 feet line. Beyond the Carn, the ridge continues in graceful undulations up to Fan Frynach, a steep bluff overlooking Glyn Tarell, along which the road to Brecon descends from the Storey Arms. The particular region where the effects of the storm are best seen is indicated on the map.

The structure of the district is simple enough—that of scarp with a southerly dip slope broken up by a series of deep-cut valleys more or less parallel to the Llia and Dringarth. To these come many tributary streams, showing all the signs of recent origin by small falls and ungraded courses.

The upper parts of the dividing ridges are monotonous stretches of coarse grass; the valley slopes are usually steep, those of Fan Llia are about 1 in 3, dropping to 1 in 12 near the summit. It is difficult to say if the slopes are of natural rock, since there is much more evidence of ice action existing in scratched surfaces, transported blocks and banks of finer material, some of which support small pools.

On the morning of the 26th, haymaking was in full swing at Ystradfellte. Farmers had gone in their shirt sleeves with their carts for long distances, and everything betokened a warm sunny day. But according to the Rector of Ystradfellte, clouds began to appear about mid-day, and though dissipated very soon, it was but to re-appear with greater

intensity, and a fierce storm lasted from about 1 to nearly 3 p.m. The keeper of the Ystradfellte Reservoir, on the Dringarth, had experienced "waterspouts" in Scotland, but none in Wales during his 12 years of residence. He was in the valley below Ystradfellte walking N., and had the phenomenon in full view. It was, he says, shaped like a balloon, gradually extending downwards, and later contracting upwards as it floated along towards Fan Llia, when he lost sight of it in the blackness. All the observers agree that there was an extraordinary amount of lightning and that the violent downpour lasted about half-an-hour. The period of excessive fall seems to have been soon after 2 p.m., and the Llia was in greatest flood at Castell Mellte about 2.30 p.m. Mr. Pritchard, an old resident, was sheltering in the field adjoining the bridge, and estimates that for about 10 minutes the water stood 3 feet higher than he had ever seen it during 40 years. The game-keeper's family living at Llech Llia, to the west of the stream, had little rain, but saw the cloud very black opposite on Fan Llia, and to their surprise, two wide streams rolling down the side "red like blood" with a deal of noise. The son of the keeper of the water works was on the spot about 2 p.m., and saw what looked like a solid sheet of water descending the eastern face of Fan Llia, and watched big stones being washed out of the slope near the reservoir dam. Practically no rain fell at Fan Fawr, $1\frac{1}{2}$ miles to the east of the top end of the reservoir. Similarly, Mr. Priestley, the Engineer of the Cardiff Waterworks, informs me that he was in Breconshire and no rain fell on that day. "I do not find," he says, "that on that date or for a week previously and fortnight afterwards there was any rain at all registered on our Breconshire gathering ground." Again, at Neath town no rain fell, and the rapid rise and the discolouration of the river there caused alarm lest the reservoir had burst. On the other hand, the Dringarth rain gauge registered a rainfall of 1.73 inches, most of it falling in half-an-hour, while the fall to the west was very much heavier.

The visible effects of the cloud-burst support these verbal descriptions. The Dringarth reservoir lay just outside the area of greatest fall, so received but little damage. Its stream naturally rose quickly, but compared with its neighbour, the flooding was not of extraordinary height. Various catch drains formed to bring in the waters of streams normally discharging below the reservoir were entirely destroyed, the old channels being reopened and cut much deeper and the rock debris carried in large quantities into the river channel.

The stream joining the Llia near Rhyd-uchaf was cut deeper, and stones were piled up near the junction; but the chief line of destruction, as seen by the map, is a furlong to the south. Here shallow cuts through the turf had been made obliquely across the slopes, open lateral catch drains leading to a central catch drain following the main direction of the slope slightly N. of W., which main catch drain itself turned obliquely towards the north as it approached the bottom. They were made for trials in anticipation of a new reservoir. The removal of the turf plainly gave great opportunity to the volume of water which fell at this point. The lateral drains, full to overflowing, conveyed great quantities of water mixed with mud and small stones, to the main channel, which was eroded to a depth in places of nearly 6 feet, through soft red clay and beds of hardened whitish, greenish, and red mudstones and sandstones. Large blocks of these were strewn over the surface, especially near the base of the hill, where the main cut turned aside northwards since the stream in part held on directly along the line of the slope. The main channel is now 3 to 4 feet across in places, while near the Llia it terminates in a delta 70 yards wide at the face and 70 feet deep from face to hollow, composed of blocks of all sizes.

The amount of downward cutting along the new stream course varies greatly, one factor being the amount of hard sandstone which the flood stream encountered. The volume of water was obviously too great even for the main catchment drain, since lines of stones indicated overflowing from the tributary cuts.

The second group of flow seems to have started where the storm struck the slope of Fan Llia on the saddle-back between 1,650 and 1,800 feet. They are marked by non-continuous cuttings through the turf, sometimes 1 to 1½ feet deep, and extending for a few yards, and by blocks and fragments of stone scattered all over the lower slope.

Other evidence of the destruction is clearest near the Castell Mellte bridge. Just above the bridge the course has been deepened, and large blocks removed from their former positions. The foundation stones of the east wall of the bridge were washed or battered out and carried for some distance down stream. Though the bridge did not collapse, it was rendered too dangerous for use, and has been partially reconstructed. A bank just south of the bridge separates the Dringarth and Llia, which unite some 20-30 yards further south. The bank is usually 2 to 3 feet above ordinary stream level, and covered with bushes and trees. Across it the Llia flood cut a new channel into the Dringarth. Large blocks of stone were deposited on the top of the bank; one, half a ton in weight, must have been lifted 3 to 4 feet; while traces of the rapid flow were indicated on the trees 11 feet above ordinary water level.

Along the stream itself, for over 30 yards from the bridge, large blocks were thrown together in heaps. One pear-shaped block of red sandstone gave average measurements of 41 inches in length, 34 in width, and 27 in depth, and a squared limestone block from the foundations of the bridge measured 49 inches by 45 inches by 7 inches. One giant above the bridge is estimated to weigh over 1½ tons, being 5½ feet long, 2½ feet in average width, and 34 inches in average thickness.

It is interesting to compare these effects with those produced at Llyn-y-fan Fach, a few miles away west by north. (The facts about this second storm-centre and the details of rainfall for the map have been kindly supplied by the British Rainfall Organisation.) The rainfall registered was certainly more than 2.5 inches. The storm began about 1 p.m., and

became very heavy about 2 p.m., the fall being great on the hill known as Carmarthen Fan, between the two lakes, so that the water came down the Sychlwch, but affected its neighbour the Sawdde very little. The stream rose 4 feet in 15 minutes. From the summit and slopes of the cliffs masses of peat and sandstone were torn, leaving hollows 2 to 3 feet deep, while a new channel for the stream 10 feet deep in places was cut in the valley itself, while boulders and sand were piled up elsewhere in banks 10 feet high. "At the height of the storm," says Mr. D. A. Howell, the engineer, "the crashing of the huge boulders and the lashing of the rain created an uproar which completely drowned the noise of the thunder." The storm had ceased by 2.45 p.m.

It will be seen that the general results were similar. They were intensified at Llyn-y-fan-Fach in that the storm broke at the top of the scarp, and therefore the slope was greater.

The main points of interest seem to be as follows:—

(a) The protective character of even a thin turf: it threw off the water from the Fan Llia with little erosion except where cut through by the drains for the trials.

(b) Slope is of prime importance in denudation; the work done along the graded stream to the Llia obliquely across the slope was small compared with that along the main catchment drain directly down the slope.

(c) The amount of destruction possible in a brief space of time. This is a point to be specially remembered when considering the evolution of surface features. Here it is best seen in the cutting of a new valley and the marked lowering of the stream bed of the Llia near Mellte Bridge.

(d) The weight of the stones lifted, *e.g.*, the four biggest noted are calculated to weigh—one 10 cwts., one 28 cwts., and two between 31 and 35 cwts.

BIOLOGICAL AND GEOLOGICAL SECTION.

 REPORT FOR THE 30TH SESSION. 1916-17.

COMMITTEE.

THE PRESIDENT AND HON. SECRETARY OF THE C.N.S. (*ex-officio*).Professor T. FRANKLIN SIBLY, D.Sc. (*President*).Professor W. N. PARKER, Ph.D. (*Vice-President*).

F. J. NORTH, B.Sc., F.G.S.

H. E. SALMON.

H. M. SALMON.

ERNEST HEATH, F.R.M.S.

J. J. NEALE, J.P.

R. W. A. SOUTHERN (*Hon. Treasurer*).H. M. HALLETT, F.E.S. (*Hon. Secretary*).

The number of members on the Society's books at the time of the Annual Meeting was 77, of which four were elected during the Session. At the end of September, 1917, the number was 69, including 16 members on Service with the Colours. There have been four resignations, three struck off the roll, and one loss by death—J. H. Phillips, Penarth.

In the course of the Session, five Ordinary Meetings and the Annual Meeting (April 19th, 1917) have been held and have been well attended.

The following papers have been read :—

- Nov.* 2, 1916. H. M. HALLETT, F.E.S., "Entomological Notes, 1916."
- Dec.* 14, 1916. T. FRANKLIN SIBLY, D.Sc., F.G.S. "Geological Photographs."
- Jan.* 18, 1917. ERNEST HEATH, F.R.M.S. "Shells other than the Mollusca."
- Feb.* 15, 1917. W. EVANS HOYLE, M.A., D.Sc. "Zoological Nomenclature."
- Mar.* 15, 1917. F. J. NORTH, B.Sc. "The British Isles in Carboniferous Times."

The following exhibits were made and commented on:—

Nov. 2, 1916. By J. DAVY DEAN. A new British Land-shell, *Helicella neglecta*, from Kent.

By JOHN GRIMES. A branch of *Weigela rosea*, also a Lizard caught on the East Moors.

Dec. 14, 1916. By JOHN GRIMES. *Paris quadrifolia*, showing abnormal features.

Jan. 18, 1916. By JOHN GRIMES. Fronds of *Polystichum*, showing bulbils growing on the base of the stalk.

Feb. 15, 1917. By JOHN GRIMES. A portion of the Ash tree, showing grafting. A photograph of Elm planks, showing the trunk had twice been broken during the life of the tree.

By HAROLD EVANS. Leeches of large size obtained from waterlogged soil at Llanishen.

By H. E. SALMON. A beautiful bird's nest from the Salonica district.

Mar. 15, 1917. By JOHN GRIMES. A portion of a honeycomb, found attached to a piece of wood in the centre of a hedge.

By H. E. SALMON. A mole-cricket from the Salonica district.

Mr. H. M. Hallett's resignation of the office of Honorary Secretary has meant a considerable loss to the Section. Mr. Hallett was forced to take this course owing to the call to Military Service, and the Committee had no alternative but to accept the resignation. Mr. Hallett's long record of work is very highly appreciated by all, and is expressed by the members in their letter, preserved in the Minute Book.

UNIVERSITY COLLEGE,
NEWPORT ROAD,
CARDIFF,

16th March, 1917.

MY DEAR HALLETT,

I read your letter at the Meeting of the Biological and Geological Section last night. The members received your resignation with great regret, and authorised me to write and express to you their great appreciation of the splendid work you have done for the Section; also to convey their sincere good wishes, and their hope that circumstances will allow you to return before long. Personally, I join most cordially in all these sentiments.

Yours very sincerely,

T. FRANKLIN SIBLY,
(President).

At the Annual Meeting, April 19th, 1917, Mr. F. J. North, B.Sc., was appointed to the office and remained as Hon. Sec. until May, when again a call to Military Service brought with it a second resignation. Mr. North has always taken a foremost place in the work of the Section, and the good wishes of all the members will go with him in his new work.

J. DAVY DEAN.
Hon. Secretary.

CARDIFF NATURALISTS' SOCIETY.
BIOLOGICAL AND GEOLOGICAL SECTION.

Dr. *Cr.*
Cash Account for 1916-17 Session.

	£	s.	d.	£	s.	d.
To Balance from Session 1915-16—						
Bearer Bonds, £50 in 4½						
per cent. War Loan,						
at cost	49	16	8			
Cash at Bank	15	7	5			
Cash in hand	3	9	9			
	68	13	10			
Subscriptions collected by						
Society	8	11	3			
Interest on Deposit	0	7	0			
Dividend on War Loan	1	13	8			
Difference between 4½ per						
cent. Bearer Bonds and						
5 per cent War Loan						
(£52 12s. 7d. less £49 16s. 8d.)	2	15	11			
Dividend on War Loan						
(June 2nd, 1917)	1	4	6			
	83	6	2			
By Postages, Petties, &c.						
Printing						
Attendance						
Rent of Rooms at University						
College						
Balance forward to Session						
1916-17—						
5 per cent. War Loan				52	12	7
Cash at Bank (Sept.						
30th)				25	19	4
Plus ditto (June 2nd)				1	4	6
Cash in hand				0	12	7
				80	9	0

Audited and found correct,
(Signed) H. EDGAR SALMON.
E. JOHN SPENCE.

£83 6 2

ARCHÆOLOGICAL SECTION.

 ANNUAL REPORT. SESSION 1916-17.

OFFICERS AND COMMITTEE.

<i>President</i>	- - - -	J. S. CORBETT.
<i>Vice-President</i>	- - -	W. EVANS HOYLE, M.A., D.Sc.
<i>Hon. Secretary and Treasurer</i>		JOHN W. RODGER.

Committee.

J. WARD, M.A., F.S.A.	W. CLARKE.
C. H. FARNSWORTH.	C. MORGAN, B.A.
F. BLIGH BOND, F.R.I.B.A.	B. AMSDEN.
Professor O. L. RICHMOND, M.A.	J. H. WESTYR-EVANS.

Owing to the conditions of the War, all work of the Section has been in abeyance.

No subscriptions have been collected during this Session, and the amount to the credit of the Section is £11 4s. 2d., as shown in the published Cash Account for 1915-16 Session.

The Committee regrets to report the death of Mr. J. H. Westyr-Evans and desires to place on record its sincere appreciation of the services he rendered to the Section during the 16 years he was one of its members.

JOHN STUART CORBETT,
President.

JOHN W. RODGER,
Hon. Secretary.

PHOTOGRAPHIC SECTION.

REPORT FOR THE SIXTH SESSION, 1916-17.

OFFICIALS AND COMMITTEE.

President.

Mr. J. STUTTARD.

Vice-Presidents.

Col. P. RHYS GRIFFITHS.

Mr. S. W. ALLEN.

Mr. E. W. M. CORBETT, J.P.

Mr. T. MANSEL FRANKLEN.

Mr. GILBERT D. SHEPHERD.

Mr. J. PETREE.

Committee.

Mr. G. T. FLOOK.

Mr. S. J. MILNER.

Mr. J. A. LOMAX.

Mr. E. T. BEVAN.

Mr. G. C. S. INGRAM.

Mr. A. J. MORGAN.

Delegates to the Wales and Monmouthshire Photographic Federation.

Mr. S. J. MILNER.

Mr. G. T. FLOOK.

Treasurer.

Mr. A. BROWN.

Hon. Secretary.

Mr. HARRY STORM, 10, Burlington Terrace, Cardiff.

The Committee has pleasure in presenting its Sixth Annual Report on the Work of the Photographic Section for the Session 1916-17.

Meetings were held throughout the Session, at which either Lectures or Demonstrations were given. These were reasonably well attended, and considering the trying times through which we are passing, the interest in the Section has been quite good.

The following is a list of the Meetings held :—

- 1916.
- Oct. 24. Annual General Meeting.
- Nov. 14. " Amateur Photographer Prize Slides."
One Man Show—Mr. H. STORM.
- „ 28. Demonstration on " Exposure and Development."
Messrs. J. ARTHUR LOMAX and H. STORM.
One Man Show—Mr. H. N. VAN WADENOYEN.
- Dec. 12. Demonstration on " The Carbon Process." Mr. S. HOLE.
One Man Show—Mr. S. HOLE. Prints and Colour Slides.
- 1917.
- Jan. 9. Lantern Lecture by the President (Mr. J. STUTTARD).
" The Channel Islands and Normandy."
One Man Show—Mr. J. STUTTARD.
- „ 30. Lecture, " Killarney." Mr. I. J. CHORLEY.
One Man Show—Mr. G. T. FLOOK.
- Feb. 13. Members' Lantern Slides and Prints.
Display of Prints—Mr. H. FARR (Librarian).
- „ 27. Lecture, " Pictorial Photography." Mr. GWYN MORGAN (Barry).
- Mar. 13. " Photography and Focus " Prize Slides.
Record and Survey Competition.

Several of the Lectures were illustrated by Lantern Slides. All the meetings were held in the room of the South Wales Institute of Architects, High Street. No Exhibition has been held this Session, due to the fact that so many Members are on Service, and also to the restrictions placed upon photographers by the Defence of the Realm Act. For the same reason Field Meetings have been abandoned until after the conclusion of the War. A Record and Survey Competition was held, and the President, Mr. J. Stuttard, presented a silver medal for the best set of six prints, or lantern slides, dealing with the subject. This was won by Mr. G. T. Flook, with a set of six fine pictures. These were presented to the National Museum of Wales. Three members of the Section were successful in having two pictures each accepted by the London Salon of Photography, viz., Mr. J. A. Lomax, Mr. H. van Wadenoyen, Mr. H. Storm.

The membership at the close of the Session was 84, of whom 24 are on service with the Colours.

The Annual Statement of Accounts is presented herewith.

CARDIFF NATURALISTS' SOCIETY.

PHOTOGRAPHIC SECTION.

<i>Dr.</i>	<i>Hon. Treasurer's Cash Account for the 1916-17 Session.</i>		<i>Cr.</i>
	£	s. d.	£ s. d.
To Balance from 1915-16 Session ..	0	19 8	2 10 8
„ Members' Subscriptions ..	9	17 6	0 16 8
			2 5 0
By Printing and Stationery ..			0 10 0
„ Gas, etc., for Lantern ..			1 11 8
„ Rent of Room for Meetings ..			1 4 3
„ Affiliation Subscription, Wales and Monmouthshire Photographic Federation ..			
„ Postages ..			
„ Incidentals ..			
„ Balance carried forward to 1917-18 Session :—			
In Treasurer's hands £0 19 8			
In Secretary's hands 0 19 3			
			1 18 11
	£10	17 2	£10 17 2

Audited and found correct,

JOHN GRIMES,
RICHD. E. THOMAS.

23rd October, 1917.

REPORT OF THE COUNCIL.

FOR THE

Year ending September 30th, 1917.

The Council has pleasure in submitting to the Members the Fiftieth Annual Report of the Society.

The number of members at the close of last						
Session was	..	..	..	..	..	480
Elected during 1916-17	..	..	..	..	..	21
						—
						501
Deaths	..	..	..	..	..	10
Removals	..	..	..	..	..	12
Resignations	..	..	..	..	..	18
						—
						40
						—
						461
						==

The members are distributed thus:—

Honorary Members	..	..	..	..	..	4
Ordinary Members	..	..	..	..	..	432
Life Members	..	..	..	..	..	14
Non-Resident Members	..	..	..	..	..	4
Corresponding Members	..	..	..	..	..	7
Associates	..	..	..	..	..	0
						—
						461
						==

The Society has unfortunately suffered heavy losses during the year by the death of the following members:—Mr. G. J. Alexander, Junr., Councillor Edward England, Major J. A. Gibbs, D.S.O. (Killed in action on Sept. 20th, 1917), Col. C. W. Ingram, J.P., Mr. G. F. Insole, Mr. M. H. Matthews, Mr. J. H. Phillips, Dr. William Price, Mr. C. L. Ryder, and Mr. J. H. Westyr-Evans. Mr. Westyr-Evans was one of the oldest members of the Society, having joined in 1869.

The following is a list of papers read at Members' Meetings, viz. :—

1916.

- Oct. 19th. Annual Meeting. Presidential Address by Dr. W. Evans Hoyle, M.A.—“Edward Lhwyd : A Seventeenth Century Scientist.”
- Nov. 9th. Mr. F. Bligh Bond, F.R.I.B.A.—“Glastonbury Abbey,—A record of its architectural history and the discoveries made in excavations, 1909-1916.”
- Dec. 7th. Mr. Isaac J. Williams—“Evolution in Art.”

1917.

- Jan. 11th. Rev. H. G. Stanley, F.E.S.—“Wasps.”
- Jan. 25th. Professor T. Franklin Sibly, D.Sc., F.G.S.—“The Scenery of the Cardiff District in relation to Geological structure.”
- Feb. 8th. Sir Isambard Owen, D.C.L., M.D.—“Rheims Cathedral.”
- Mar. 8th. Mr. T. W. Proger—“Hawks and Hawking.”

The following Public Lectures have been delivered during the year :—

1916.

- Oct. 26th. Mr. A. H. Pollen, M.A.—“The Navy at War.”
- Nov. 23rd. Mr. Ernest Denny—Recital.
- Dec. 21st. Rev. Canon J. T. Parfit, M.A.—“Baghdad, Nineveh, and Babylon.”

1917.

- Feb. 22nd. Professor H. H. Turner, D.Sc., D.C.L., F.R.S.—“Other Moons than ours.”
- Mar. 22nd. Miss Vivian Edwards—“Ballads and Folk Songs of Serbia and the Southern Slavs.”

The Meetings were held at the Cory Hall, with the exception of that held on December 7th, for which the Whitehall Room was used.

The thanks of the Society are due to Members who have read papers, and also to those who entertained the Lecturers.

Owing to the continuance of the War, the same plan was followed with regard to Field Meetings, as in the previous Session, and only one short excursion was held on the occasion of the Annual Ladies' Day. This took place on Wednesday, June 27th, 1917, when a visit was paid to Castell Coch, by kind permission of the Marquess of Bute. Over 80 members attended, travelling to Tongwynlais by the Cardiff Railway by the 2.30 p.m. train. On arrival at Castell Coch, the party was met by Mr. J. S. Corbett, who had kindly consented to act as Guide. Before conducting the members over the Castle, Mr. Corbett read some interesting notes on the history of the District, and gave particulars of all that was known with regard to the Castle. The members were afterwards entertained to tea by the Marquess of Bute. During the afternoon a Meeting of members was held, when Mr. J. J. Neale, J.P., was elected President for the 1917-18 Session.

During the year, Volume XLIX. of the Transactions has been issued to the Members.

Progress has been made with the preparation of the "Fauna of Glamorgan," the publication of which had been decided upon as a permanent memorial of the celebration of the Society's Jubilee in 1917. Unfortunately, the issue of the volume and the holding of a public function to celebrate the Jubilee have necessarily to be deferred for the time being, owing to the War.

The Conference of Corresponding Societies of the British Association was held in London on July 5th, and was attended by the President, Dr. W. Evans Hoyle, as the Society's Delegate.

The preliminary arrangements for the visit of the British Association to Cardiff, in 1918, are now being made, and the Society is fully represented on the Local Committees which have been appointed.

The Council desires to express its thanks to Dr. E. Walford, D.P.H., F.R.Met.Soc., for again kindly editing the Meteorological Report.

The three Sections of the Society, viz. :—Biological and Geological, Archæological, and Photographic, have been maintained during the year, but their activities have necessarily been largely restricted owing to the War, especially in the case of the Archæological Section.

The Annual Statement of Accounts is presented herewith. It will be noted that £350 of the 5 per cent. War Loan has been taken up on behalf of the Society.

CARDIFF NATURALISTS' SOCIETY.

Balance Sheet, 30th September, 1917.

	£	s.	d.	£	s.	d.
LIABILITIES.						
Sundry Creditors
Subscriptions paid in advance	10	10	0
Conversazione Reserve Account	25	15	6
Balance, being excess of Assets over Liabilities .. 481 8 0	0	1	0
				41	7	8
ASSETS.						
Value of Furniture
Library
Reports unsold	5	0	0
" Cardiff Flora " unsold	0	1	0
" Glamorgan Flora " unsold	0	1	2
£350 5 per cent. War Loan, 1929-47, at Issue Price of 95
£200 Barry Railway Company Consolidated 4 per cent. Preference Stock (at 74)
Cash at Lloyds Bank, Limited, viz. :—
Deposit Account	95	17	10
Current Account	90	16	1
				186	13	11
				£708	11	7

(Signed) A. BROWN, HON. TREASURER.
CARDIFF, 1st October, 1917.

(Signed) T. W. PROGER, HON. AUDITOR.
CARDIFF, 2nd October, 1917.

CARDIFF NATURALISTS' SOCIETY.

 ESTABLISHED 1867.

Past Presidents.

- 1868—WILLIAM ADAMS, C.E., F.G.S.
 1869—WILLIAM ADAMS, C.E., F.G.S.
 1870—WILLIAM ADAMS, C.E., F.G.S.
 1871—WILLIAM ADAMS, C.E., F.G.S.
 1872—WILLIAM ADAMS, C.E., F.G.S.
 1873—WILLIAM ADAMS, C.E., F.G.S.
 1874—FRANKLEN G. EVANS, F.R.A.S., F.R.M.S.
 1875—JOHN WALTER LUKIS, M.R.I.A.
 1876—WILLIAM TAYLOR, M.D.
 1877—JOHN WALTER LUKIS, M.R.I.A.
 1878—COLONEL PICTON TURBERVILL.
 1879—HENRY HEYWOOD, C.E., F.C.S.
 1880—LOUIS TYLOR.
 1881—CLEMENT WALDRON.
 1882—GEORGE E. ROBINSON.
 1883—WILLIAM GALLOWAY.
 1884—PETER PRICE.
 1885—C. T. VACHELL, M.D.
 1886—HENRY HEYWOOD, C.E., F.C.S.
 1887—J. VIRIAMU JONES, M.A.
 1888—T. H. THOMAS, R.C.A.
 1889—W. RÖNNFELDT.
 1890—J. GAVEY.
 1891—C. T. VACHELL, M.D.
 1892—C. T. VACHELL, M.D.
 1893—C. T. WHITMELL, M.A.
 1894—EDWIN SEWARD, F.R.I.B.A.
 1895—R. W. ATKINSON, B.Sc., F.I.C.
 1896—Rev. CANON C. J. THOMPSON, D.D.
 1897—ROBERT DRANE, F.L.S.
 1898—J. TATHAM THOMPSON, M.B.
 1899—C. T. VACHELL, M.D.
 1900—W. N. PARKER, Ph.D.
 1901—J. J. NEALE.
 1902—C. H. JAMES.
 1903—D. R. PATERSON, M.D.
 1904—T. W. PROGER.
 1905—P. RHYS GRIFFITHS, M.B.
 1906—E. H. GRIFFITHS, Sc.D., F.R.S.
 1907—J. BERRY HAYCRAFT, M.D., D.Sc.
 1908—A. H. TROW, D.Sc.
 1909—ARCHIBALD BROWN.
 1910—Rev. DAVID DAVIES, M.A.
 1911—PROFESSOR W. S. BOULTON, B.Sc., F.G.S.
 1912—WILLIAM SHEEN, M.S., F.R.C.S.
 1913—E. P. PERMAN, D.Sc., F.C.S.
 1914—JOHN W. RODGER.
 1915—H. M. HALLETT, F.E.S.
 1916—JOHN GRIMES.
 1917—W. EVANS HOYLE, M.A., D.Sc.

OFFICERS AND COUNCIL, 1917-18.

President.

J. J. NEALE, J.P.

Vice-Presidents.

H. M. HALLETT, F.E.S.

JOHN GRIMES.

W. EVANS HOYLE, M.A., D.Sc.

Hon. Treasurer.

ARCHIBALD BROWN.

Hon. Librarian.

H. M. HALLETT, F.E.S.

Hon. Secretary.

GILBERT D. SHEPHERD, F.C.A.

Council.

HAROLD EVANS.

HARRY FARR.

ERNEST HEATH, F.R.M.S.

GEOFFREY C. S. INGRAM.

D. SIBBERING JONES.

O. L. RICHMOND, M.A.

H. EDGAR SALMON.

W. GILBERT SCOTT.

T. FRANKLIN SIBLY, D.Sc., F.G.S.

E. WALFORD, M.D., D.P.H.

CECIL L. WILSON, F.R.I.B.A.

MAX A. WRIGHT.

"Also such of the Past Presidents as shall, in reply to an annual circular, consent to serve on the Council."

BIOLOGICAL AND GEOLOGICAL SECTION.

President.

Professor T. FRANKLIN SIBLY, D.Sc., F.G.S.

Hon. Secretary.

J. DAVY DEAN.

ARCHÆOLOGICAL SECTION.

President.

J. S. CORBETT.

Hon. Secretary.

JOHN W. RODGER.

PHOTOGRAPHIC SECTION.

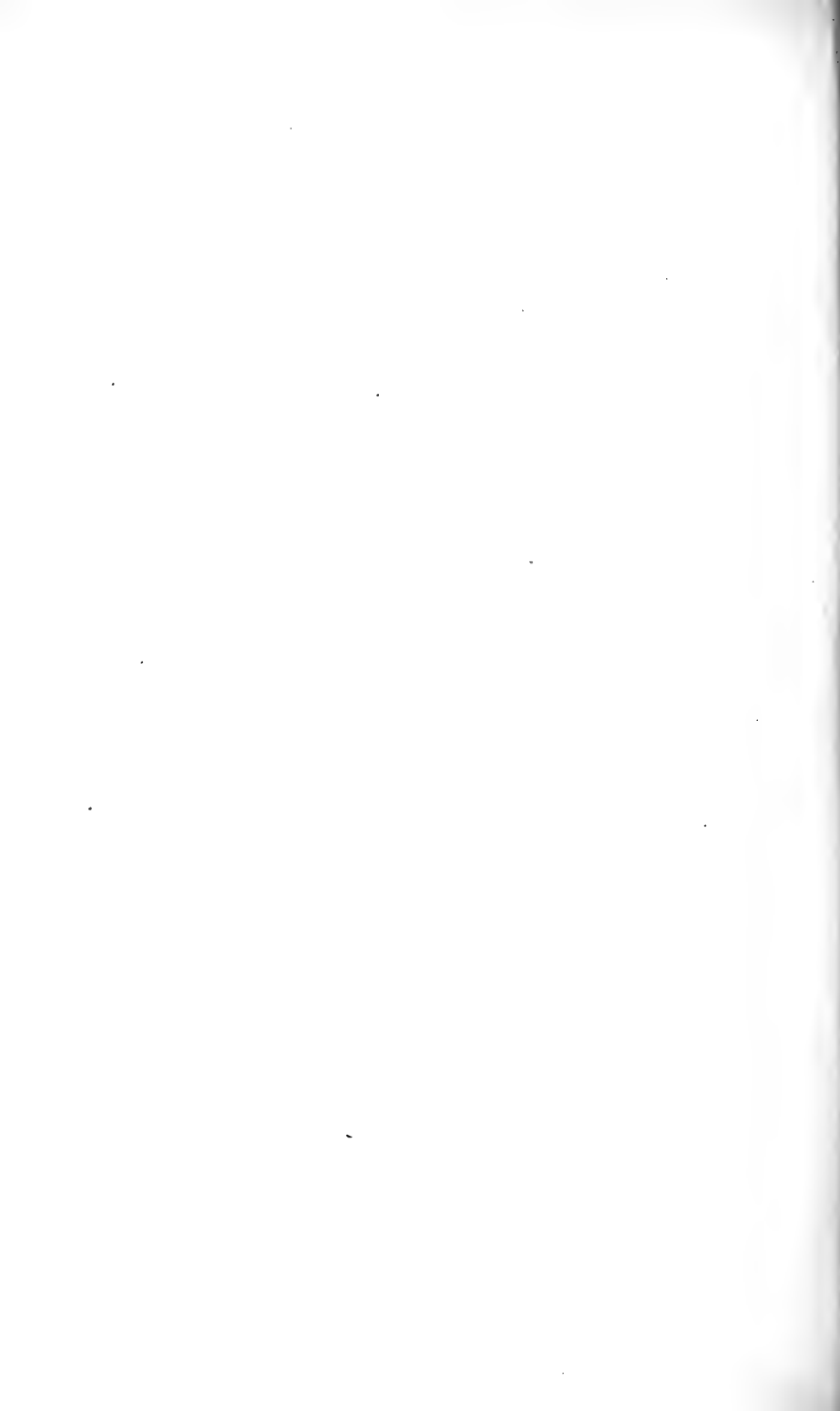
President.

J. STUTTARD.

Hon. Secretary.

HARRY STOKM

WILLIAM LEWIS (PRINTERS) LD.
CAMBRIAN WORKS, CARDIFF.





TRANSACTIONS OF THE
CARDIFF NATURALISTS' SOCIETY.

VOL. LI.

1918.



Cardiff Naturalists' Society

REPORT
AND TRANSACTIONS

VOL. LI

1918

The Price of the Transactions is Ten Shillings and Sixpence



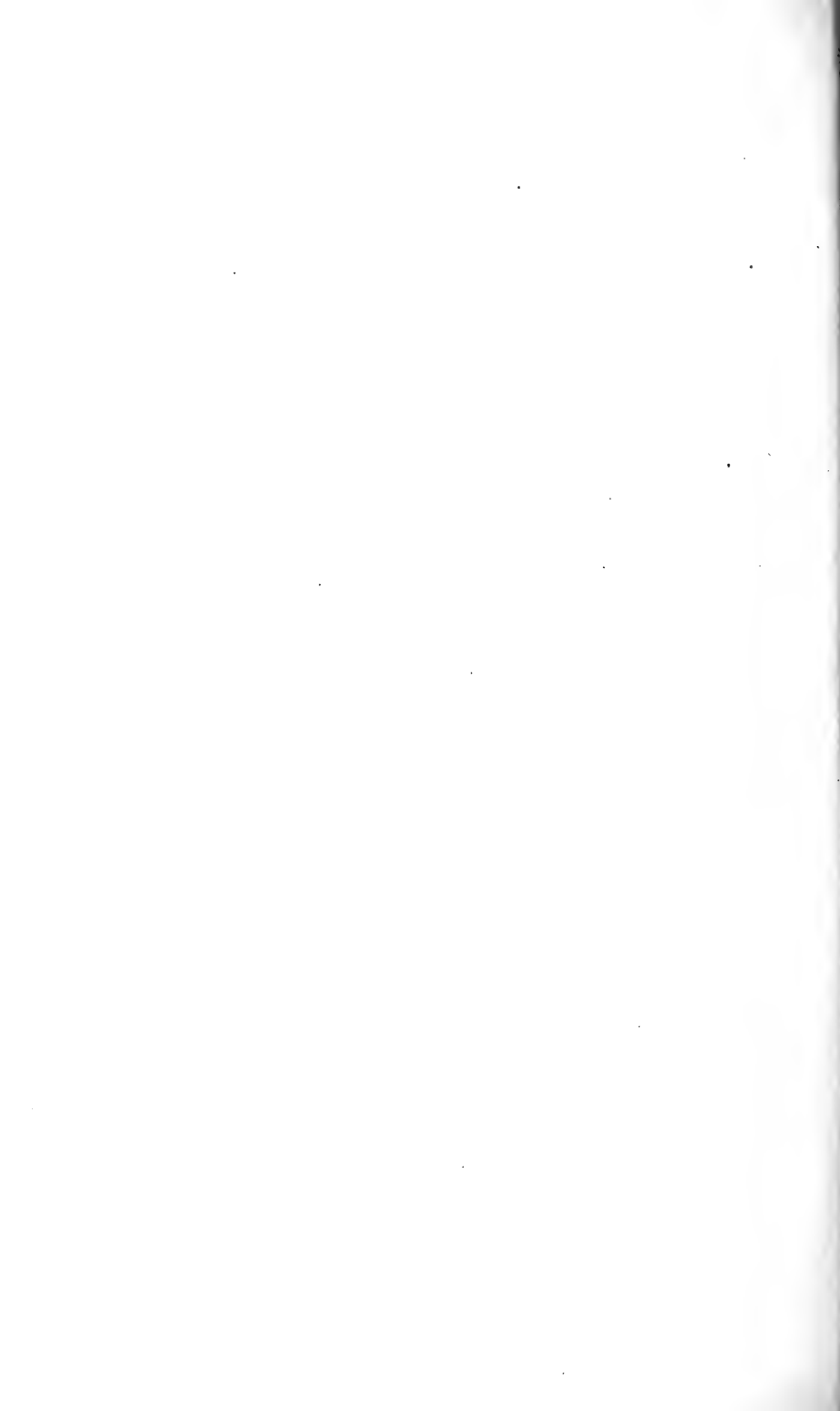
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1920.

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CONTENTS.

—
VOL LI., 1918.
—

	PAGE
Meteorological Observations in the Society's District E. WALFORD, M.D., F.R.Met.Soc. - - -	1
The Fresh Water Fishes of Glamorgan. H. EDGAR SALMON - - - - -	17
The Geographical Background to Welsh Arthurian Stories. F. T. HOWARD, M.A., F.G.S. - -	21
The Diptera of Glamorgan. Colonel J. W. YERBURY, R.A., F.Z.S., F.E.S. - - - - -	48
Biological and Geological Section. Report and State- ment of Accounts for the Thirty-first Session, 1917-18 - - - - -	80
Photographic Section. Report for the Sixth Session, 1917-18 - - - - -	83
Report of the Council of the Society, 1917-18 - -	84
Statement of Accounts for the Year ending September 30th, 1918 - - - - -	88
List of Past Presidents of the Society - - - -	90
Officers and Council of the Society, 1918-19 - - -	91



METEOROLOGICAL OBSERVATIONS IN THE SOCIETY'S DISTRICT, 1918.

BY E. WALFORD, M.D., F.R.MET.SOC.

The average monthly rainfall over the whole of the Society's district (comprised within the semi-circular area, having the Beacons as its northernmost point, its base the coastline from Neath to Chepstow, and with a mean height of 628 feet above the sea level) was as follows:—

January	5·61 inches.
February	4·70 "
March	2·97 "
April	2·82 "
May	2·16 "
June	1·90 "
July	6·29 "
August	3·32 "
September	11·54 "
October	4·04 "
November	4·57 "
December	9·33 "
	<u>59·25</u> inches.
Total in 1917	47·01 inches.
„ 1916	62·12 "
„ 1915	51·52 "
„ 1914	59·77 "
„ 1913	57·17 "
„ 1912	68·20 "
„ 1911	50·95 "
„ 1910	59·27 "
„ 1909	50·83 "
„ 1908	45·60 "
„ 1907	52·37 "
„ 1906	49·29 "
„ 1905	39·98 "
„ 1904	50·02 "
„ 1903	67·90 "
„ 1902	41·72 "

OBSERVERS.						FEET ABOVE MEAN SEA LEVEL.	INCHES OF RAIN.
C. H. PRIESTLEY,	Summit of Tyle Brith,	Breconshire	..	..	..	2350	86.48
"	Nant Penig	.. .. .	..	..	..	2000	101.24
"	Nant Ddu	.. .. .	..	..	..	1560	77.85
"	Storey Arms	.. .. .	..	..	..	1430	70.77
"	Beacons Reservoir	.. .. .	..	..	..	1340	77.61
"	Nant Gwineu	.. .. .	..	..	..	1275	56.28
T. W. COATES,	Pontluestwen Reservoir,	Maerdy, No. 1					
Gauge	.. .. .	.. .. .	..	..	..	1250	95.92
"	No. 2 Gauge	.. .. .	..	..	..	1225	67.63
"	No. 3 Gauge	.. .. .	..	..	..	1200	89.32
H. C. STEEL,	Blaenavon Estate Office,	Mon.	..	..	..	1150	65.37
C. H. PRIESTLEY,	Cantref Reservoir	.. .. .	..	..	..	1120	78.61
"	Garw-nant	.. .. .	..	..	..	1100	74.33
R. C. HARRISON,	Gwernllwyn, Dowlais	.. .. .	..	..	..	1071	53.30
EBBW VALE STEEL,	IRON AND COAL CO.,	Ebbw Vale	..	..	..	902	60.23
C. H. PRIESTLEY,	Llwynon Reservoir,	Breconshire	..	..	..	860	61.21
"	Troedyrhiw	.. .. .	..	..	..	860	66.53
"	Pont-ar-daf	.. .. .	..	..	..	850	67.89
GLYNCORRWG COLLIERY Co.,	Glyncorrgw	.. .. .	..	..	..	725	105.99
UNITED NATIONAL COLLIERIES, LTD.,	Treherbert	.. .. .	..	..	..	670	96.78
NEWPORT CORPORATION,	Newchurch, Wentwood,	Mon.	..	..	..	525	47.06
"	" Nantyridd, Wentwood,	Mon.	..	..	..	500	45.32
"	" Llanvaches Embankment	.. .. .	..	..	..	456	43.67
"	" Pant-yr-eos Reservoir,	Mon.	..	..	..	435	59.74
EDWARD CURRE,	Itton Court, Chepstow	.. .. .	..	..	..	390	41.14
E. TUDOR OWEN,	Ash Hall, Cowbridge	.. .. .	..	..	..	315	54.45
HENRY CLAY,	Piercefield Park, Chepstow	.. .. .	..	..	..	300	39.54
T. W. COATES,	Lan Wood Reservoir,	Pontypridd	..	..	..	300	61.59
WYNDHAM D. CLARK,	Talygarn, Glam.	.. .. .	..	..	..	250	65.66
JAMES WILLIAMS,	Wern House, Ystalyfera	.. .. .	..	..	..	240	74.55
SIR HENRY MATHER JACKSON,	Bart., Llantilio Court,	Mon.	..	..	..	230	21.64
E. WALFORD, M.D.,	Meteorological Station,	Penylan, Cardiff	..	..	..	204	50.76
Rev. CANON HARDING,	Pentwyn, Rockfield,	Mon.	..	..	..	191	31.69
J. F. MATTHYSSENS,	Witla Court, Rumney	.. .. .	..	..	..	177	45.58
C. H. PRIESTLEY,	Llanishen Reservoir,	Glam.	..	..	..	155	45.56
"	Lisvane Reservoir,	Glam.	..	..	..	150	40.71
Mrs. LYSAGHT,	Castleford, Chepstow	.. .. .	..	..	..	146	39.83
C. H. PRIESTLEY,	The Heath Filter Beds,	Cardiff	..	..	..	132	48.12
Mrs. O. H. JONES,	Fonmon Castle, Glam.	.. .. .	..	..	..	130	41.34
NEWPORT CORPORATION,	Ynis-y-fro Reservoir,	Mon.	..	..	..	130	43.76
C. H. PRIESTLEY,	Cogan Pumping Station,	Glam.	..	..	..	121	40.83
J. E. GLADSTONE,	West Hill, Llandaff	.. .. .	..	..	..	110	51.00
C. H. PRIESTLEY,	Ely Pumping Station,	Glam.	..	..	..	53	47.78
A. A. PETIGREW,	Roath Park, Cardiff	.. .. .	..	..	..	52	48.53
C. H. PRIESTLEY,	Trade Street Depot,	Cardiff	..	..	..	45	49.61
NEWPORT CORPORATION,	Friars Street Depot,	Newport	..	..	..	33	45.09
T. E. FRANKLIN,	Biglis Pumping Station,	Cadoxton, Barry	..	..	..	20	47.85

TABLE I.

BAROMETRIC PRESSURE AND RELATIVE HUMIDITY.

1918.	Mean Barometric Pressure.*		Hygrometer.*		
	Uncorrected.	At M.S.L. and 32° F.	Dry Bulb (Mean).	Wet Bulb (Mean).	Mean Relative Humidity.
	in.	in.	° F.	° F.	
January ..	29.755	29.978	38.9	37.7	89
February ..	29.976	30.175	43.8	42.4	88
March ..	29.842	30.054	42.6	40.4	83
April ..	29.756	29.959	45.1	42.5	81
May ..	29.889	30.057	55.2	51.6	77
June ..	29.961	30.123	56.6	51.9	72
July ..	29.791	29.944	59.7	55.9	77
August ..	29.885	30.040	59.9	57.1	75
September ..	29.594	29.766	53.8	51.8	86
October ..	29.827	30.019	49.4	47.3	86
November ..	29.952	30.108	42.8	41.6	90
December ..	29.255	29.648	45.5	44.1	89
Means ..	29.790	29.989	49.5	47.0	83

* From observations at 9.0 a.m. and 9.0 p.m.

TABLE II.

TEMPERATURE.

1918.	Maximum.	Minimum.	Mean of Maximum.	Mean of Minimum.	Mean Temperature.	Difference from Average (29 years).
	° F.	° F.	° F.	° F.	° F.	° F.
January ..	53.0	19.3	44.4	34.9	44.5	+ 5.3
February ..	55.0	28.0	48.8	40.2	44.1	+ 4.2
March ..	69.0	29.0	50.1	37.2	43.6	+ 1.4
April ..	65.9	31.9	52.4	38.8	45.5	— .9
May ..	81.1	39.0	65.0	47.1	56.1	+ 3.5
June ..	79.6	40.0	63.6	47.7	55.6	— 1.6
July ..	79.0	47.0	68.3	52.4	60.3	— 0.4
August ..	78.1	47.0	67.3	53.5	60.4	0.0
September ..	70.6	35.2	60.2	47.8	50.4	— 6.0
October ..	59.4	36.1	53.4	44.0	48.7	— 1.6
November ..	56.2	29.4	47.9	37.8	42.9	— 1.7
December ..	55.0	29.0	49.9	41.4	44.2	+ 3.6
	Max. 81.1	Min. 19.3	Mean 55.9	Mean 43.6	Mean 49.7	+ 5.8

TABLE III.
TERRESTRIAL RADIATION, UNDERGROUND TEMPERATURE
AND SUNSHINE.

1918.	TEMPERATURE.			Bright Sunshine.	Bright Sunshine— Difference from Average (9 years).
	Grass Minimum (Mean).	Underground (Mean.)			
		1ft.	4ft.		
	° F.	° F.	° F.	hrs.	
January ..	32.0	39.1	42.9	65.2	+ 13.7
February ..	36.5	44.3	44.6	54.6	— 24.2
March ..	32.2	42.9	44.5	126.8	+ 20.2
April ..	34.3	46.5	46.2	148.4	— 39.7
May ..	42.9	55.7	50.2	255.8	+ 42.1
June ..	41.0	59.3	55.3	248.4	+ 36.4
July ..	48.3	62.3	57.4	244.3	+ 27.7
August ..	49.9	63.3	59.3	191.7	0.0
September ..	45.0	57.4	57.9	138.9	— 8.9
October ..	39.2	50.5	53.7	82.0	— 16.9
November ..	32.2	45.0	50.1	74.4	+ 8.6
December ..	35.3	45.3	47.0	43.4	— 9.1
	Mean	Mean	Mean	Total	
	39.1	51.0	50.8	1673.9	+ 49.9

TABLE IV.
RAINFALL.

1918.	Amount.	Difference from Average (29 years).	*Greatest Fall in 24 hours.	*Date of Greatest Fall.	*No. of Days with Rain (0.01 in. or more).
	ins.	ins.	ins.		
January ..	5.47	+ 2.01	1.53	18th	17
February ..	2.97	+ 0.04	0.83	6th	19
March ..	2.76	— 0.46	0.56	28th	12
April ..	2.39	— 0.26	0.63	9th	16
May ..	1.52	— 0.99	0.49	7th	10
June ..	2.27	— 0.68	1.19	18th	12
July ..	5.95	+ 3.38	0.79	22nd	19
August ..	3.39	— 0.92	0.76	24th	16
September ..	10.49	+ 7.86	1.25	18th	25
October ..	2.90	— 2.21	0.62	5th	21
November ..	3.52	+ 0.07	1.15	4th	18
December ..	7.13	+ 2.63	0.77	26th	28
	Total				Total
	50.76	+10.47	1.53	Jan. 18th	213

* 24 hours ending 9.0 a.m. next day.

MAIN FEATURES OF THE MONTHS,

1918.

JANUARY.

The month was wet and mild generally, with a few cold days. The direction of the wind was chiefly from the S.E. and W.

The Barometric Pressure was variable, but the mean, 29.755 in., was below the average for past years.

The Rainfall was plentiful, the total precipitation for the month being 5.47 in., or 2.01 in. above the average, 3.46 in., for the past 29 years. Rain fell on 17 days, the greatest fall during 24 hours was 1.53 in., on the 18th.

Mean Temperature was comparatively high for the time of year; the mean for the month was 44.5°, being 5.3° above the average for 29 years. The maximum temperature recorded was 53° on the 24th and 25th. The minimum was 19.3° on the 9th. The minimum on the grass was 16.2° on the 4th. Frost was recorded by the minimum thermometer in the screen on 12 days. There was a ground frost on 15 days. Snow fell on the 8th, 12th, 15th, 16th, and 17th.

The total amount of sunshine recorded during the month was 65.2 hours, as compared with an average of 51.5 hours for the past 10 years.

FEBRUARY.

The weather was dull and fairly dry during the month. The wind was chiefly from S.W.

The mean Barometric Pressure for the month was 29.976 and was above the average for past years.

The total Rainfall amounted to 2.97 in., corresponding closely with the average, 2.93 in. for the past 29 years. Rain fell on 19 days, the greatest fall in 24 hours being 0.83 in. on the 6th.

The Mean Temperature for the month was 44.1°, being 4.2° above the average for 29 years. The maximum temperature recorded was 55° on the 4th. The minimum was 28° on

the 17th. The minimum temperature on the grass was 24° . Frost was recorded on three days, the 1st, 17th, and 19th. There was a ground frost on seven days.

The sunshine recorder registered a total of 54.6 hours of bright sunshine, being 24.2 hours below the average, 78.8 hours, for the past 10 years.

MARCH.

The weather during the month was dry and bright, the wind was chiefly from N.E., amounting to strong winds and gales on the 1st and 2nd. During the greater part of the month high pressure prevailed, the mean pressure being 29.842 in.

The total rainfall amounted to 2.76 in., being 0.46 in. below the average (2.93 in.) for the past 29 years. Rain fell on 12 days, the greatest fall being 0.56 in. on the 28th.

The mean temperature for the month was 43.6° , being 1.4° above the average for 29 years. The maximum temperature recorded was 69° , on the 24th. The minimum, 29° , on the 3rd, and frost was recorded on five days. The minimum temperature on the grass was 24° on the 10th. A ground frost was registered on 14 days.

The sunshine recorder registered a total of 126.8 hours of bright sunshine, being 20.2 hours above the average for the past 10 years.

APRIL.

The weather was dull, with overcast skies, and on many days it was colder than in the preceding month. The wind, blowing constantly from the N.E., was accompanied by a great deficiency in warmth. This continued until towards the end of the month, when more springtime conditions prevailed. The barometric pressure was comparatively high, the mean of the month being 29.756 in.

The total rainfall amounted to 2.39 in., being 0.26 in. below the average for 29 years. Rain fell on 16 days; the greatest fall was 0.63 in. on the 9th.

The mean temperature for the month was 45.5° , being 0.9° below the average. The maximum was 65.9° on the 26th. The minimum was 31.9° on the 3rd and 22nd. Frosts were recorded on two days. The grass minimum was 24° on the

19th. A ground frost was registered on nine days. A thunderstorm occurred on the 26th, accompanied with hail, snow, and rain.

The sunshine recorder registered a total of 148.4 hours, being 39.7 hours below the average of 10 years.

MAY.

During the first few days in this month easterly winds resulted in a deficiency of warmth, afterwards warm weather set in with one or two days of unusually high temperature, during which westerly winds prevailed. The mean barometric pressure for the month was 29.889, and was generally above the normal.

The total rainfall amounted to 1.52 in., being 0.99 in. below the average for 29 years. Rain fell on 10 days, the greatest fall (0.49 in.) was on the 7th. A thunderstorm, with rain and hail, occurred on the 23rd.

The mean temperature for the month was 56.1°, being 3.5° above the average. Throughout the month the temperature was above normal. A maximum of 81.1° was reached on the 22nd, being the highest temperature reached in May for many years. The minimum in the screen was 39° on the 2nd, on the grass the minimum was 35° on the 9th.

The sunshine recorder registered 255.8 hours of bright sunshine or 42.1 hours above the average.

JUNE.

The weather was generally bright and dry, with one or two hot days in the early part of the month, towards the middle the weather became cool and unseasonable. The direction of the wind was for the most part N.E. and N.W.

The barometric pressure was generally high, the mean of the month was 29.961 in.

The total rainfall was 2.27 in., or 0.68 in. below the average for 29 years. Rain fell on 12 days, the greatest fall was 1.19 in. on the 18th. The mean temperature for the month was 55.6° or 1.6° below the average. The few hot days were balanced by cool days and cold nights. The maximum tempera-

ture, 79.6° , was recorded on the 2nd. The minimum, 40° , on the 16th. The grass minimum registered 31.2 on the 26th. There was frost on one day.

248.4 hours of bright sunshine were recorded, being 36.4 hours above the average.

JULY.

Except in the first week of this month, when there was a continuance of fine weather, there was a long spell of cool and wet days with occasional thunderstorms. The direction of the wind was for the most part from the S.W.

The barometric pressure was slightly below the normal, the mean for the month being 29.791.

The rainfall was plentiful, the total precipitation amounted to 5.95 in., being 3.38 in. above the average for 29 years. Rain fell on 19 days, the greatest fall was 0.79 in. on the 22nd. Thunderstorms with heavy rain occurred on the 9th and 20th.

The mean temperature, 60.3° , was 0.4° below the average. The maximum reached 79° on the 31st. The minimum, 47° , on the 10th. The grass minimum registered 37° on the 9th.

244 hours of bright sunshine were recorded, being 27.7 hours above the average for the past 10 years.

AUGUST.

The weather was moderately warm and dry, but very variable, being dull and rainy in the early part of the month, but more summerlike towards the end. The direction of the wind was mainly from the W. and N.W. The mean monthly barometric pressure was near the normal, 29.885 in.

The total rainfall for the month was 3.39 in., being 0.92 in. below the average for the past 29 years. Rain fell on 16 days, The greatest fall was 0.76 in. on the 24th.

The mean temperature for the month was 60.4° , approximately the average for the past 30 years. The maximum was 78.1° on the 21st. The minimum 47° on the 29th. The grass minimum registered 41° on the 16th

The sunshine recorder indicated 191.7 hours of bright sunshine during the month, which came near the average for the past 10 years.

SEPTEMBER.

The most noticeable feature of this month was the unusually heavy rainfall common to all parts of the British Isles. It was in fact the wettest month in the year, and the wettest September for many years past. The direction of the wind was chiefly from the W. and S.W.

The mean barometric pressure for the month was 29.594 in., being below the normal. Numerous depressions passed across the British Isles in rapid succession, their influence being felt in this district.

The rainfall was quite remarkable and much above the average, amounting in the month to 10.49 in., or 7.86 in. above the average for 29 years. Rain fell on 25 days, the greatest fall was 1.25 in. on the 18th.

The mean temperature for the month was 50.4°, being 6° below the average. The maximum was 70.6° on the 6th. The minimum 35.2° on the 29th. The grass minimum thermometer registered 36° on the 29th.

138.9 hours of bright sunshine were recorded during the month, being 8.9 hours below the average for the past 10 years.

OCTOBER.

The weather was dull but fairly dry, with less bright sunshine than usual. The direction of the wind was very variable, E., N.E., S.W., and W. winds were the prevailing directions.

The mean barometric pressure for the month was 29.827 in., with some marked depressions, with S.W. gales in the first week.

The total rainfall in the month was considerably below that of September, being only 2.90 in., and 2.21 in. below the average for the past 29 years. Rain fell on 21 days, the greatest fall being 0.62 in. on the 5th.

The mean temperature for the month was 48.7°, being 1.7° below the average. The maximum was 59.6° on the 3rd, the minimum 36° on the 1st. There was a frost on six days. The grass minimum registered 29° on the 1st.

Bright sunshine was deficient. The total amount recorded was 82.0 hours, 16.9 hours below the average.

NOVEMBER.

The weather was typical of the month, being cold, damp, and misty, especially during the middle part of it, when the wind was chiefly from the easterly direction. The mean barometric pressure for the month was 29.952 in., and was generally above normal.

The total rainfall amounted to 3.52 in., being 0.07 in. above the average for the past 29 years. Rain fell on 18 days, the greatest fall being 1.15 in. on the 4th. The mean temperature was 42.9°, or 1.7° below the average. The maximum of 56.2° was reached on the 1st. The minimum, 29.4°, on the 7th. There was frost on three days. The grass minimum registered 21° on the 20th, and a ground frost on 16 days.

A total of 74.4 hours of bright sunshine was recorded, being 8.6 hours above the average.

DECEMBER.

The weather was comparatively mild, with a copious rainfall and winds chiefly from the S.W. and W. The barometric pressure was generally low, with numerous depressions, the mean for the month was 29.255, being below the normal.

The total rainfall amounted to 7.13 in., being 2.63 in. above the average for 29 years. Rain fell on 28 days, the greatest fall, 0.77 in., was on the 26th.

The mean temperature was 44.2°, being 3.6° above the average. The maximum was 55° on the 3rd, the minimum was 29° on the 26th, with three days of frost. The grass minimum was 19° on the 26th, with a ground frost on 12 days.

The total of bright sunshine recorded amounted to 43.4 hours, being 9.1 hours below the average for the past 10 years.

EXTREMES AND SUMMARY.

May was the driest month with a rainfall of 1.52 in.

September the wettest with a rainfall of 10.49 in.

December was also a very wet month in which the rainfall was 7.13 in.

The wettest day was January 18th, when 1.53 in. fell.

The total rainfall for the year was 50.76 in., being 10.47 in., above the average for 29 years; rain fell on 213 days.

The hottest day was May 22nd, when the maximum thermometer in the screen registered 81.1°.

The coldest day was January 9th, on which the minimum thermometer registered 19.3°.

The total number of hours of bright sunshine recorded was 1,673.9, being 49.9 hours above the average for 10 years.

GENERAL NOTES.

The table of "Rainfall in the District" was compiled by Mr. Gilbert D. Shepherd, Honorary Secretary of the Society. The Society is much indebted to him and to the Observers for their voluntary co-operation, which renders the preparation of the Meteorological report possible.

RAINFALL IN THE DISTRICT, 1918.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0·01 in. or more rain.	Greatest fall in one day.
Summit of Tyle Brith || Average	7·75 6·59	6·79 5·35	3·94 5·54	4·36 4·35	3·34 4·30	2·28 4·29	9·12 4·95	4·00 7·25	15·62 4·91	8·10 8·44	6·57 7·39	14·61 9·15	86·48 72·51	Readings taken weekly and at end of each month.	
Nant Penig † Average	8·80 8·40	10·47 6·42	5·00 7·25	3·32 5·54	3·71 4·22	2·58 4·93	11·41 5·14	4·33 8·55	17·84 4·82	8·93 9·37	7·18 7·91	17·67 11·24	101·24 83·79	Readings taken weekly and at end of each month.	
Nant Ddu	6·53	7·76	3·51	3·28	2·93	2·08	8·36	3·55	13·04	6·48	5·94	14·39	77·85	Readings taken weekly and at end of each month.	
Storey Arms † Average	7·86 6·01	5·81 5·39	3·34 5·83	3·67 4·38	2·96 3·92	2·13 4·31	9·01 4·04	3·48 7·26	8·13 3·93	4·67 8·39	8·25 6·64	11·46 9·47	70·77 69·57	Readings taken weekly and at end of each month.	
Beacons Reservoir Average	8·56 7·86	8·00 6·21	4·18 6·52	3·32 4·91	3·07 4·20	2·30 4·42	9·22 5·07	3·47 8·07	13·86 4·46	5·61 8·90	5·49 7·79	10·53 10·29	77·61 78·71	241 ...	{ 1·84 { Sept. 21st.
Nant Gwineu	4·60	4·95	3·07	2·63	2·36	1·53	6·54	2·73	10·64	4·05	4·19	8·99	56·28	Readings taken weekly and at end of each month.	
Pontllnestwen Reservoir (No. 1 Gauge)	8·32	9·61	3·73	4·37	2·57	3·95	8·51	4·63	16·41	7·87	8·22	17·73	95·92	218	{ 2·42 { Feb. 7th. { Oct. 6th.
Pontllnestwen Reservoir (No. 2 Gauge)	6·62 6·12	4·82 4·88	2·95 5·04	3·02 4·04	2·35 3·56	3·53 3·76	7·15 4·21	4·51 7·00	11·99 4·07	3·86 7·40	6·02 6·59	10·81 8·57	67·63 65·24	218	{ 1·88 { Nov. 5th.
Pontllnestwen Reservoir (No. 3 Gauge)	7·84	8·49	3·55	3·82	2·55	4·13	7·71	4·37	16·05	6·87	8·60	15·34	89·32	218	{ 2·67 { Nov. 5th.
Blaenavon † Average	6·18 4·86	5·79 5·01	2·85 5·73	7·01 3·72	3·24 3·63	1·81 3·35	5·93 3·11	2·77 5·06	12·23 2·97	4·30 6·66	5·61 5·17	7·65 7·35	65·37 56·62	220 ...	{ 2·02 { Nov. 2nd.

RAINFALL IN THE DISTRICT, 1918.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 in. or more rain.	Greatest fall in one day.
Nantyridd, Wentwood, Mon.	5.26	2.62	2.71	2.53	2.29	1.04	4.90	3.02	9.46	3.08	3.13	5.28	45.32	203	1.76 Jan. 15th.
Llanvaches Embankment, Mon.	4.79	2.55	2.02	2.39	2.24	1.15	4.33	2.98	9.43	2.77	3.07	5.35	43.67	211	1.43 Jan. 18th.
Pant-yr-eos Reservoir, Mon.	5.62	4.08	3.43	2.60	1.88	1.66	6.78	3.75	13.01	4.42	4.07	8.44	59.74	220	1.72 Jan. 18th.
Chepstow, Itton Court ... *Average ...	4.36 3.27	2.49 2.80	2.29 2.88	2.17 2.27	1.94 2.30	1.00 2.48	4.42 2.66	2.32 4.19	9.65 2.46	2.59 4.57	3.13 3.39	4.78 4.49	41.14 37.76	190 ...	1.72 Sept. 29th.
Cowbridge, Ash Hall ... Average ...	3.86 3.93	4.16 3.26	2.23 3.54	2.40 2.73	1.87 2.56	1.74 2.66	5.02 3.20	4.01 4.59	11.66 3.12	3.22 5.36	4.46 4.25	10.02 5.42	54.45 44.62	205 ...	1.63 Jan. 18th.
Chepstow, Piercefield Park Average ...	3.57 2.94	2.62 2.52	2.04 2.77	2.71 2.17	2.22 2.26	1.05 2.42	4.96 2.57	2.18 3.71	8.97 2.22	2.22 4.14	2.79 3.09	4.21 4.05	39.54 34.86	179 ...	1.44 Sept. 28th.
Pontyridd, Lanwood Reser. * Average ...	5.73 5.52	5.07 4.65	2.66 4.19	2.42 3.27	2.02 2.67	1.44 3.04	6.43 3.12	3.27 5.47	12.67 3.47	4.64 6.48	4.24 5.32	11.00 7.15	61.59 54.35	213 ...	1.81 Jan. 19th.
Talygarn ... †Average ...	7.30 6.31	5.03 4.64	2.32 4.89	2.58 3.49	1.44 2.85	1.65 2.99	5.11 3.33	3.86 5.05	12.50 3.87	3.50 6.71	5.29 5.48	15.08 8.07	65.66 57.66	205 ...	2.85 Jan. 18th.
Ystalyfera, Wern House. †Average ...	7.72 6.40	6.03 5.68	3.45 5.72	2.53 4.29	2.60 3.72	3.11 4.21	8.31 4.18	2.63 6.87	12.97 3.59	6.27 7.75	6.10 6.36	12.83 8.73	74.55 67.50	232 ...	1.71 Oct. 5th.
Llantilio Court, Mon. ... ‡Average ...	1.06 2.61	1.78 2.47	0.87 3.06	2.54 2.01	1.83 2.33	0.60 2.08	1.92 2.24	0.65 3.29	5.92 2.13	0.68 4.05	0.29 2.68	3.50 3.92	21.64 32.87	117 ...	1.10 Sept. 29th.

RAINFALL IN THE DISTRICT, 1918.

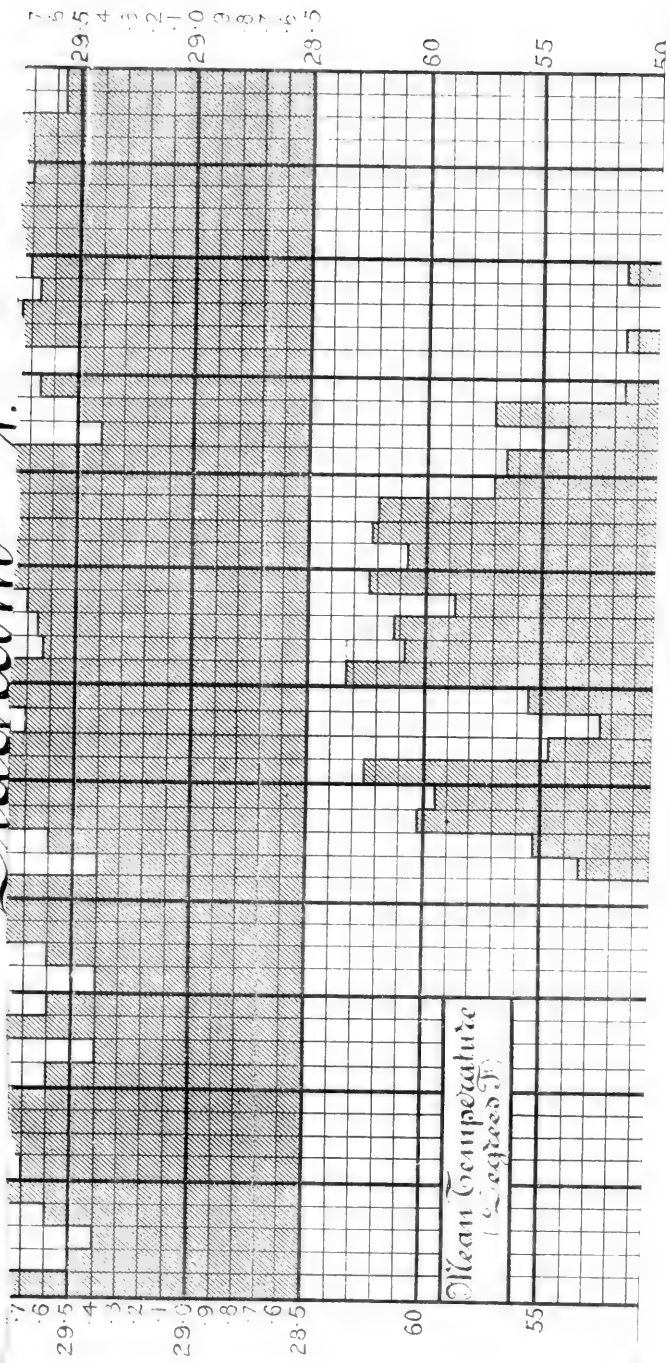
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 in. or more rain.	Greatest fall in one day.
Cardiff Meteorological Station, Penylan															
<i>l</i> Average ...	204	297 3.31	276 3.73	239 2.48	152 2.61	227 2.97	595 2.92	339 4.64	1049 2.21	290 5.28	352 3.74	713 5.62	5076 4286	213	{ 1'53 Jan. 18th.
Pentwyn, Rockfield, Mon.															
...	191	142	150	281	216	058	280	167	813	154	251	347	3169	177	{ 1'58 Sept. 29th.
Runney, Witla Court ...															
...	177	292	265	255	153	155	558	310	975	212	3'96	601	4558	188	{ 1'42 Jan. 18th.
Llanishen Reservoir															
<i>k</i> Average ...	155	276 3.32	249 3.07	201 2.35	137 2.34	162 2.50	524 2.83	324 4.30	998 2.56	256 4.76	324 3.55	667 4.75	4556 3905	203	{ 1'38 Sept. 18th.
Lisvane Reservoir															
<i>k</i> Average ...	150	251 3.11	240 2.87	195 2.26	133 2.25	135 2.35	475 2.65	288 3.90	912 2.37	203 4.34	279 3.21	536 4.34	4071 3623	199	{ 1'43 Jan. 18th.
Chepstow, Castleford															
<i>k</i> Average ...	146	250 2.70	210 2.96	285 1.82	247 2.29	106 2.67	452 2.59	193 3.82	889 1.88	219 4.68	259 2.89	426 4.38	3983 3524	191	{ 1'50 Jan. 15th.
Cardiff Heath Filter Beds															
<i>¶</i> Average ...	132	300 3.61	259 3.27	223 2.39	152 2.37	229 2.47	491 2.77	340 4.28	987 2.71	288 4.83	329 3.76	730 5.03	4812 4037	207	{ 1'48 Jan. 18th.
Fonmon Castle ...															
...	130	199	162	181	124	122	461	373	1027	246	287	562	4134	156	{ 1'27 Jan. 19th.
Ynisyfro Reservoir, Mon.															
...	130	275	283	269	191	109	461	283	960	269	268	568	4376	222	{ 1'64 Jan. 18th.
Cogan Pumping Station															
<i>¶</i> Average ...	121	200 3.04	210 2.92	144 2.21	126 2.13	111 2.31	590 2.82	249 4.00	914 2.57	224 4.46	254 3.42	591 4.42	4083 3690	186	{ 1'27 Jan. 18th.

RAINFALL IN THE DISTRICT, 1918.

	Feet above sea level	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	No. of days with 0.01 in. or more rain.	Greatest fall in one day.
Llandaff, West Hill	110	4.72	2.98	3.00	2.55	1.52	2.05	5.70	3.78	10.77	2.76	3.55	7.62	51.00	226	1.57
‡ Average	...	3.83	3.54	3.82	2.65	2.05	3.06	2.81	4.09	2.30	5.38	3.99	5.34	43.46	...	{ Jan. 18th.
Ely Pumping Station	53	4.78	2.04	2.88	2.17	1.43	1.87	5.54	3.61	10.49	2.07	3.27	7.03	47.78	244	1.52
‡ Average	...	3.64	2.94	3.34	2.50	2.41	2.54	3.02	4.52	2.83	5.00	3.87	5.08	41.69	...	{ Jan. 18th.
Cardiff, Roath Park	52	4.93	2.55	2.43	2.22	1.53	2.25	5.29	3.09	10.53	3.12	3.29	7.30	48.53	211	1.53
Cardiff, Trade St. Depot	45	4.93	2.53	2.69	2.17	1.52	1.74	6.34	3.30	11.32	2.83	3.03	7.21	49.61	194	1.57
‡ Average	...	3.50	3.03	3.40	2.47	2.32	2.73	2.62	4.20	2.28	5.12	3.52	4.99	40.18	...	{ Jan. 18th.
Newport, Friars St. Depot	33	4.75	2.98	2.91	2.97	1.88	1.25	4.32	3.16	9.77	2.73	2.62	5.75	45.09	196	1.50
Cadoxton, Biglis Png. Stn.	20	6.22	1.81	2.07	2.24	1.33	1.27	6.98	3.77	11.11	2.03	2.73	6.29	47.85	192	1.62
§ Average	...	2.67	2.37	2.59	2.05	1.82	2.20	2.60	3.79	2.51	4.26	2.99	4.04	33.89	...	{ Sept. 11th.

NOTE.—Average Rainfall is for the 30 years 1888—1917, unless otherwise indicated.
 § 29 years 1889—1917. * 23 years 1895—1917.
 † 14 years 1901—1917. † 18 years 1900—1917. † 31 years 1887—1917.
 † 12 years 1906—1917. † 10 years 1908—1917.

Diagram I.



THE FRESH WATER FISHES OF GLAMORGAN.

BY H. EDGAR SALMON.

Freshwater fishes are found in great variety in the rivers, streams, lakes, reservoirs, and ponds throughout the County of Glamorgan.

In the following list I have followed the nomenclature of Mr. C. Tate Regan, F.R.S. ("British Freshwater Fishes," London; Methuen, 1911).

PETROMYZONTIDÆ.

Lampetra fluviatilis, Linnæus. River Lamprey or Lampern. Rivers Rhymney, Taff, Neath, and Perddyn; Coed-y-goras Brook.

SALMONIDÆ.

Salmon and Trout were formerly caught in large numbers in the Rhymney, Taff, Ely, and Ogmores Rivers, but at the present time Salmon are seldom seen and Trout are comparatively scarce in the lower reaches of these rivers, owing to the pollution caused by the development of collieries, coal washeries, tinplate and other works in the valleys through which these rivers run to the Bristol Channel.

I am indebted to Mr. Max Wright for the following particulars of record fish for the County. The late Mr. Wm. Davies, of Canton, Cardiff, who was personally known to Mr. Wright, took a 39lb. Salmon in the Rhymney, also a 29lb. Salmon in the Ely, the latter on the fly; the last Salmon he caught in the Taff was some 30 years ago.

Salmo salar, Linnæus. The Salmon. Rivers Rhymney, Taff, Ely, Ewenny, Ogmores, Neath, and Loughor.

Salmo trutta, Linnæus. The Trout. Rivers Rhymney, Taff, Ely, Ewenny, Ogmores, Afon, Thaw, Waycock, Neath, Tawe and Loughor. Lisvane and Llanishen reservoirs. Cyfarthfa, Llwynypia, and Pendoylan ponds; Roath Park Lake, and most of the smaller streams in the County. Many good trout have been caught in the Lisvane and Llanishen reservoirs, the largest I have recorded weighed 5lb. 9ozs.; in 1917 a trout 7½lbs., and in 1919 two trout 7½lbs. and 10½lbs. respectively, were taken in a colliery reservoir near Hirwain.

The Sewin, **Salmo cambricus**, and Sea-Trout, which are frequently taken in the rivers of the County, are treated by Mr. Tate Regan as sea-run forms of the common trout.

Thymallus thymallus, Linnæus. The Grayling. This fish was successfully introduced into the River Ewenny by Colonel Turbervill in 1889, where they are still numerous.

ESOCIDÆ.

Esox lucius, Linnæus. The Pike. Kenfig Pool, St.-y-Nyll Ponds, Hensol Castle Lake, and River Ely.

In the autumn of 1903, Mr. Wright caught a 17 $\frac{3}{4}$ lb. Pike in the lake at Hensol Castle, and in 1908-9 I took several good Pike in Kenfig Pool, the heaviest being 16 $\frac{1}{4}$ lbs.

ANGUILLIDÆ.

Anguilla anguilla, Linnæus. The Eel. Common in rivers, lakes, ponds, and streams throughout the County.

CYPRINIDÆ.

I have failed to find an authentic record of either a Chub or a Dace having been taken in any of the rivers of the County, although they are very numerous in the rivers of the adjoining County of Monmouth. Dace were introduced at Cyfarthfa, but they did not thrive, and there have been none there for very many years.

Cyprinus carpio, Linnæus. Common Carp. Brynmill Park, Welsh St. Donats, Caehir and Pendoylan Ponds.

Carassius auratus, Linnæus. Goldfish. Introduced in ornamental waters.

Gobio gobio, Linnæus. Gudgeon. Roath Park Lake and Brook, Kenfig Pool, Rivers Taff, Ely, Ewenny, Ogmores, and Neath.

Tinca tinca, Linnæus. Tench. Hensol Lake, St.-y-Nyll, Caehir, Newport Road, and Waterhall Ponds. In 1903 a Tench weighing 5 $\frac{1}{4}$ lbs. was taken in the Ely.

Phoxinus phoxinus, Linnæus. Minnow. Rivers Rhymney, Taff, Ely, Waycock, Thaw, Roath Park Lake and Brook and Caehir Ponds.

Rutilus rutilus, Linnæus. Roach. Rivers Taff and Ely; Hensol and Brynmill Park Lakes, Waterhall Ponds.

In 1903 a Roach weighing 2 $\frac{1}{4}$ lbs. was taken in the Ely.

Scardinius erythrophthalmus, Linnæus. Rudd. Hensol Lake, St.-y-Nyll, Caehir, and Waterhall Ponds.

COBITIDÆ.

Nemachilus barbatula, Linnæus. Loach or Stone Loach. Whitchurch Brook, Dinas Powis and Roath Brooks.

PERCIDÆ.

Perca fluviatilis, Linnæus. Perch. Hensol and Brynmill Lakes, St.-y-Nyll, Newport Road, and Pendoylan Ponds.

Mugil capito, Cuvier and Valenciennes. Thin-lipped Grey Mullet. Rivers Taff, Ely, Thaw, and Ogmore. Also in considerable numbers in the Docks at Cardiff, Penarth, Barry, Port Talbot, and Swansea.

COTTIDÆ.

Cottus gobio, Linnæus., Bull Head or Miller's Thumb. Rivers Rhymney, Taff, and Ely, Dinas Powis and Roath Brooks.

GASTROSTEIDÆ.

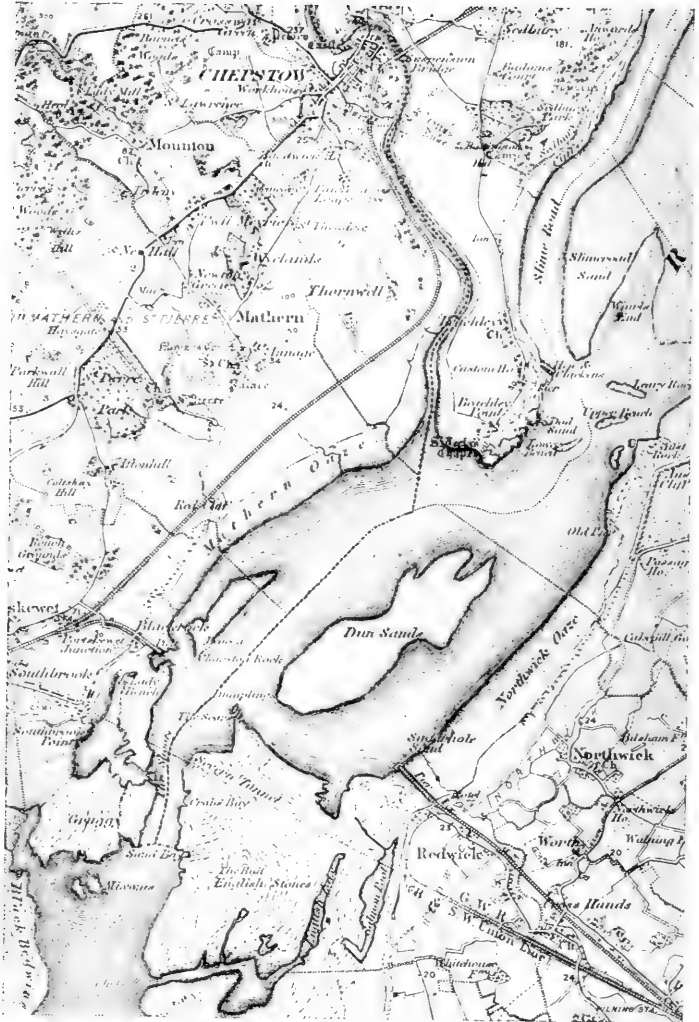
Gastrosteus aculeatus, Linnæus. Three-spined Stickleback. Common in most streams and ponds in the County.

Pygosteus pungitius, Linnæus. Ten-spined Stickleback. Kenfig Pool.

PLEURONECTIDÆ.

Pleuronectes flesus, Linnæus. Flounder or Fluke. Rivers Rhymney, Taff, Ely, Ogmore, Ewenny, Thaw, Neath, and Loughor.

MAP I.



Reproduced from the Ordnance Survey Map, with the sanction of the Controller of H.M. Stationery Office.

THE GEOGRAPHICAL BACKGROUND TO WELSH ARTHURIAN STORIES

BY F. T. HOWARD, M.A., F.G.S.

IDENTIFICATION OF ARTHUR

Who was King Arthur of the early Romances? The answer which almost every school child would give without hesitation is that he was a prominent Celt who led the inhabitants of this country against the Saxon invaders when the Romans withdrew. And yet, when one probes more deeply to discover the foundations for this belief, there is little of substance upon which to rely. Certainly interest in Arthur was intensified about the middle of last century by the translation by Lady Charlotte Guest of the Arthurian stories in the Welsh *Mabinogion*. Somewhat later that eminent Welsh scholar, Sir John Rhys, put forward the idea that Arthur was the Roman official known as the Count of Britain, whose business it had been to guard the Scotch frontier and who subsequently took charge of the country when the armies of occupation were withdrawn. This working theory Rhys thought best explained all the facts and his contemporaries accepted it; from which time it seems to have been taken as established truth, at least by those who profess belief in the historical existence of King Arthur.

It is natural, therefore, to ask "Was the evidence upon which Rhys and others depended sound"? Evidence derived from an enumeration of the places on mountain tops and in valleys throughout the whole of these islands bearing the name of Arthur is, in my view, from their very number and their distribution, necessarily unsound. No man could have been in so many places within the ordinary span of life. Besides, his name is attached to prehistoric monuments and Roman mines—to places which came into existence after Geoffrey's

Historia Britonum was written in 1148 A.D., after Caxton published Malory's *Morte d'Arthur* in 1485 A.D., and to others which have risen into prominence since the last Arthurian revival of the nineteenth century. Even under the Turk the innumerable relics of the past in Palestine have gained in sanctity and importance through attachment in comparatively modern times to the ancient names of Abraham and Elijah

EARLY REFERENCES TO ARTHUR.

Now, as Professor Lewis Jones has pointed out, Bede was a careful historian, and if a great Christian prince had fought in England, he should have known of it: Bede makes no reference to Arthur. If the Saxons had been so strenuously opposed and actually defeated, some reference might be looked for in their official historical record: the Anglo-Saxon Chronicle says nothing. Equally there is nothing in early Welsh literature which suggests that the Saxons were always such implacable foes of the Celts as are described in Geoffrey's story of Arthur.

It would seem that we have only three possible references to Arthur in writings belonging to the period before the Norman Conquest. Gildas of the seventh century mentions a battle of Badon: but the name is a common one, and his battle may easily have no connection with Arthur. The *Annales Cambriæ* (the oldest edition existing was published in 955 A.D.) give much interesting material: but that record is not reliable. Like other histories of the kind the early part was filled in merely for the sake of completeness. It begins with the year 453 A.D. and for the first century there are only three entries relating to Britain, viz., the death of an un-named Archbishop of York and the battles of Badon and Camlan. There are indeed very few records for the first four centuries, and very meagre as to details. Under 516 one reads "battle of Badon in which Arthur carried the cross of our Lord Jesus Christ for three days and nights on his shoulders and the Britons were victorious," and again under 537 A.D., "the battle of Camlan in which Arthur and Medraut fell." The third writer is Nennius, whom certain learned German scholars, e.g., Mommsen and Zimmer, regard as an eighth century author of the whole book which bears his name. But English

scholars have always looked on it as a compilation with many late interpolations. Even if written in Welsh originally, as supposed, we have no copy beyond Latin translations, all of them dating since the Conquest. In my view the references to Arthur are among the late insertions

We have positive evidence that vivid stories speaking of Arthur as if of recent events, were told about the time of the Norman invasion, especially in the west country and in Brittany; with the revival of learning they soon found their way into current literature. Geoffrey of Monmouth made free use of them in the construction of his historical romance in the twelfth century. Other writers of approximately the same date, like William of Malmesbury and Henry of Huntingdon, definitely regard Arthur as of the British nation.

All modern Celtic scholars have not followed Rhys. Some, like Dr. Sebastian Evans, hold that Arthur is no particular man, but a creation of Geoffrey's; others, like Dr. Gwenogvryn Evans, doubt the antiquity of the writings, and date some of them as late as the eleventh and twelfth centuries.

Arthurian stories have been studied from many points of view, but as far as I know the geographical aspect has not received much attention. It has been customary even to treat the place-names as "shadowy and unreal." And yet the modern geographer who gives proper consideration to the control which natural conditions exercise over the activities of mankind in past ages, when such conditions were dominant, may bring to bear methods of investigation which may help considerably. It is from this standpoint that I have approached the subject. I know that philologists will disagree: but local people have never troubled about philology in framing their fanciful explanations of place-names, an amusement which still lives.

Professor Lewis Jones, in his "King Arthur in History and Legend," 1911, the latest authoritative work on Arthur, accepts the theory of Sir John Rhys that Arthur was the sixth century representative of the third officer of the Roman military organisation, the *Comes Britanniae*. Jones holds that it explains better than any other theory "Nennius' description of Arthur as *dux bellorum* and the seemingly wide range of

country covered by the twelve battles." It is this theory which I propose to challenge.

But let us see what are the facts recorded by Nennius about Arthur. He gives a list of twelve battles fought by Arthur; in addition, he speaks of a marvel in the shape of a dog's footprint on a stone lying on a hill near "Builth" made when the dog Cavall was pursuing, along with Arthur, the boar Twrch Trwyth.

The twelve battles have been fixed all over the place. Geoffrey was determined to make his hero win battles in the North of Britain, and following his lead the general tendency has been to locate them in Scotland or the North of England. Even the careful Skene fixed them in the Lowlands of Scotland. That their identification was lost quite early is known by the fact that Henry of Huntingdon, in the twelfth century, says the places were unknown in his time. In any case, the commentators have challenged us to identify the battles, and thereby to decide who Arthur was.

IDENTIFICATION OF ARTHUR WITH ALFRED THE GREAT.

To commence with, let me point out that 12 is not the traditional complete number of the Celts; it may be that the author of the story was determined to have a rival to Hercules and his twelve tasks. But of greater interest is a comparison with the recorded battles of Alfred the Great.

It is to him that geographical investigation unmistakably points. I have set out side by side the battles of Arthur as given by Nennius and Geoffrey of Monmouth, and those of Alfred as given in the Anglo-Saxon Chronicle and elsewhere. The numbers indicate the succession of the battles as recorded by each.

Where lists are so similar, the balance of evidence is in favour of the man of later date. Besides, we have sound historic evidence for Alfred in this connection, and there are marked differences between the accounts of Arthur given by the two main authorities, Nennius and Geoffrey, which can be explained if we use Alfred's record as the key. Finally, if we

study Alfred's life, we see that other details of Arthur are definitely applicable to him. For example, if anyone is asked to name the great rulers of England who stand out as *Christian* warriors, undoubtedly Alfred's name would come among the first. It is worth mentioning that Caxton, in his Introduction to Malory's *Morte d'Arthur*, asserts that in the world's history there have been "9 worthy and best men to wit 3 paynims, 3 Jews and 3 Xtians." He is going to "write up" the great Christian king of England, he says, and he puts his Arthur just where we should expect to find Alfred, who lived about the time of Caxton's other heroes, Charlemagne and Godfrey of Boulogne.

If anyone will compare the story as told by Geoffrey with the Anglo-Saxon Chronicle on Alfred, he will be struck by the points of similarity.

Nennius.	Alfred's History.	Geoffrey of Monmouth.
1. Mouth of the Glein (Gleni).	1. <i>ae</i> Glea (<i>ae</i> Glea, Iley, in other versions) (<i>a</i>)	Nil.
2-5. On the River Dubglas in the region Linnuis (Limuis).	2. Battles South of the Thames and near the River Dubris (Dover), Durobrivis (Rochester), and in the region of the Lemnarcha or Warden of the Cinque Ports. The big Danish Fleet came into Leminemouth, or Lympne. (<i>b</i>)	A series of battles at Duglas, near York, and the siege of of York.
7. Coet Celidon.	6. Caledonian Forest: the old name of Andreadswald or the Weald Forest. (<i>c</i>)	Wood of Celidon.
6. River Bassas.	7. Battle of Feamhamme, close to Basing, while the Danish fleet was attacking Exeter and the South Coast. (<i>d</i>)	Fleet attack Totnes.
8. Castle of Guinnion (Gurnion). "When Arthur bore the image of the holy Virgin Mary on his shoulders, and when the pagans were put to flight, and a great slaughter made of them through the might of our Lord Jesus Christ and of Holy Mary His mother."	8. Buttingadun or Buttington Tump, close to Chepstow. The old name for Chepstow Castle was Castle Gwent and Castell Guinn.	Battle of Bath, where Arthur bore the image of the Virgin on the shield, on his shoulders.

Nennius.	Alfred's History.	Geoffrey of Monmouth.
9. City of Legions.	9. A waste Chester in Wirhealum (Wirral). Chester on Dee. (e)	York.
10. Shore of the River Tribruit, Robroit, or Trat Treutroit.	10. The defeat of the Danish fleet on the river Lea, when Alfred made the main course of the stream un navigable by increasing the courses to three. (f)	A fight on the water in which Saxon ships were captured.
11. Mountain Agned (Breguoin : Agned Cath Regonium in other versions).	11. Cwat Bregne, probably Bridgnorth, the old name being Coed Moerheb, (g)	Murief in Scotland, the old name being Moerheb.
12. Mount Badon.	12. Baddabbyrig. Badbury Rings.	Battle of Camlan.

NOTES.

- (a) "Leah," meaning "wood" and later "field" to-day is written "Leigh" and pronounced "Li" in Surrey. Asser speaks of the Guilou as the river of Wilton where Alfred fought. This stream is now called "Wiley." The mouth of the Glein presumably is the junction of the Wiley with the Avon.
- (b) Richard of Cirencester mentions two rivers and two towns, Dubris and Lemanus in Cantium, and also,
- (c) "The vast forest, called by some the Anderidian and by others the Caledonian."
- (d) I find no modern stream called Bassas, which presumably is the abbreviated form nominative plural Basinges—the people of Basing. The Anglo-Saxon Chronicle says clearly that Alfred divided his army: he with one portion relieved Exeter and guarded the coast from Southampton westwards, leaving Ethelred of Mercia and his son Edward to watch Hasten in the east. By a breach of faith the Danes made a rapid march from the south inland and were caught and defeated by Edward at Fearnhamme (Farnham in Surrey).
- (e) Chester is clearly implied, for when Hasten was shut up there and starved, he broke away into North Wales.
- (f) "Fecit aquam Luye findi in tria brachia" (Henry of Huntingdon).
- (g) From the Lea Alfred harried the Danes across country until they fortified themselves "at Cwat-bryegec."

BATTLE OF GUINNION.

One battle of Arthur's is of peculiar interest—that of Castell Guinnion, so called by Nennius and Bath by *Annales Cambriæ* and Geoffrey. Had Geoffrey known his geography well he would undoubtedly have used the fact to foster his pet idea of founding or reviving an Archbishopric of Caerleon in order to free Wales from the supremacy of Canterbury. Throughout history this battle has fastened itself upon the imagination. Here Arthur, as the story goes, “ bore the image of the holy Virgin Mary on his shoulders, and when the pagans were put to flight and a great slaughter made of them through the might of our Lord Jesus Christ and of holy Mary His Mother.” In old Welsh the word for shield is the same as for shoulder. But Geoffrey avoids the difficulty by writing “ upon his shoulder did he bear the shield whereon the inner side was painted the image of holy Mary mother of God that many a time and oft did call her back into his memory.” The name Guinnion is suggestively like Gwent (the old name of Chepstow was Castell Gwent or Guinn). Now in the story of Alfred the Great the struggle with Hasten the Dane takes place at Buttington. As the map (I) shows, Buttington Tump is near Chepstow, close to the point where the Wye joins the Severn. But even Plummer, the chief biographer of Alfred, rejects it in favour of Buttington in Montgomery on the Upper Severn. The evidence in favour of Buttington Tump appears to me overwhelming. The record says that the Danes went to “ Buttingadun on Severn shore ” “ up along the Severn ” which merely conveys to me the idea of their following the western Roman road and striking the Severn in the Bristol district, perhaps at Uphill, far below the point where they could cross it, consequently they turned up stream to the first point of crossing. I find that the Welsh official record under date A.D. 895 has an entry: “ the Norsemen came and laid waste Bricheniauc (Brecknock) et Guent (Gwent) et Guinn Liguiauc (Wentloog) ” which certainly brings the Danes to Chepstow. Again we must always remember that the king had no standing army, but used local militia. If he was attacking Buttington in Montgomery we should expect the men of Cheshire, Shropshire, and Staffordshire to be engaged. It is just the reverse :

they were men from Somerset, Gloucester, and Wiltshire : from regions north of the Thames ; from west of the Severn and from Wales. To quote Alfred's chronicler, " they drew together and beset them about on either side in a fastness." The Danes " broke out against the men encamped on the east side of the river " most of which would not apply to Montgomery. The map (I) shows how well Buttington Tump is situated for a sea force driven to bay and looking for relief from oversea.

BATTLE OF TRAT TREUROIT.

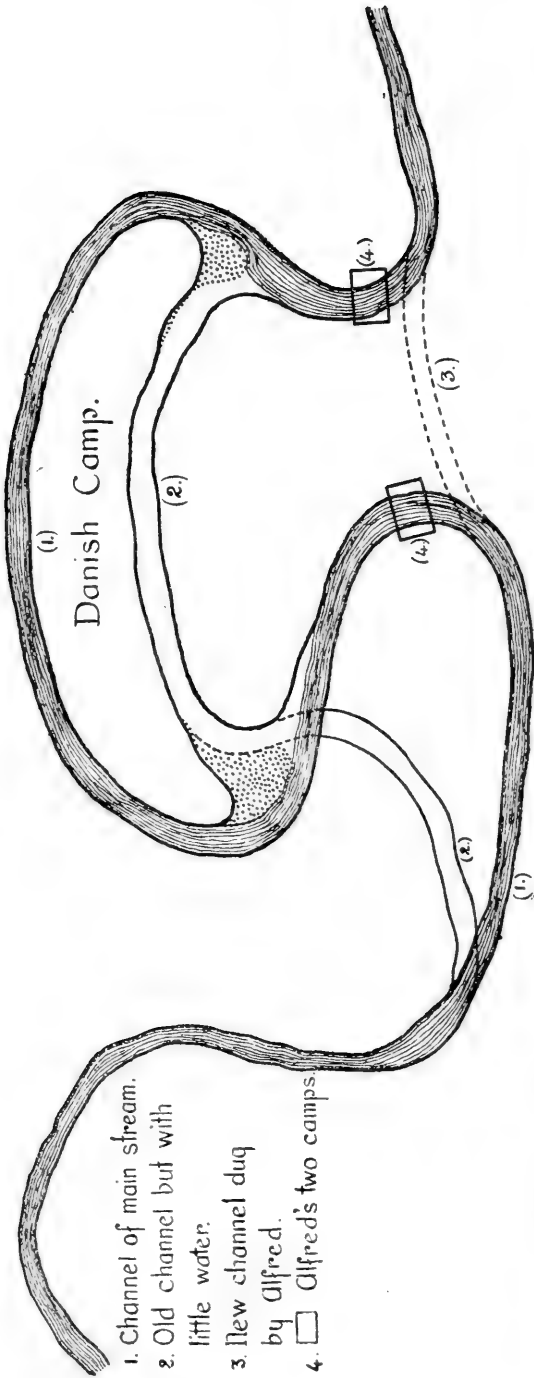
Perhaps the most convincing case is the battle of Trat Treuroit or Tribruit. Trat may be an abbreviated form of Streat (road) or Strath (shore), though more likely it is a form of an old French word *Tret* meaning margin. Tribruit clearly means three courses. Turning to Alfred's story we find the Danes sailing 20 miles up the Lea from London and seizing an island near Ware, from which Alfred drove them by cutting another course. After studying the ground of this flat-bottomed valley with its many streams, I offer this solution (see map II.), which brings out clearly what Henry of Huntingdon in his old Chronicle, meant when he wrote that Alfred made the Lea to flow in three branches. An old children's rhyme runs—

" London bridge has fallen down,
London Bridge has fallen down,
Dance on my Lady Lea."

which becomes intelligible when one recalls the old broad sound of ' a ' in Danes and the old word ' lade ' meaning a passage or a stream. As long as the Danes held the Lea and the roads to the north, they threatened seriously the food supplies of London.

MEANING OF THE NAME AND TITLE OF ARTHUR.

Now before I deal with the twelfth battle, let me mention a few other points. Rhys and others make much of the fact that Arthur is never called " King " in Celtic literature, but given various titles which mean " emperor " or " war leader." The very name Arthur is regarded by some as a variant of a well-



known Welsh name meaning "Lord of Princes." It is on these titles that Rhys depends when identifying Arthur with the Duke of Britain, the officer who had to face the Picts of the north. But the position of war lord fits Alfred better. One after the other the Welsh princes ranged themselves under Alfred against the Danes. There was a definite agreement: each was to hold the same position as Ethelred of Mercia and Asser the Welshman and friend of Alfred adds that the connection "gave more power to him that wished: money to him that wished for money." "Hemeid with all the inhabitants of the region of Demetia, compelled by the violence of the six sons of Rotri, had submitted to the dominion of the king. Howel also, son of Ris king of Gleguising, and Brocmail and Fernmail sons of Mouric king of Gwent, compelled by the violence and tyranny of Earl Ethelred and of the Mercians, of their own accord sought King Alfred that they might enjoy his government and protection from him against their enemies. Helised also son of Teudyr King of Brecon, compelled by the force of the same sons of Rotri, of his own accord, sought the government of the aforesaid king; and Anarawd son of Rotri with his brother, at length abandoned the friendship of the Northumbrians, from which he received no good but harm, came into King Alfred's presence and eagerly sought his friendship." (Asser, *History of Alfred*.)

Besides, Alfred was a Pendragon—the silver dragon was the standard of Wessex. You will recall that Arthur is stated to have fought at Castell Guinnion wearing "a helm of gold graven with a semblance of a dragon." We can gather from other stories that the old quarrel between the red and white dragons was not easily forgotten. But Christianity made even this possible, and Arthur is pictured in the Nennian story as having borne the ensign of a primitive Crusader, a curiosity certainly if the description was written at the beginning of the eighth century. It is interesting that the Anglo-Saxon Chronicle at this stage of Alfred's history ceases to speak of the men of Kent or West Saxons or Mercia, and notes simply "The Christians had the victory."

AVALLON.

Another point of interest is Avallon, whither Arthur was carried when dying. Sometimes it is spoken of as an island, and sometimes as a valley. Glastonbury Abbey made an impertinent claim to the name and also to the mortal remains of Arthur, which were duly discovered at an opportune moment in the reign of Henry II. William of Malmesbury tells us that the Abbey made a point of collecting as many relics of saints as it could. Pilgrimages to the tombs of saints were a fruitful source of income to any religious community in the Middle Ages. William of Malmesbury, however, wrote "the sepulchre of Avallon is nowhere to be seen whence ancient ballads fable that he is still to come." The word Avallon, for some reason, has been taken as "a fallen" or "apple," and the early monkish explanation why excellent sites were secured for abbeys was, that inspired pigs led the pious founders to fruitful orchards. But in the glossary of an eighth century manuscript in the old Mercian dialect at Corpus Christi College, Cambridge, the word is interpreted as meaning "hazel nuts," and the scientific name of the hazel is still *Corylus Avellana*. Perhaps this gives us a clue to the real meaning. The hazel is the tree of mystery; the hazel provides the rod used for divining in the discovery of water and, in the past, of hidden treasure and many other things. The Irish have traditions of hazel-nuts which give wisdom and knowledge when eaten and are grown on forbidden ground—the *land of the unknown*.

Thus Stokes, in translating the Rennes Dindsenchas, gives more than one story as to magic wells under the sea where grow "the hazels of the science of poetry" and from whence "flow seven streams of wisdom." Persons who sought to look into these springs were either struck blind or lost their life.

Just as in our own times the tomb of the Mahdi was destroyed, so the Danes attacked monasteries and broke down the tombs of saints as a means of weakening national feeling. Because of them, the body of St. Cuthbert and other saints during the era to which Alfred belonged were carried about for years. The idea of a person sleeping ready for resuscitation dated back to Roman times and was revived by the story tellers of the Charlemagne cycle. It was a mode adopted by Christian

missionaries who fitted their beliefs on to local Paganism—the Saxons and Norsemen only thought of everlasting feasting after death. In any case a story was current after Alfred was buried at Winchester that he could be seen walking at nights, and in the end it was found advisable to bury him in another place. It may have been necessary later still to conceal the burying place of Alfred from the vindictive Danes. The queen Morgan, to whom Arthur is said to go, is nothing but the word “morgen,” meaning “water-spirits.” “Fata morgana” is the mirage sometimes seen in the Straits of Messina.

GELLIWIC.

In all the stories, Arthur is constantly going to his palace of Gelliwic, which has been fixed in many places, but hitherto never satisfactorily. We have an old Roman station called Vindo-gladia, and possibly derived from Gelad (a derivative of lad or lode—passage), and often now modified into “inlet,” or from Gelaet—a junction of roads. One form of “wic” is the A.S. for “bay,” and is still a word commonly found in Iceland and Norway. Poole Harbour, the Megas Limen of the early voyagers of Britain, certainly answers the description of “the harbour for the junction of the roads,” since several roads broke away at Badbury, just to the north. Gelliwic is Celtic for forest, which would not fit the context. Maclure, in his “British Place-names in their Historic Setting,” points out that in dealing with early Anglo-Saxon place-names, it is important to bear in mind the tendency to shorten words by omitting elements, sometimes doubling the consonant and appending the vowel “e” or “a.” Vindo-gladia is practically the modern Wimborne on Poole Harbour, and I hazard the suggestion that it is also Gelli-Wic. Wimborne was one of Alfred’s royal residences. To turn once more to the story of Arthur, Medrodd, who caused Arthur’s death was his nephew. The name means “chief usurper.” He seized the palace of Gelliwic, and also Queen Guinevere, as some say, making her his wife. Let us go back to Alfred. We know he died in A.D. 901 from a cause differing from the sickness which had plagued him through his life. We know that his nephew, Ethelwald,

raised a rebellion in 901 and seized this very palace of Wimborne and took a nun related to the royal family—a person married to God—from the abbey and made her his wife. This is thought to be one of the chief reasons why the Witan decided against his claim to the throne. Edward, Alfred's son and general, besieged his cousin at Badbury Rings, commonly acknowledged to be Badon, which is the place of Arthur's last battle. It should be noted, however, that most of the records usually fix it as subsequent to his succession to the throne.

In the stories of the Middle Ages it was usual for a great hero to fall in battle. So Roland fell in the Charlemagne story, and his magic sword Durandel was sunk in a magic well to prevent it from falling into the enemy's hands.

The battle of Badon certainly took place ; but just as Geoffrey had no Merlin in the first edition of his "History" so he improved upon the passing of Arthur in the second. History it was not. Giraldas Cambrensis pokes fun at him ; William of Newburgh, another contemporary, denounces him vigorously as a liar who not merely collected folk-tales, but freely invented stories himself under the guise of Merlin. At any rate, we have every reason for thinking that Alfred died in his bed and not on the battlefield, but the description by Geoffrey of the force of Medrodd has a suspicious likeness even in wording to that given by others of the forces of Ethelwald. The geography of the incident stands firm—it is the incident which has been improved upon by the story-teller. Perhaps the connection of Camlan, which Geoffrey makes the scene of the "fatal blow," with the district of Glastonbury may yet give a clue to the details that are missing.

Two facts emerge from the comparison of Arthur and Alfred—the tendency of early tale-tellers to speak of people by pseudonyms, and the fact that Danes were the hated enemy of Welsh and English alike. As to the first we must remember that in those times a knight in full armour was not recognizable except by his device, and he often passes under the name of the creature so depicted. Do we not recall the fifteenth century couplet ?

"The Rat, the Cat and Lovell the Dog
Rule all England under the Hog."

The Hog was the crest of Richard III. Possibly in some cases the animal is the old totem of the tribe. Arise Evans of Barmouth, who would tell his dreams to Oliver Cromwell, used to finish his pedigree with "the son of the Red Lion the son of the Wren."

The reputation of the Danes was terrible and lasted for ages. The early litanies of monasteries contained the petition "From the Black Pagan Good Lord deliver us." In the Middle Ages mothers used to frighten their children into good behaviour with the threat of the Danes. The amusing Irish story of the boy with the goat skin tells how he went to Hell for the Devil's flail with which to thrash the Danes, and Satan refuses it "because the Danes are much better customers to me." It is recorded that some telegraph men landed with their apparatus on the west coast of Ireland during the eighteenth century and the people fled thinking the Danes had returned.

CAVALL THE DOG AND THE TWRCH TRWYTH.

Now the second story about Arthur given by Nennius speaks of his dog Cavall, which hunted the Boar Twrch Trwyth. Assuming that the tale-teller followed his usual practice, I set myself to answer the questions "What man is Cavall? What Dane is the Twrch Trwyth?" given that they belong to Alfred's period. Now Cubal, or as he is more commonly called in Pembrokeshire Bwth Ci Bal or Hen Ci Bal, means Baal's dog, the big black dog which frightens ill doers at night and carries off sinners at death.

Cabal is a word introduced into French and English during the Renaissance from Jewish mystics: as a term applied to dogs, "bal" may come from the root which has given us the word "bald" and the Gaelic "maol" or bald hill. In the Vosges and Black Forest, "ball" means a round-topped hill (*e.g.*, Ballon d'Alsace). I take Cibal to be Ethelred, Alfred's son-in-law. Clearly the prominent underling and companion was no favourite with the Celts, and Mercia was the kingdom which had oppressed them heavily according to the Welsh writer Asser. Ethelred certainly hunted the Danes and was present at the famous battle of Buttington, at which place

the hunt of Twrch Trwyth as given in the story of Kilhwch and Olwen ends. As for the Twrch Trwyth, he is said to be the son of Prince Tared—that is, “Burster” the son of “Piercer,” and he carried the usual emblems of sovereignty, the comb, razor, and scissors, whereby a young aspirant among those of nobler blood was formally admitted to manhood. The story says he was changed from man to boar because of his sins. Perhaps originally the story was about the ferocious leader Turgesius, whose name is Latinised as Torchillus Turchesius. For 100 years, about the ninth century, his name stood as the rallying point for new parties of Danes attacking Ireland. It was a common name; the chief ruler of Dublin, when captured by the Normans, was Turkil. And there are other reasons why the Celts commonly called the Danes pigs. A bronze plate (III.) taken from the grave of an early Viking on an island, Oland in the Baltic, showed two figures with helmets surmounted by boars; and according to the sagas the boar was a favourite emblem of the Norsemen and probably worn on their helmets and belts.

PLATE III.



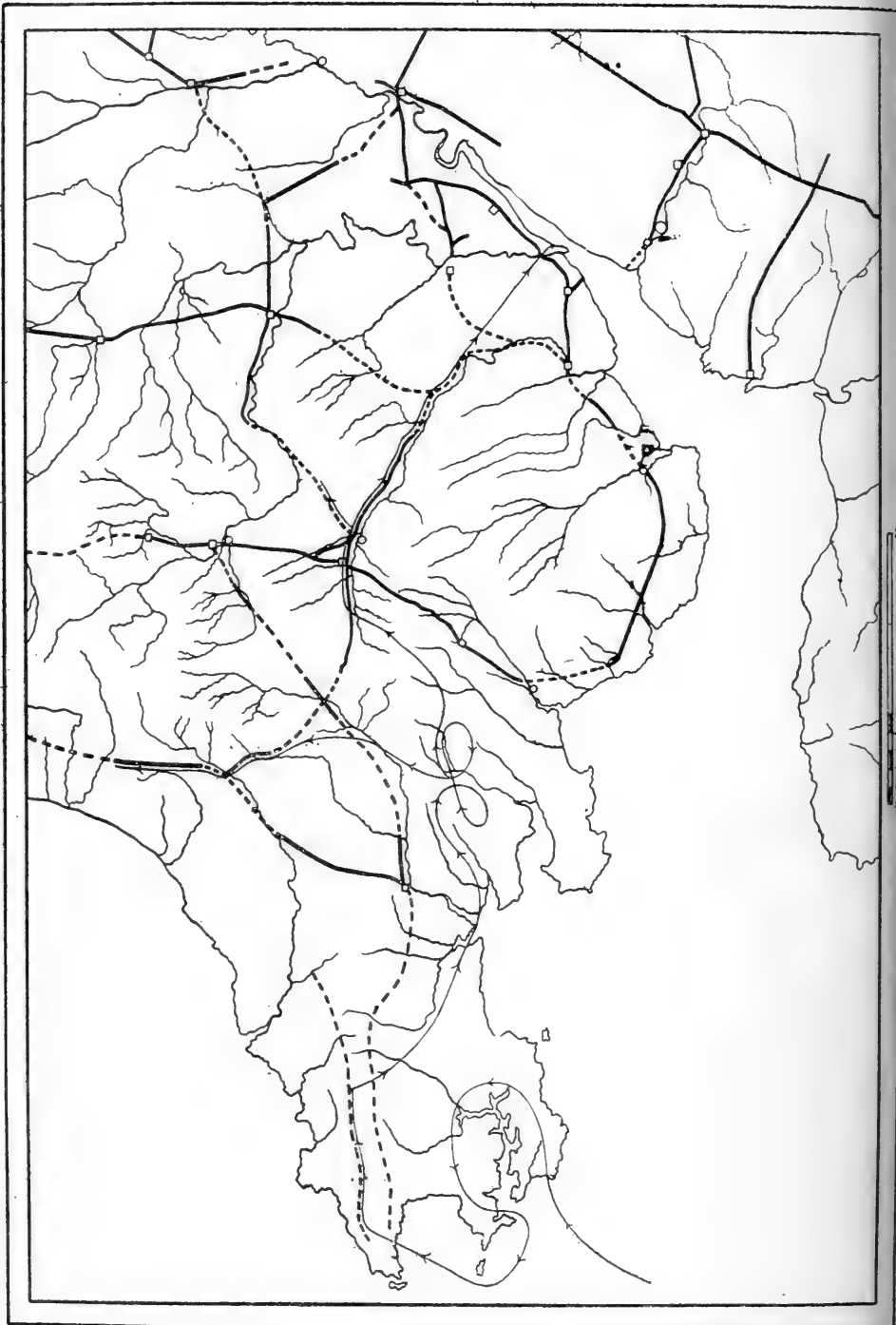
HUNT OF THE BOAR TRWYTH.

The hunt of the boar is told with much spirit in the Mabinogion story of Kilhwch and Olwen, and Sir John Rhys has elaborated the details. I agree with him that the names of the hunters

are manufactured from local place-names, and the story generally followed the model of the classical Calydonian Boar Hunt. But Sir John was no geographer, otherwise he would not have blundered so often. Had he turned up Leland's "Tours" of the Elizabethan Period he would have found many of the places mentioned. To take but one instance. From the Amman Valley the Boar goes to "Llwch Tawe," which Rhys identifies with the bog by Ynys Pen Llwch below Pontardawe. Whereas Leland states clearly "Loogh Tawe in Blake Mountain wher sum say is the Hedde of Tawe that cummith to Swansey." Even worse is his placing of Llwch Ewin at Llwch's Awel, a bog in Bettws parish, whereas on the Ordnance and other maps it is plain enough as Llwch Owen or Wen or Llyn Llech Owen, near Llandebie. Only a person familiar with South Wales could know of this peculiarity in Llwch replacing Llyn locally which goes some way to support the theory that the person who placed the story on record was a monk of Neath Abbey.

The accompanying map (IV.) gives the details as I have worked them out. The Danes, otherwise Twrch Trwyth and his host, sailed from Ireland and ravaged the region about Milford Haven, taking boat again to Porth Clais just ahead of Arthur's fleet, which gained the neighbouring port of St. Davids, and the pursuit began at once. The Twrch is heard of at Cor-y-vagil—the name still exists as Cwr-y-vagwr-ile—a farm east of St. Davids. He follows the Via Flandrica, the old road eastwards in North Pembrokeshire, with Arthur at his heels, clearly making for the Teify; but the men of Cardigan disputed the passage of the Nevern, and the Boar turned back to the Via Flandrica and is caught at the pass of Cwm Kerwyn and compelled to fight. His forces ultimately broke away south on to the lower Roman road, and he hastily passed by Peulinioc, not the Commŵt of that name, but the region of Paulinus the early missionary, whose headquarters were at Whitland or Ty Gwyn ar Daf. Presumably they wanted to get out to sea, but failed, and crossed the sands at the mouth of the Towy to the old fort, Aber Towy, now buried in sand. Thence he goes towards Dinevor, but is clearly in danger from forces ahead, and is baffled which way to turn. He hides for some time in the Llwchwr valley but is discovered

MAP IV.



and driven into the Amman valley, where he loses heavily. Three streams of the mountainous region between the Amman and the Tawe Valleys bear the names of his supposed leaders. He attempts to retrace his steps, and is next heard of at Llwh Owen, the great pool near Llandeibie and the source of the Gwendraeth Fawr. Here a part of his force got away by Dinevor into Ceredigion, but were exterminated before reaching the sea at a place Garth Grugyn, Grugyn being the pig's name.

The Roman road known as the Sarn Helen follows the valley of the Twrch and leads to near Llangeitho, where, according to the story, stood Garth Grugyn. Certainly such a castle was in the possession of Maelgwn Vychan in 1242 A.D., standing on land apparently obtained by exchange. It is along this road that Grugyn is taken by the tale-teller. This may have been a feint, for the main force got through the Amman Valley and is next recorded as at Llwh Tawe, the big Van Pool, near by which runs an old north road to Redbriw Castle by Devynock on the Usk. This was a famous castle of about the twelfth century, and a hunter whose name is manufactured from that of the place, Rhudvyw Rhys, is killed there. Ewyas of course must appear in all Welsh stories. It was the disputed land about which the Welsh princes in the eleventh century consulted the King of England as over lord. In early times the men of Ewyas and Archenfield went with Saxon Hereford in spite of differences of blood and held the privilege of leading the van and covering the return of the army. To Ewyas went part of the Danish force under the lieutenant called Llwydawc, and here the men of east Glamorgan and Monmouth living on the westerly plain, called men of Llydaw or Armorica, attacked and finished them off.

The dominant hill is Allt Llwyd, and Craig Llwyd overlooks Ystrad Yw, where the pig was killed. Sir John Rhys gives a highly picturesque, though absurd explanation associating the men of Llydaw with the lake dwelling of Brecon Lake, but the text shows clearly enough what people are meant. Besides "litau" is a gloss for Latio in an eighth century document, meaning Latium or Latin territory. Stokes thinks it meant "coast" and illustrates this from "litus" in Lituwa or Lithuania, just as Armorica means "upon the sea." In

this case it seems to refer to the coast-dwellers of Bro Morganwg and Wentloog. Howel, king of Gleguising (which is assumed to have included Wentloog) accepted the overlordship of Alfred. Geoffrey makes Howel son of Emyr Llydaw and king of Llydaw one of Arthur's distinguished battle leaders against the Romans.

The main Danish force pushed on towards the Severn. At this stage the dog Cabal is much to the front, for "Bal" is a common name thereabouts. Pen y fal is our Sugar Loaf and Bal mawr and Bal bach hills near Llanthony. As the Twrch gets nearer the coast, besides the men of Glamorgan and others from north of the Usk pressing him in the rear, Arthur calls up the men of Devon and Cornwall and others to oppose his passage. At Llyn Lliwan a fierce fight takes place, but the Chief Boar manages to escape across the Severn and out to sea though with the loss of all his following and his personal possessions. If anyone will read the story of the big Danish raid which ended at Buttingdon, he will understand the Boar Hunt better. Hasten fled, his forces being scattered or slain.

CABAL.

Cabal is only mentioned in the story when the name of a prominent hill or feature bears the name of "Bal." The rounded and treeless appearance of the Sugar Loaf suggests that the name arises therefrom. The Roman roads particularly, and other roads leading to important places give the foundation for the story. In a hill country with many bogs it was important to know the roads and the big landmarks. The telling of stories was one way of teaching them.

The story of Cabal's footprint preserved in stone is a good illustration of the tendency to connect stones with particular places and to read a meaning into place-names. Thus Nennius writes: "There is a wonder in the district which is called Buelt. Here is a heap of stones and one stone superposed upon the heap in which is the footprint of a dog. Cabal, which was the dog of Arthur the warrior, made it when hunting the Boar Troit, and afterwards Arthur made the heap of stone and placed the rock with the footprint on top and called it Carn

Cabal. And men came and took away the stone for a day and a night, and on the following day they found it on the heap again." But Giraldus Cambrensis, who was Archdeacon of Brecon and a South Walian by birth, should be more accurate, and he writes: "It is a remarkable circumstance or rather a miracle concerning Llanthoni that although it is on every side surrounded by lofty mountains not stony or rocky, but of a soft nature and covered with grass, Parian stones are frequently found there and are called freestones from the facility with which they admit of being cut and polished and with these the church is beautifully built. It is also wonderful that when after a diligent search all the stones have been removed from the mountains and no more can be found, upon another search, a few days afterwards, they reappear in greater quantities to those who seek them."

Now Bal mawr and Bal bach and Pen-y-fal are the names of the hills referred to by Giraldus, and a misreading by a stranger to the district, at about the time when Llewellyn the king was killed at Builth, which made Bal into Buallt is understandable. Again, during last century, Lady Charlotte Guest, anxious to test the Nennian story, persuaded a friend to visit the hill near Builth named Carn Gavallt and of course on the top of the carn was a stone with a hollow left by a pebble which had dropped out. But Gavallt as a word has no connection with Cabal, and worse still, Builth is obviously right away from the road system which is being described in the Hunt of the Twrch. At any rate, though it is 600 years since Giraldus wrote, I have heard myself from the people of the district near Llanthony and Abergavenny stories how they can carry away tile-stones (fissile bands of Old Red Sandstone) and come again almost at once for a further supply as if the first had been replaced. Over this very hill ran the Roman road from Brecon to Kentchester.

LLYN LLIWAN.

Now there is one thing which continues to be regarded as a marvel throughout all Welsh literature—the flood of Llyn Lliwan. At times one is reminded of the brook Kishon and

the wonders which the Israelites ascribe to it : at others it reads somewhat like the flood of Noah. Hear how Nennius describes it. " And there is a beach near the river and when the tide is in the Severn this beach is not covered : and when the sea and the Severn recede then the pool Lliwan disgorges all it has swallowed from the sea and that beach is covered therewith. and it discharges and pours it out in one wave like to a mountain. And if there should be the whole army of the country there and they should turn their faces towards the wave it would draw the army to it by force, their clothes being full of moisture and their horses would be drawn in like manner. But should the army turn their backs towards the wave it will not injure them." Clearly the features of Llyn Lliwan gave a fine opening for exaggeration to the tale tellers. When hunting the Twrch here Kacmwri " was dragged down by two millstones into the deep " and Osla Kyllelvawr was sucked under simply because his empty sword sheath became full of water.

If there is anyone who would like to try the truthfulness of the facts, setting aside the exaggeration, I can assign him the place, and will guarantee that he will be under no delusions. In one of the early numbers of the Transactions there is an account of the making of the Severn Tunnel. The engineer tells how the face of the Dun Sands is cut away at a fearful rate to a great depth by the tidal current and how his men could not land because of the undercutting. The map (I.) gives the place. The important fact is that the rock barrier, the English Stones, are covered about half-tide. The tidal inflow sets towards the mouth of the Wye, and much sand and gravel are thrown up, so that sometimes the Dun Sands join up to the English Stones.

The Dun Sands are covered only at very high tides during the flow. But with the ebb it is quite different. The current sets towards the English shore and across the Dun Sands and the English Stones until about half-tide, when the rocks are approaching the surface. Then the current changes its direction and with a tremendous rush seeks the restricted channel of the Shoots, during which time the face of the bank is being steadily undercut. Anyone standing with his face towards the water is apt to slide in through this undercutting :

if standing reversed he might escape by falling on his face. As for the name Lliwan, it seems to have been a mis-spelling for Hewan or Owen, one of the early Christian Kings of Gwent.

ANCIENT STYLE OF STORY TELLING IN WALES.

So far I have been trying to show that the early Arthurian stories as preserved to us have a close connection with South Wales. Let me now show by examples how prone were the Welsh story-tellers to borrow local names and adapt stories to suit their own motives of local patriotism. The Mabinogion stories bear out what Giraldus Cambrensis tells us of the Welsh of his day. "Beyond all other rhetorical ornaments they preferred the use of alliteration and that kind more especially which repeats the first letters or syllables of words. They make so much use of it in every finished discourse that they thought nothing elegantly spoken without it. In private company or in seasons of public festivity they were very facetious in their conversation with a view of entertaining the company and displaying their own wit. And persons of lively parts sometimes in wild and sometimes in sarcastic terms under the cover of a double meaning by a peculiar turn of voice or by the transposition of words were continually uttering humorous or satirical expressions." I wish I could tell you the stories making the points which they did for their hearers. All I can do is to illustrate their method by two well-known stories, and show how they manipulated them according to the place of telling. More than one has come down to us with South Wales colouring.

WELSH VERSION OF THE STORY OF THE ANCIENT ANIMALS.

My first story is that of the Ancient Animals. The main structure is common to the world—the creatures say much the same thing in the stories of Japan and India, of the Hausas in Africa and in the old Scandinavian world. The animals differ according to the geographic situation—the monkey comes in if it be a tale of the tropics, the whale if it belongs to northern climes. The animals used in these islands are those with traditions of long life or the power of revival after death. The

story always makes the creatures speak, and the whole point is to find some fanciful way of illustrating how long the creature has lived. Now we have Irish, Scotch and Welsh versions, probably all modelled on the Irish. They are peculiar in that they add the habitat of the creature to its name, *e.g.*, the otter of the burn, the duck of the oozy pool. For the Mabinogion story, if my theory is accepted, you must imagine the audience made up of people who spent their time hunting and were familiar with many spots in the chase of Monmouth Castle or some other castle of Wentwood. The hunter who knows the language of animals asked the ousel of Cilgwri for information about the man lost a long time ago, whom they seek. The ousel, or rather Kingfisher, "has sharpened his beak nightly on a smith's anvil and has worn it away, so long has he lived." He sends the enquirer to the Stag of Rhedynfre who has seen an oak sapling grow into a magnificent tree and this pass into decay through age. The Stag sends him to the Owl of Cwm Cawlyd who has seen three forests grow in succession on the same ground while his wings have withered into mere stumps, but he had never heard of Modron. So the hunter goes to the Eagle of Gwern abwy "who used to perch on a rock so high that he could peck the stars, but so long has he lived that the rock is now nothing more than a big boulder:" yet he knew nothing. But the Eagle remembers that the Salmon of Llyn Lliwan is older than himself, for when he was young the Salmon was well grown and drew him down into the deep when he pounced upon him. And when they settled their differences the eagle pulled 50 fish spears out of the salmon's broad back. So big was this fish that he could carry two men on his back and sure enough he did know the man sought for; he was imprisoned in Gloucester Castle, to which the Salmon swam daily with the tide.

Now the Kingfisher was the bird of wonder in the twelfth century. Giraldus tells some strange stories about it—how it never decayed on death, and if hung up dead could sprout feathers annually. The Kingfisher is of Cilgwri, or "lonely thicket," descriptive certainly of its favourite haunt. The play is on the word, for Kilgwrrwg is a large village in the middle of Wentwood. The Stag is of Rhedynfre or Fernbrake. The famous Buckstone is by the Reddings to-day. The Owl is of

Cwm Cawlyd, the retreat of mixed food or hodge podge; Who does not recognise in this the character of the disgorged pellets of undigested food? I suggest tentatively that this is Cwm Clawdd, spelled Clawith by Speed, a well-known spot near Monmouth, where Offa's Dyke is very clear. The eagle is of Gwern abwy or "Carrion Swamp," and by the description close to the river at Chepstow. It is a play on the name of the river. For Gwern abwy we must read Gwern ab gwy, "Swamp by the Wye."

THE SOW HENWEN.

My second story is that of the Beneficent Pig. It was one to be told in any Castle of South Wales, but less frequently in the north, and there were variants provided in the Triads, I fancy for use in a Welshman's home to be omitted when told in a Norman castle. The sow, Hen-wen, or Old White, of Dallwyr Dallpenn, went burrowing so far as Aust (or as a variant Pen wedic) and crossed the Severn into Gwent and at Maes Gwenith left a bee and a grain of wheat "from which time onwards Gwent has been famous for wheat and honey." Thence she went to the region of Pembroke to a place called Lanion or Llonniau Llonwen, and left a little pig and a grain of barley, "from which time Dyfed has been famous for barley and pigs." In Eivionydd she left a grain of rye only. At Rhiw Gyferthwch, near the Snowdon Mountains, the sow gave birth to an eagle-chick and a wolf-cub, which she presented to chieftains of the district. On the Straits of Menai, at Maen Du she brought forth a kitten which her keeper threw into the water, but the men of Anglesey rescued it to their subsequent regret, for this creature, the Cath Palug or ermine weasel, grew up to be one of their big persecutors, and, if no Norman was about, the story-teller could add "the others were Daronwy and Edwin, King of England."

You will note that the good things are all for South Wales and the opposite kind are given to the North. No one but a South Walian could have divided the honours so. Again, we have a mixture of fact and fancy: Dallwyr Dallpenn is descriptive. One of the favourite landing places of old before the days of the mariner's compass was Axmouth and the coast

thereabout. Here came hordes of Anglo-Saxons with all their worldly possessions, including varieties of pigs which the Celtic folk coveted. The Axe runs near its mouth in a glen or dale, so we get the Dale weir or landing place, while a few miles up it is apparently blocked by a hill or Penn around which the Roman road used to wind and behind it still lies the village of Dallwood. The Roman road is the "Foss Way" and in old Saxon Charters is termed the "Sow's Way." Aust and Pen Redwick are two landing places still on the Severn facing Chepstow. The Welsh words for bee and wheat are much alike, and the play of words is clear—gwenith, gwenyn and Gwent. Maes Gwenith is a farm still. The Golden Valley takes its name from the rich wheat lands, and anyone who wanders near Abergavenny knows how abundant are the wild bees' nests.

In a book written about 80 years ago *Lleiniau Llonnyen* in Cardigan is mentioned as producing the earliest barley in West Wales, and this is the place given by the twelfth century story teller. The very name indicates strips cultivated by the fisher folk still, and tradition has it that barley has been grown year after year on the strips for centuries. Similarly the other places are recognisable. *Rhiw gyverthwch*, the slope of the pantings, is obviously the hill behind Tremadoc, one of of the outposts of the Welsh princes of Snowdonia, from which they kept an eye on the sea. On this hill is the ancient stone of *Gesail gyfarch*. We recall that Snowdon is *Mynydd Eryri*—the Eagle Mountain, while wolves lived on longer in that region than anywhere else in South Britain. But what of the *Cath Palug*? The word is given differently in some versions, but *Cath Pali*—the ermine weasel, noted for its bloodthirstiness, though called beautiful by the old Norse folk, is clearly meant. *Palig* or *Palling* was one of the better known Danish leaders who ravaged the western coast and the name has been preserved in Carnarvonshire as a term of reproach for people of non-Welsh extraction. The weasel used to abound near the sand dunes of the Straits with their swarms of rabbits. One variant is of peculiar interest, "That was the *Cath Balwg*: it proved a molestation to the Isle of Mona subsequently." In the *Brut y Tywysogion*, under A.D. 959 is recorded: "And the sons of *Abloec* (*Anlaf*) devastated *Caer Gybi* and *Lleyn*." *Balwg* and

Bloec are near enough to show the persons referred to. If the Normans were not present, the story teller added the words about the three molestations of Anglesey. The second persecutor was Edwin, King of Northumbria, who though brought up at the Court of Gwynedd made war upon it and laid Mona waste; the third was Daronwy, whom Mr. Gwenogvryn Evans has now fixed as Hugh the Fat, the terrible first earl of Chester, from a Taliesin poem describing his using a church as a stable.,

Here ends my story. I claim then that Arthur, if he is to be identified by his battles, is not the Post Roman Celtic chief, but Alfred, King of the West Saxons. Again I hold that the people so often referred to in Welsh stories as cruel and bloodthirsty and constantly attacking Wales are the Danes. And that in the form they have come down to us, many stories were intended for use in the homes of South Wales.

THE DIPTERA OF GLAMORGAN.

BY COLONEL J. W. YERBURY, R.A., F.Z.S., F.E.S.

(*Editorial Note.*) Our knowledge of the flies in the County is due, almost entirely, to Colonel Yerbury, and the list printed below is given in his own words. In sending his MS. he writes that when he was collecting in Glamorgan he had no intention of making a list, and the flies, other than those groups he was specially interested in, were distributed to many correspondents and no record kept of the species. It is obvious, therefore, that the compilation of this list must have been a work of considerable labour, the records having to be taken from the data labels on the specimens in his collection.

Colonel Yerbury remarks that "In some families the list is fairly complete and probably representative of the fauna of the County, but in others, *e.g.*, the *Syrphidæ*, *Anthomyidæ*, *Tachinidæ*, etc., it is lamentably weak, these families having been almost entirely neglected; it is worthy of note, however, that the weakest point of the list is the absence of all record of the commoner species, and probably a single season's collecting would add 150 of these common insects."

Mr. H. W. Andrews, F.E.S., collected at Porthcawl from 27th June to 4th July, 1913, and kindly supplied a list of additions to Colonel Yerbury's list, amounting to some 30 species, mostly in the *Anthomyidæ*, and about a similar number have been collected by others. These additional records have been incorporated, at Colonel's Yerbury's suggestion, in his list and bear the name of the recorder; all the remainder without the name of the recorder are to be understood as those of Colonel Yerbury.

MYCETOPHILIDÆ.

- Mycetobia pallipes, Mg.** Margam, 24th August, 1908.
Plesiastina annulata, Mg. Porthcawl, 16th July, 1906.
Macrocera lutea, Mg. Fairwood Common (Mumbles), 29th August, 1908.
Macrocera centralis, Mg. Porthcawl, 20th June, 1906.
Macrocera stigma, Curt. Porthcawl, 25th May and 9th June, 1906.

- Platyura semirufa, Mg.** Port Talbot, 26th July, 1908.
Platyura nigricauda, Strobl. Porthcawl, 17th July, 1906.
Boletina trivittata, Mg. Porthcawl, 16th May, 1906.
Boletina basalis, Mg. Caswell Bay (Verrall "Another Hundred New British Species" E. M. M., January, 1912, p. 20).
Boletina inermis, Lundstr. Porthcawl (Trans. Ent. Soc., 1913, p. 363).
Boletina plana, Wlk. Caswell Bay, 12th September, 1905, in B.M.
Glaphyoptera subfasciata, Mg. Porthcawl, 2nd June, 1906.
Brachycampta silvatica, Landr. Porthcawl, 19th July, 1906.
Sceptonia nigra, Mg. Fairwood Common (Mumbles), 6th September, 1908.
Mycetophila punctata, Mg. Porthcawl, 4th June and 19th July, 1906.
Mycetophila curviseta, Ldstr. Southerndown, 9th August, 1908, Bridgend, 7th August, 1908. These species stand in the B.M. Collection under this name, but they were labelled by the late Mr. Verrall as **Mycetophila blanda, Winn.**
Rhymosia connexa, Winn. Bridgend (Trans. Ent. Soc., 1913, p. 367.)

BIBIONIDÆ.

- Scatopse flavicollis, Mg.** Fairwood Common, 1st September, 1908.
Aspistes berolinensis, Mg. Porthcawl, 30th June and 1st and 3rd July, 1906. This insect occurred in abundance on the sand hills round Porthcawl, though Mr. Verrall (who had never seen it alive) was unfortunate in his attempts to capture a specimen.
Dilophus febrilis, L. Cardiff Docks (Brook) in B.M. A common insect everywhere. A neglected family.
Bibio marci, L. Abundant at Cwrt-yr-ala; Taff's Well, &c. (Hallett).

SIMULIDÆ.

- Simulium ornatum, Mg.** Porthcawl, 27th June, 1906.
Simulium latipes, Mg. (Labelled by Roubard in the B.M. Collection as **aureum, Fries**), Porthcawl, 17th, 18th, 20th, and 24th June, 1906. In the neighbourhood of Porthcawl the **Simulidæ** do not appear to be among the bloodthirsty biters.

CHIRONOMIDÆ.

- Chironomus tentans, F.** Porthcawl, 22nd May, 1906.
Chironomus pictulus, Mg. Porthcawl, 24th May, 1906.
Gen. inc. and sp. inc. Porthcawl, 13th July, 1906, hovering in a flock over seaweed near low-water mark.
Gen. inc. and sp. inc. A pair "in coitu."

- Gen. inc. and sp. inc.** Porthcawl, 7th June, 1906. Common among the sandhills, hovering round one's head.
- Tanyus culiciformis, L.** Porthcawl, 20th May, 1906.
- Ceratopogon egeus, Winn.** Porthcawl, 11th June, 1906, swept in the salt marsh.
- Ceratopogon ochraceus, Winn.** Porthcawl, 22nd June, 1906, many specimens.
- Ceratopogon fulvus, Macq.** Porthcawl, 29th June, 1906. A singleton; apud Verrall, l.c. January, 1912, p. 23, this is the ♀ of **Ceratopogon spinipes, Panz.**
- Ceratopogon sp. inc.** Porthcawl, 18th May, 1906.
- Ceratopogon sp. inc.** Porthcawl, 25th May, 1906.
- Ceratopogon femoratus, Mg.** Crwmllyn Bog, 6th June, 1906, Porthcawl, 20th, 22nd, 24th, and 29th May, 1906, very common.
- Ceratopogon nubeculosus, Mg.** Worms Head, 13th September, 1905 (Verrall). Although there is no record of this species being taken "red-handed" in Glamorgan, still it is known to be a biting pest. At the Gull Pond on Rimpstone Heath near Studland, these blood-thirsty midges are such a plague as to be almost unbearable, both from their numbers and their venomous bites.
- Ceratopogon fascipennis, Staeg.** Porthcawl, 12th and 27th June, 1906, and 12th July, 1906. Some of these specimens are labelled "A troublesome biter, caught on my knickerbocker stocking."
- Ceratopogon obsoletus, Mg.** Crwmllyn Bog, 14th June, 1906, labelled "Caught red-handed." Kert. Kat. Pal. Dipt., Vol. I., p. 86, sinks this name as a synonym of **Ceratopogon arcuatus, Winn.**, an action which does not seem justified.
- Ceratopogon varius, Winn.** Bridgend, 30th May, 1906. Several labelled "Very troublesome in damp wood at Merthyr Mawr"; Porthcawl, 12th June, 1906, and 12th July, 1906, some labelled "Troublesome, caught on my stocking."
- Ceratopogon pulicaris, L.** Porthcawl, 27th June, 1906, many labelled "Troublesome, caught on my stocking." Penarth, May, 1916 (Hallett).

It is noteworthy that all the venomous blood-thirsty midges caught red-handed belong to the Sub-genus *Culicoides* of *Ceratopogon*. *Ceratopogon* were specially collected in 1906, as Mr. Austin was at that time engaged in arranging the British material at the Natural History Museum.

CULICIDÆ.

- Corethra sp. inc.** Porthcawl, 10th June, 1906; apparently the only Culicid brought away; possibly Glamorgan is so well provided with biting flies such as *Ceratopogon*, and the various species of *Tabanidæ*, that it has no use for gnats and mosquitos.

LIMNOBIDÆ.

Empeda flava, Schum. Porthcawl, 31st May, 1906.

Molophilus obscurus, Mg. Porthcawl, 1st July, 1903.

TIPULIDÆ.

Pachyrrhina quadrifaria, Mg. Porthcawl, 3rd June, 1903.

Pachyrrhina histrio, F. Porthcawl, 11th and 19th May, 1903, common on the Newton Burrows. This daddy was the usual prey of **Lasiopogon cinctus**, vide Poulton, "Predaceous Insects," Trans. Ent. Soc., 23rd January, 1907, p. 338. The daddies were another neglected family.

RHYPHIDÆ.

Rhyphus fenestralis, Scop. Very abundant on windows at Cardiff (C. T. Vachell).

STRATIOMYIDÆ.

Pachygaster atra, Panz. Bridgend, 6th August, 1908. Glamorgan (Verrall).

Pachygaster leachii, Curt. Porthcawl, 21st June, 1906 (Verrall).

Oxycera formosa, Mg. Porthcawl, 18th June, 1903, and from 23rd June to 7th July, 1906, in numbers.

Oxycera tenuicornis, Macq. Porthcawl, 30th June and 1st July, 1903, in fair numbers during July, 1906, in the ravine of the Newton Burrows running down to the Rifle Butts, vide Verrall "British Flies," Vol. II., p. 100.

Oxycera pulchella, Mg. Bridgend, 8th August, 1908, Porthcawl, 12th July, 1906.

Oxycera trilineata, F. Glamorgan (Verrall), Porthcawl, July, 1916 (Hallett).

Nemotelus pantherinus, L. Porthcawl, 27th June, 1906.

Nemotelus notatus, Zett. Porthcawl.

Nemotelus nigrinus, Fln. Porthcawl, 27th June, 1903.

Odontomyia viridula, F. Glamorgan (Verrall).

Sargus flavipes, Mg. Eastwood Common (Mumbles), 29th August and 1st September, 1908, very common. See Verrall "British Flies," Vol. II., p. 769. Addenda and corrigenda. On label "Eyes bronze green, upper corner above the shining frontal spot indigo blue with a lighter blue or green margin."

Sargus nitidus, Ver. (nec. Mg.) Margam, 24th August, 1908.

Sargus cuprarius, L. Glamorgan (Verrall).

Sargus iridatus, Scop. Porthcawl, 4th June, 1903.

Chloromyia formosa, Scop. Kenfig Hill, 5th June, 1903.

- Microchrysa polita**, L. Margam, 24th August, 1908.
- Microchrysa flavicornis**, Mg. Glamorgan (Verrall).
- Microchrysa cyaneiventris**, Zett. Porthcawl.
- Beris vallata**, Forst. Porthcawl (also in same locality, July, 1916, Hallett).
- Beris clavipes**, L. Porthcawl.
- Beris geniculata**, Curt. Porthcawl.
- Beris fuscipes**, Mg. Porthcawl, 12th July, 1906.
- Beris chalybeatus**, Forst. Porthcawl, 24th May and 18th July, 1903, Kenfig Hill, 5th June, 1903.
- Beris morrisii**, Dale. Porthcawl, 24th June to 4th July, 1913 (H. W. Andrews.)
- Chorisops tibialis**, Mg. Glamorgan (Verrall).

LEPTIDÆ.

- Leptis scolopacea**, L. Port Talbot, 4th August, 1908, but common and generally distributed.
- Leptis tringaria**, L. Porthcawl, 1906.
- Leptis nigriventris**, Lw. Porthcawl, June, July, and August, 1903 and 1906. See Verrall's remarks regarding these two forms, "British Flies," Vol. II., p. 278.
- Leptis lineola**, F. Glamorgan (Verrall). Common, Porthcawl, 18th June, 1903, and 6th and 10th July, 1903.
- Chrysopilus cristatus**, F. Porthcawl, 18th June, 1903, common.
- Chrysopilus aureus**, Mg. Porthcawl, 29th June and 17th July, 1906, occurred plentifully at Pyle near the Railway Station on more than one occasion.
- Ptiolina obscura**, Fln. Porthcawl, 20th June, 1903, common.
- Ptiolina atra**, Staeg. Kenfig Pool, 18th May, 1906, vide Verrall, "British Flies," Vol. II., p. 316.
- Spania nigra**, Mg. Porthcawl, 23rd June, 1903.

TABANIDÆ.

- Hæmatopota crassicornis**, Wahlb. Porthcawl, 5th and 30th June, 1906, and 7th July, 1906.
- Hæmatopota pluvialis**, L. Porthcawl, 7th July, 1906, and 17th June, 1906; Crwmllyn Bog, 24th July, 1908; Bridgend, 22nd August, 1908.
- Theriopteles tropicus**, Mg. Crwmllyn Bog, 24th and 31st July, 1908, see Verrall "British Flies," Vol. II., p. 771, Corrigenda and addenda.

- Theriopectes montanus, Mg.** Crwmllyn Bog, 24th July, 1908. "Eyes olive green with three dark orange bands, the upper band at level of bottom of upper callus, the middle band at lower edge of lower callus, and the lowest band just above the level of the antennæ."
- Theriopectes distinguendus, Verr.** Crwmllyn Bog, 24th July, 1908. Porthcawl.
- Atylotus fulvus, Mg.** Crwmllyn Bog, 24th July, 1908.
- Tabanus bovinus, L.** Cwrt-yr-ala (C. W. Williams).
- Tabanus cordiger, Wied.** Porthcawl, 30th June, 1906.
- Tabanus vittatus, F.** Recorded by Capt. Blomer from Bridgend, but probably in error, see E.M.M.
- Chrysops caecutiens, L.** Porthcawl, 17th and 18th June, 1903, and July, 1906. Crwmllyn Bog, 24th July, 1908.
- Chrysops quadrata, Mg.** Crwmllyn Bog, 24th July, 1908. Porthcawl, 30th June, 1906.
- Chrysops relicta, Mg.** Kenfig Pool, 12th and 17th August, 1908, labelled as follows:—"Eyes bright green with five spots," 12th August, 1908, Porthcawl, 25th June, 1903; (also July, 1916, Hallett).

CYRTIDÆ.

- Oncodes pallipes, Latr.** Pyle, 17th July, 1906.

BOMBYLIDÆ.

- Phthiria pulicaria, Mik.** Porthcawl, common, 21st July, 25th June, 1903.
- Bombylius discolor, Mik.** Porthcawl.
- Bombylius major, L.** Porthcawl.
- Lomatia lateralis, Mg.** Swansea (B.M.), see Verrall, l.c., p. 761 (Reputed British Diptera).
- Anthrax-paniscus, Rossi.** Porthcawl, 20th July, 1906; abundant Merthyr Mawr, 19th July, 1906, and 29th July, 1908, abundant but worn during July and August, 1908; Southerndown, 18th August, 1908.

THEREVIDÆ.

- Thereva fulva, Mg.** Porthcawl, 10th June, 1903, June and July, 1906, 1st July, 1906, not uncommon.
- Thereva nobilitata, F.** Porthcawl, 12th and 28th June, 1903, very common, June and July, 1903, and 1906,—these two species frequent nettles on the sandhills; Margam, 10th August, 1908, and 27th July, 1908; Port Talbot, 26th July, 1908.
- Thereva bipunctata, Mg.** Porthcawl, 17th June, 1903, very common June and July, 1903, and 1906, often swept off the Marram Grass.

- Thereva annulata**, F. Porthcawl, 11th June, 1903, June and July, 1903 and 1906, Bridgend, 11th August, 1908, very common.
- Dialineura analis**, L. Porthcawl, from 23rd May to 1st July, 1903, not uncommon.

ASILIDÆ.**Asilinæ.**

- Asilus crabroniformis**, L. Cwrt-yr-ala, 1912 and 1913 (Hallett).
- Philonicus albiceps**, Mg. Porthcawl, 20th June, 1903, June and July, 1903 and 1906, very common on all the sandhills.
- Pamponerus germanicus**, L. Newton Burrows, 3rd June, 1903, and 13th June, 1906, rare; Llangennith (Harwood).
- Dysmachus trigonus**, Mg. Porthcawl, 1st June, 1908.
- Machimus atricapillus**, Fln. The Mumbles, 1st to 6th September, 1908.

Dasypogoninæ.

- Selidopogon diadema**, F. Swansea (Stephens). The occurrence of this species still awaits confirmation.
- Lasiopogon cinctus**, F. Newton Burrows, 11th May, 1903, and 19th May, 1903, common. For prey see Poulton, "Predaceous Insects," Trans. Ent. Soc. 23rd January, 1907, p. 338.
- Dioctria oelandica**, L. Kenfig Hill, 2nd June, 1903.
- Dioctria rufipes**, De G. One at Horton, July, 1914 (Hallett).

Leptogastrinæ.

- Leptogaster cylindrica**, De G. Porthcawl.
- Hybos culiciformis**, F. Porthcawl, 20th to 27th June and 3rd to 19th July, 1906.
- Hybos femoratus**, Mull. Porthcawl, 25th and 29th June, 1906.
- Cyrtoma sulcata**, Zett. Porthcawl, 25th and 26th May and 8th June, 1906.
- Rhamphomyia nigripes**, F. Porthcawl, 8th June, 1906.
- Rhamphomyia flava**, Fln. Porthcawl, 1st and 11th June and 20th July, 1906. Kenfig Hill, 5th June, 1903.
- Rhamphomyia variabilis**, Fln. Pyle, 14th August, 1908, Bridgend, 21st August, 1908, Margam, 27th August, 1908.
- Rhamphomyia culicina**, Fln. Porthcawl, 27th July, 1906, see Verrall, E.M.M.
- Rhamphomyia hybrida**, Zett. Porthcawl (Collin, E.M.M., May, 1913, p. 106).
- Empis tessellata**, F. Abundant at Sully on Austrian Pines, April, 1916 (Hallett).

- Empis livida**, L. Porthcawl, 12th to 20th June, 1906.
- Empis trigramma**, Mg. Porthcawl, 25th May, 1906.
- Empis stercorea**, L. Porthcawl, 31st May and 12th June, 1906.
- Empis ignota**, Mg. (? **punctata**, Mg. Verrall's List). Porthcawl, 30th May, 9th to 21st June, and 6th to 18th July, 1906.
I am doubtful about the identity of **Empis ignota** and **Empis punctata**, and prefer keeping the two species separate.
- Empis concolor**, Verr. Porthcawl, 25th May, 12th and 24th June, and 5th to 16th July, 1906.
- Empis lutea**, Mg. Porthcawl, 5th July, 1906.
- Empis nigratarsis**, Mg. Porthcawl, 14th May, 1903.
- Empis pennaria**, Fln. Porthcawl, 19th May and 2nd to 12th June, 1906, Crwmllyn Bog, 6th June, 1906.
- Empis albipennis**, Mg. Porthcawl, 20th to 29th May, and 7th July, 1906.
- Empis caudatula**, Lw. Porthcawl ♀ and ♂ "in coitu" 7th June, 1906, and both sexes 18th to 27th June, 1906.
- Empis aestiva**, Lw. Porthcawl, 25th and 29th June, 4th to 18th July, and a pair "in coitu" 17th July, 1906.
- Empis sp. inc.** Porthcawl, 31st May and 5th June, 1906, still unnamed in the B.M. Collection.
- Pachymeria femorata**, F. Porthcawl, 4th June, 1903.
- Ragas unica**, Wlk. Porthcawl, 15th and 30th June, 1906.
- Hilara maura**, F. Porthcawl, many dates between 18th May and 24th June, 1906, Crwmllyn Bog, 6th June, 1906, very common.
- Hilara pinetorum**, Zett. Bridgend, 6th August, 1908.
- Hilara carinthiaca**, Strobl. Porthcawl.
- Hilara cingulata**, Dahlb. Porthcawl, 16th and 26th June, 1906. As regards these last two species, see Verrall E.M.M., 1912, p. 25.
- Hilara quadrivittata**, Mg. Porthcawl, 2nd and 9th June and 4th July, 1906.
- Hilara cornicula**, Lw. Porthcawl, 2nd to 26th June, 1906, and 4th July, 1907.
- Hilara canescens**, Zett. Bridgend, 11th, 29th, and 31st July, and 6th and 11th August, 1906.
- Hilara litorea**, Fln. Bridgend, 29th July, 1906, Porthcawl, 16th June to 17th July, 1906.
- Hilara chorica**, Fln. Porthcawl, 14th June to 17th July, 1906.
- Hilara flavipes**, Mg. Porthcawl, 26th June, to 12th July, 1906. Ewenny, 13th August, 1908, and Crwmllyn Bog, 30th July, 1908. Bridgend, 29th July and 6th August, 1908.

- Hilara bivittata**, Strobl. Porthcawl, 2nd, 8th, and 22nd June; and 1st July, 1906.
- Hilara flavibarba**, Verrall M.S. Porthcawl, 23rd and 29th June and 2nd and 17th July, 1906. I believe that the above name has been sunk as a synonym, but as I am unable to trace in what species I am forced to avail myself of the name given to me by Mr. Verrall.
- Hilara fulvibarba**, Strobl. Porthcawl (Collin l. c.).
- Hilara sp. inc.** Porthcawl, 5th June, 1906. This specimen still awaits identification.
- Trichina flavipes**, Mg. Porthcawl, 21st May to 14th July, 1906.
- Trichina elongata**, Hal. Porthcawl, 1st June, 1906.
- Michrophorus velutinus**, Macq. Porthcawl, 2nd June, 1906.
- Oedalea holmgreni**, Zett. Porthcawl, 29th June and 4th, 5th, and 9th July, 1906.
- Leptopeza sphenoptera**, Lw. Porthcawl; although unmentioned in Verrall's list, this species was common in a small wood close to the railway at Porthcawl.
- Ocydromia glabricula**, Fln. Porthcawl, common from 21st May to 19th July, 1906. Poulton records this species "Predaceous Insects," Trans. Ent. Soc., 17th July, 1906, p. 385, as preying on a Mycetophilid (*Sciara*).
- Clinocera stagnalis**, Hal. Porthcawl, 12th, 18th, and 21st May and 4th June, 1906.
- Ardoptera irrorata**, Fln. Porthcawl, 14th May to 29th June, 1903, and 12th and 25th June, 1906.
- Lepidomyia melanocephala**, F. Porthcawl, 29th June, 1906.
- Thamnodromia vocatoria**, Fln. Porthcawl, 5th to 20th July, 1906.
- Tachypeza nubila**, Mg. Porthcawl, 31st May and 1st and 16th June, 1906, many specimens.
- Tachista arrogans**, L. Porthcawl, 15th June to 2nd July, 1906, many specimens.
- Tachydromia lutea**, Fln. Porthcawl, 15th June, 1906.
- Tachydromia nigratarsis**, Fln. Porthcawl, 21st and 30th May, 1906.
- Tachydromia dissimilis**, Fln. Porthcawl, 20th June, 1906.
- Tachydromia pubicornis**, Zett. Porthcawl, 28th and 30th May, and 5th, 8th, and 16th June, 1906, and a pair "in coitu" 21st May, 1906.
- Tachydromia pallipes**, Fln. Porthcawl, from 30th May to 20th July, 1906, many specimens.
- Tachydromia minuta**, Mg. Porthcawl, many specimens, 5th June to 15th July, 1906. It is recorded by Poulton, "Predaceous Insects," Trans. Ent. Soc., 1907, p. 385, as having been taken at Porthcawl

on the 22nd June, 1906, with a Cynipid as prey. A dark legged variety was taken at Porthcawl on many days between 28th May and 5th June, 1906, and is an example of the many dark forms of various insects obtained at Porthcawl; see Verrall, "British Flies," Vol. II., p. 428, on these forms; a specimen of this variety was taken at Crwmllyn Bog on 6th June, 1906.

Tachydromia exigua, Mg. Porthcawl, 6th July, 1906.

Tachydromia thoracica, Lund. Porthcawl, 26th May, 1903, and 16th June, 1906 (E. M. M., June, 1913, p. 130).

Tachydromia articulata, Mcq. Porthcawl, June, 1906. A series—see Edwards, E. M. M., 1914, p. 59.

Tachydromia palliventris, Mg. Penarth, May, 1916, one specimen (Hallett).

DOLICHOPODIDÆ.

Psilopus platypterus, F. Porthcawl, 25th June, 1906.

Psilopus wiedemanni, Fln. Porthcawl, 21st, 23rd, and 30th June, 1906, and 2nd July, 1903.

Psilopus longulus, Fln. Porthcawl, 6th and 12th July, 1906.

Psilopus laetus, Mg. Margam, 24th August, 1907, and 14th August, 1908.

Neurigona pallida, Fln. Merthyr Mawr, 1st September, and 11th June, 1906, a few on Dog Mercury.

Eutarsus aulicus, Mg. Porthcawl, 12th July, 1906.

Dolichopus atratus, Mg. Crwmllyn Bog, 14th June, 1906.

Dolichopus lepidus, Staeg. Porthcawl, 23rd June, 1906.

Dolichopus clavipes, Hal. Porthcawl, 20th and 23rd June, 1903, and 6th and 26th July, 1906.

Dolichopus nubilus, Mg. Porthcawl, 11th and 26th June, 1906.

Dolichopus claviger, Stan. Porthcawl, 11th June and 14th and 19th July, 1906.

Dolichopus plumipes, Scop. Porthcawl, 19th June, 1903, and 11th, 12th, and 17th June, 1906.

Dolichopus pennatus, Mg. Kenfig Hill, 5th June, 1903, and Porthcawl, 14th July, 1903.

Dolichopus popularis, Wied. Porthcawl, 9th July, 1906.

Dolichopus signatus, Mg. Porthcawl, 27th June, 1906.

Dolichopus cilifemoratus, Macq. Porthcawl, 9th July, 1906. The specimens taken on this date was recorded as British for the first time by Mr. Verrall, *vide* E. M. M., February, 1912, p. 27.

Dolichopus trivialis, Hal. Porthcawl, 9th, 12th, and 27th June, 1906.

- Dolichopus arbustorum, Stan.** One at Cwrt-yr-ala, June, 1914 (Hallett).
- Dolichopus festivus, Hal.** Porthcawl, 9th July, 1906.
- Dolichopus griseipennis, Stan.** Porthcawl, 29th June, 1903, and 9th September, 1912, and 17th July, 1906.
- Dolichopus puncticornis, Zett.** Porthcawl, 25th June and 1st July, 1903, and 1st July, 1906.
- Dolichopus acuticornis, Wied.** Porthcawl, 2nd June and 1st July, 1903, and 1st July, 1906.
- Dolichopus longicornis, Stan.** Porthcawl, 26th June and 15th July, 1906.
- Dolichopus latilimbatus, Macq.** Porthcawl, 11th June, 1906.
- Dolichopus sabinus, Hal.** Porthcawl, 1913 (Andrews).
- Dolichopus simplex, Mg.** Porthcawl, 23rd June, 1903, and 10th June and 3rd and 18th July, 1906.
- Dolichopus unguatus, L. (aereus, De G. of Verrall's List).** Porthcawl, 23rd June, 1903, and 9th and 11th June, 1906.
- Dolichopus longitarsis, Stan.** Porthcawl, 30th June, 1906.
- Dolichopus brevipennis, Mg.** Porthcawl, 11th June and 14th July, 1906.
- Tachytrechus insignis, Stan.** Porthcawl, 23rd May to 8th June, 1903, and 24th June to 18th July, 1906.
- Tachytrechus ripicola, Lw.** Porthcawl, 23rd June, 1903, and June and July, 1906. The specimens taken 23rd June, 1903, were the first instance of the occurrence of this insect in the British Isles,—the late Mr. Verrall recorded this capture in the E. M. M. of November, 1904, p. 243. Both **Tachytrechus insignis** and **Tachytrechus ripicola** are common, they sit on the black mud at the mouth of the River Kenfig; and both species occur commonly too in the neighbourhood of Studland, Dorset.
- Poecilobothrus nobilitatus, L.** 26th June, 1906, and 4th July, 1906. At Bridgend, near the mouth of the Ogmore, I witnessed the courtship of this species. A pair were seated facing one another on a burdock leaf, then both sexes began to vibrate their wings rapidly, (the white spots at the tip of the wings of the male being particularly conspicuous as silvery arcs), after a time the pair began to revolve rapidly round a point about midway between their heads, and waltzed gaily for some time, but their flirtation came to a sad and abrupt termination, as in the course of their dance they passed close to a Crabro ♀ sitting on the leaf apparently asleep, and she seized the male as he circled past her.
- Hercostomus cretifer, Wlk.** Margam, 2nd August, 1908, Ewenny, 13th August, 1908, and Bridgend, 11th August, 1908, very common in the bed of the Ogmore, near its mouth, on this last date.
- Hercostomus gracilis, Stan.** Porthcawl, 6th December, 1914, and 15th July, 1906, common.

- Hercostomus chaerophylli, Mg.** Porthcawl, 2nd July, 1906.
- Hercostomus nigriplantis, Mg.** Porthcawl, recorded by Mr. Verrall, E. M. M., November, 1904, but probably in error for the following species.
- Hercostomus subsimplicipes, Verr.** Porthcawl, 1906, Bridgend, 11th August, 1908, Port Talbot, 29th July, 1908, in great numbers sitting on black mud. For original description and particulars regarding this species, see Verrall, E. M. M., March, 1912, p. 56.
- Hercostomus nigripennis, Fln.** Porthcawl, 27th June, 1906.
- Hercostomus nanus, Macq.** Porthcawl, 7th July, 1906.
- Hercostomus sp. inc.** Porthcawl, 1st July, 1906.
- Hypophyllus obscurellus, Fln.** Porthcawl, 28th June, 1903, and 12th July, 1906.
- Gymnopternus cupreus, Fln.** Kenfig Hill, 5th June, 1903, Porthcawl, 31st May and 5th June, 1906, Crwmllyn Bog, 14th June, 1906.
- Gymnopternus celer, Mg.** Porthcawl, 20th June, 1903, and 14th, 23rd, and 26th June, 1906.
- Gymnopternus metallicus, Stan.** Porthcawl, 12th July, 1906, Crwmllyn Bog, 6th June, 1906.
- Gymnopternus assimilis, Staeg.** Porthcawl, 2nd and 12th June and 4th July, 1906.
- Gymnopternus aerosus, Fln.** Porthcawl, 8th and 23rd June, and 4th and 12th July, 1906, Crwmllyn Bog, 14th June, 1906, Kenfig Hill, 5th June, 1903.
- Chrysotus neglectus, Wied.** Porthcawl, 29th June, 1903, and 20th and 27th June, and 3rd and 6th July, 1906, Crwmllyn Bog, 14th June, 1906.
- Chrysotus cilipes, Mg.** Porthcawl, 1st July, 1906.
- Chrysotus pulchellus, Kow.** Porthcawl, 21st and 25th June and 1st and 18th July, 1906.
- Chrysotus femoratus, Zett.** Porthcawl, 15th and 30th June and 6th and 8th July, 1906. Not in Verrall's List, but see Verrall E. M. M., March, 1905, p. 54.
- Chrysotus palustris, Verr.** Porthcawl, 8th June, 1903. Port Talbot, 4th August, 1908, mouth of the Kenfig River, 14th August, 1908, Pyle, August, 1908, Bridgend, August, 1908, and Porthcawl, 1906.
- Chrysotus suavis, Lw.** Porthcawl, 11th June, 1906, Bridgend, 29th July, 1908, and a pair 16th August, 1908, not in Verrall's List, first recorded Verrall, E. M. M., March, 1912, p. 57.
- Chrysotus melampodius, Lw.** Porthcawl. Verrall l. c., p. 57.
- Chrysotus laesus, Wied.** Porthcawl, 12 and 30th June, 1903.

- Chrysotus blepharosceles, Kow.** Porthcawl, 4th June, 1913, 12th, 22nd, and 25th June, and 4th July, 1906.
- Chrysotus angulicornis, Kow.** Port Talbot, 3rd August, 1908.
- Chrysotus microcerus, Kow.** Mouth of the Kenfig, 10th August, 1908, Ewenny, 13th August, 1908, and Bridgend, 21st August, 1908.
- Chrysotus gramineus, Flin.** Porthcawl, 29th and 30th June, 1903, 7th, 26th, and 27th June and 7th July, 1906.
- Diaphorus nigricans, Mg.** Porthcawl, 27th June, 1903, and 7th, 10th, and 15th July, 1906, Crwmllyn Bog, 24th and 30th July, 1908.
- Diaphorus oculus, Flin.** Porthcawl, 27th June, 1906, Mouth of Kenfig, 10th August, 1908.
- Argyra leucocephala, Mg.** Porthcawl, 27th June, 1906.
- Argyra argyria, Mg.** Bridgend, 11th August, 1908, Park Mill (Mumbles), 29th August, 1908.
- Argyra argentina, Mg.** Bishopston (Mumbles), 30th August, 1908, Fairwood Common (Mumbles), 1st September, 1908, Porthcawl, 26th June and 7th, 10th, and 12th July, 1906.
- Rhaphium longicorne, Flin.** Crwmllyn Bog, 14th June, 1908.
- Machaerium maritimae, Hal.** Port Talbot, 3rd August, 1908.
- Porphyrops nemorum, Mg.** Porthcawl, 17th and 23rd June, 1906.
- Porphyrops consobrina, Zett.** Porthcawl, 5th June, 1906, Bridgend, 23rd July, 1908.
- Porphyrops sp. inc.** Porthcawl, 17th June, 1906. B.M., now headless, but appears to be allied to **Porphyrops pectinata, Lw.**
- Syntormon biseriatus, Lw. var. denticulatus.** Porthcawl, 16th June and 18th July, 1906.
- Syntormon pumilus, Mg.** Porthcawl, 6th and 12th July, 1906, Crwmllyn Bog, 14th June, 1906.
- Syntormon tarsatus, Flin.** Crwmllyn Bog, 30th July, 1908.
- Syntormon pallipes, F.** Porthcawl, 22nd and 24th June, 1903, 18th and 30th May, 16th June, and 15th July, 1906.
- Xiphandrium caliginosum, Mg.** The Nash Light Houses, 15th August, 1908, Margam, 2nd August, 1908, Ewenny, 13th August, 1908, Southerndown, 19th August, 1908, Bridgend, 2nd August, 1908, and Pwllldhu, 5th September, 1908.
- Xiphandrium monotrichum, Lw.** Crwmllyn Bog, 6th June, 1906.
- Xiphandrium appendiculatum, Zett.** Porthcawl, 27th June, 1906, Bridgend, 6th August, 1908, Fairwood Common (Mumbles), 1st September 1908.
- Xiphandrium brevicorne, Curt.** Bridgend, 11th, 16th, 21st, and 25th August, 1908.

- Thrypticus bellus, Lw.** Kenfig Pool, 12th and 17th August, 1908.
- Thrypticus laetus, Verr.** Kenfig Pool, 12th and 17th August, 1908, see Verrall, "Another Hundred British Species," E. M. M., March, 1912, p. 50.
- Thrypticus sp. inc.** Porthcawl, June, 1906,—see Verrall, l.c. June, 1912, p. 144.
- Medeterus jaculus, Mg.** Porthcawl, Verrall, E. M. M., August, 1905, p. 191.
- Medeterus truncorum, Mg.** Porthcawl, 16th June and 3rd and 17th July, 1906.
- Medeterus dendrobænus, Kow.** Porthcawl, 2nd July, 1906.
- Medeterus petrophilus, Kow.** Porthcawl, 1913 (Andrews).
- Hydrophorus bisetus, Lw.** 23rd May, and 20th and 23rd June, 1903, and 19th July, 1906.
- Hydrophorus præcox, Lehm.** Porthcawl, 23rd May, 1903, and 18th and 29th May and 3rd and 24th June, 1906.
- Hydrophorus balticus, Mg.** Porthcawl, 23rd May and 27th June, 1903, and 7th, 15th, and 18th July, 1906.
- Hydrophorus, bipunctatus, Lehm.** Kenfig Pool, 12th August, 1908.
- Liancalus virens, Scop.** Southerndown, 19th August, 1908, Vale of Neath, 1st August, 1908.
- Liancalus lacustris, Scop.** Porthcawl, 23rd and 28th June, 1903, and 7th and 12th July, 1906, Mouth of Kenfig, 10th August, 1908, and Bridgend, 6th August, 1908.
- Campsicnemus scambus, Fln.** Porthcawl, 4th and 9th July, 1906.
- Campsicnemus curvipes, Fln.** Porthcawl, 12th June, 1903, and 24th June and 9th July, 1906.
- Campsicnemus loripes, Hal.** Porthcawl, 26th June, 1906.
- Campsicnemus armatus, Zett.** Port Talbot, 3rd August, 1908, Kenfig Pool, 12th August, 1908.
- Campsicnemus pectinulatus, Lw.** Porthcawl, 19th June and 3rd and 4th July, 1906.
- Teucophorus spinigerellus, Zett.** Port Talbot, 3rd August, 1908, Margam, 27th July, 1906, Porthcawl, 23rd June and 6th July, 1906.
- Teucophorus pectinifer, Kow.** Nash Light Houses, 19th August, 1908.
- Teucophorus monacanthus, Lw.** Vale of Neath, 1st August, 1908, Margam, 12th July, 1908.
- Teucophorus simplex, Mik.** Nash Light Houses, 19th August 1908, Crwmlyn Bog, 30th July, 1908. This uncommon genus occurred

in numbers in the ravine running down to the sea near the Nash Light Houses on the 19th August, 1908, and I believe all the four species were taken there.

- Sympycnus annulipes, Mg.** Porthcawl, 25th June, 1902, and 20th May, and 18th July, 1906.
- Chrysotimus molliculus, Fin.** Porthcawl, 14th and 18th July, 1906, Bridgend, 6th, 7th, and 16th August, 1908, Mouth of Kenfig River, 10th August, 1908, and 14th August, 1908.
- Xanthochlorus tenellus, Wied.** Bridgend, 6th August, 1908, Porthcawl, 19th June, 1903.
- Xanthochlorus ornatus, Hal.** Porthcawl, 1st and 20th June, 1903 and 9th June, 1906, Bridgend, 6th August, 1908.
- Anepsomyia flaviventris, Mg.** Porthcawl, 17th June, 1903, and 1st, 2nd, and 14th July, 1906.
- Micromorphus albipes, Zett.** Porthcawl, 15th May, 1903, and 23rd and 29th June, 1906.
- Thinophilus ruficornis, Hal.** Porthcawl, 1913 (Andrews).
- Aphrosylus raptor, Hal.** Porthcawl, 2nd July, 1906.
- Aphrosylus ferox, Hal.** Porthcawl, 2nd July, 1906.

These two species were in some numbers on this date on the rocks on the sea shore near the Golf Pavilion and "The Rest."

LONCHOPTERIDÆ.

- Lonchoptera lutea, Panz.** Porthcawl, 13th and 25th May and 8th June, 1903, and 12th, 20th, and 22nd June, 1906.
- Lonchoptera furcata, Fall.** Porthcawl, 18th June, 1903, and 30th May, 1906.

PHORIDÆ.

- Phora (Apiochæta?) pallens, Wood.** Porthcawl (Wood).
- Phora (Apiochæta?) pygmæa, Zett.** (var. *brachyneura*, Egg). Porthcawl.
- Phora (Apiochæta) rufipes, Mg.** Cardiff, one specimen (Dean).

PLATYPEZIDÆ.

- Callimya speciosa, Mg.** Porthcawl, 29th June, 1903.
- Callimya elegans, Mg.** Porthcawl, Verrall "Another Hundred British Species," E. M. M., July, 1912, p. 147.

PIPUNCULIDÆ.

- Pipunculus campestris, Ltr.** Porthcawl, 14th May, 1903.
- Pipunculus littoralis, Beck.** Common on the sandhills, 28th June and 2nd June, 1903.

SYRPHIDÆ.

- Paragus tibialis*, Fln. 2nd and 12th June, 1903
- Pipizella virens*, Fab. One Penarth, June, 1914 (Hallett).
- Pipizella flavitarsis*, Mg. 23rd June, 1903, 23rd June and 6th July, 1906.
- Pipiza signata*, Mg. Kenfig Hill, 5th June, 1903.
- Liogaster metallina*, F. 5th and 30th June, 1906.
- Liogaster splendida*, Mg. Porthcawl, 18th June, 1903.
- Chrysogaster hirtella*, Lw. 31st May and 7th and 23rd June, 1906.
- Chrysogaster virescens*, Lw. Porthcawl, 7th July, 1906.
- Chilosia antiqua*, Mg. Porthcawl, 12th June, 1903.
- Chilosia variabilis*, Panz. Porthcawl, 20th June, 1906.
- Chilosia vulpina*, Mg. Porthcawl, 3rd July, 1903.
- Chilosia impressa*, Lw. Porthcawl, 30th May, 1903.
- Chilosia albitarsis*, Mg. Porthcawl, 19th May, 1906.
- Chilosia fraterna*, Mg. Porthcawl, 19th May, 1903.
- Platychirus manicatus*, Mg. Cwrt-yr-ala, 1909 (Hallett).
- Platychirus peltatus*, Mg. Cwrt-yr-ala, 1909 (Hallett).
- Platychirus albimanus*, F. Porthcawl, 1913 (Andrews).
- Platychirus fulviventris*, Macq. Crwmllyn Bog, 6th June, 1906.
- Platychirus clypeatus*, Mg. Cwrt-yr-ala, 1909, Penarth, June, 1916 (Hallett).
- Melanostoma ambiguum*, Fln. Cwrt-yr-ala, 1909 (Hallett).
- Melanostoma mellinum*, L. Cwrt-yr-ala, 1909 (Hallett).
- Melanostoma scalare*, F. Cwrt-yr-ala, 1909 (Hallett).
- Ischyrosyrphus glaucius*, L. Bridgend, 23rd July, 1908.
- Catabomba pyrastris*, L. Cwrt-yr-ala, 1909 (Hallett).
- Syrphus tricinctus*, Fln. Bridgend, 21st August, 1908.
- Syrphus ribesii*, L. Cwrt-yr-ala, 1909 (Hallett).
- Syrphus luniger*, Mg. Cwrt-yr-ala, 1909 (Hallett).
- Syrphus bifasciatus*, F. Penarth, June, 1914 (Hallett).
- Sphærophoria scripta*, St. Farg. Porthcawl, 1913 (Andrews).
var. *nigricoxa*, Zett. Porthcawl, 1913 (Andrews).
- Sphærophoria menthrasti*, L. Porthcawl, 1913 (Andrews).
- Sphærophoria picta*, Mg. Cwrt-yr-ala, 1909 (Hallett).
- Xanthogramma ornatum*, Mg. Cwrt-yr-ala, 1909 (Hallett).

- Doros conopseus, F.** Bridgend; Captain Blomer reported Ent. Mag., Vol. I, 1883, p. 317, though erroneously, **Ceria conopsoides, L.** from Bridgend, this mistake was corrected by Mr. J. C. Dale on p. 515 of the same volume, who pointed out that Captain Blomer's specimen was a **Doros conopseus**. The record of capture of **Doros conopseus, Lomatia lateralis, Selidopogon diadema,** and **Pamponerus germanicus** was the lure which attracted me down to Glamorgan, but with the exception of the last, all these species proved to be "Will of the Wisps."
- Sphegina clunipes, Fln.** Bishopston (Mumbles), 30th August, 1908.
- Ascia podagrica, F.** Cwrt-yr-ala, 1909 (Hallett).
- Rhingia campestris, Mg.** Cwrt-yr-ala, 1909 (Hallett).
- Volucella bombylans, L.** Cwrt-yr-ala, 1909 (Hallett).
- Volucella pellucens, L.** Cwrt-yr-ala, 1909 (Hallett).
- Volucella inflata, Fab.** Cwrt-yr-ala at sap, June, 1909 (Hallett).
- Eristalis sepulchralis, L.** Cwrt-yr-ala, 1909 (Hallett).
- Eristalis ænus, Scop.** Cwrt-yr-ala, 1909 (Hallett).
- Eristalis tenax, L.** Very abundant, Cwrt-yr-ala, Penarth, Sully, &c. This fly is known locally as the Drone Fly (Hallett).
- Eristalis intricarius, L.** Cwrt-yr-ala, 1909 (Hallett).
- Eristalis arbustorum, L.** Cwrt-yr-ala, 1909 (Hallett).
- Eristalis nemorum, L.** Cwrt-yr-ala, 1909 (Hallett).
- Eristalis pertinax, Scop.** Cwrt-yr-ala, 1909 (Hallett).
- Eristalis horticola, Deg.** One specimen at Roath Park in 1909 (G. R. Brook).
- Myiatropa florea, L.** Cwrt-yr-ala, 1909 (Hallett).
- Helophilus pendulus, L.** Cwrt-yr-ala, 1909 (Hallett).
- Helophilus versicolor, F.** Crwmllyn Bog, 6th June, 1906.
- Helophilus lineatus, F.** Porthcawl, 7th July, 1906.
- Merodon equestris, F.** Cwrt-yr-ala, 1909 (Hallett). The Narcissus Fly; it no doubt affects the Wild Hyacinth in this locality.
- Tropidia scita, Harr.** Crwmllyn Bog, 6th June, 1906, in fair numbers.
- Criorrhina floccosa, Mg.** Porthcawl, 20th June, 1903.
- Xylota segnis, L.** Cwrt-yr-ala, 1909; Old Cogan, &c., not rare (Hallett).
- Syritta pipiens, L.** Cwrt-yr-ala, 1909 (Hallett).
- Arctophila mussitans, F.** Bishopston (Mumbles), 30th August, 1908.
- Chrysotoxum cautum, Har.** Cwrt-yr-ala, not rare; Pontneathvaughan, Porteynon, &c. (Hallett).

Chrysotoxum festivum, L. Porthcawl, 22nd June, 1903.

Callicera ænea, F. Aberavon Golf Links, Port Talbot, 28th July, 1908,
at Blackberry blossom.

CONOPIDÆ.

Conops quadrifasciata, Deg. Cwrt-yr-ala, 1909 (Hallett).

Physocephala rufipes, F. Horton (Gower) one, July, 1914 (Hallett).

Myopinæ.

Oncomyia atra, F. Horton (Gower) one, July, 1914 (Hallett).

CESTRIDÆ.

Gastrophilus equi, F. Port Talbot, 3rd August, 1908, flying round loose
horses near the Morfa Colliery.

Hypoderma lineatum, Vill. Porthcawl, 19th May, 1903 Crwmllyn Bog,
6th June, 1906.

TACHINIDÆ.

Meigenia bisignata, Mg. Porthcawl, 28th May, 1906.

Viviania cinerea, Fln. Porthcawl, 15th June, 1903

Ceromasia machairopsis, Br. & Berg. Porthcawl, 28th May, 1906.

Gymnochæta viridis, Fln. Porthcawl, 19th May, 1903.

Ptychomyia selecta, Mg. Swansea; Verrall, "Another Hundred
British Species," Ent. Mo. Mag., August, 1912, p. 192.

Marquartia tenebricosa, Mg. ♀ and ♂ "in coitu" 19th April, 1906, Porth-
cawl, 27th June, 1906.

Ptilops chalybeata, Mg. Porthcawl, 18th June and 13th July, 1906.

Erigone truncata, Zett. Porthcawl, 4th July, 1903.

Erigone intermedia, Zett. Porthcawl, 12th May, to 1st July, 1903.

Echinomyia grossa, L. Not rare at Horton, Gower, in July, 1914
(Hallett).

Echinomyia fera, L. Bridgend, 23rd July, 1908; recorded in error as
Eudorymyia magnicornis, Zett, Verrall, l.c., p. 191.

Phorichæta carbonaria, Panz. Porthcawl, 2nd June, 1906; a common
insect on the sandhills, running about on the sands.

Ptychoneura rufitarsis, Mg. Two specimens bred from bramble stems
burrowed by the Wasp **Pemphredon lethifer, Shuck,** they emerged
in May, 1915 (Hallett).

Digonochæta setipennis, Fln. Three bred from pupæ under bark, May,
1916 (Hallett).

Phyto melanocephala, Mg. Porthcawl, 1st June, 1903.

Clista lepida, Mg. Porthcawl, 2nd and 15th July, 1906.

Sarcophila latifrons, Fln. Porthcawl, 6th June, 1903.

Metopia leucocephala, Rossi. Horton, July, 1914 (Hallett).

Sphixapata conica, Fln. Porthcawl, 3rd and 7th June, 1906.

Macronychia viatica, Mg. Porthcawl, 27th June, 1903, taken from the clutch of **Scatophaga stercoraria**, *vide* Poulton "Predaceous Insects," Trans. Ent. Soc., 23rd January, 1907, p. 392. The **Scatophaga** knew better where to look for her quarry than I did, as I failed in spite of careful search to find a living specimen.

MUSCIDÆ.

Hæmatobia stimulans, Mg. Porthcawl, 27th June, 1906, and 7th July, 1906.

Lyperosia irritans, L. Porthcawl, 31st May, 1903, on cattle.

Pollenia rudis, F. Roath Park, Cardiff, 4th May, 1916 (Grimes).

Myiospila mediatubunda, Fab. Penarth, one specimen, June, 1916 (Hallett).

Musca domestica, Linn. Abundant everywhere (H.).

Musca autumnalis, Deg. (*corvina*, F.). Generally common, and often clustering in buildings during the winter (H.).

Morellia curvipes, Macq. Cwrt-yr-ala, 1909 (Hallett).

Calliphora erythrocephala, Mg. Abundant everywhere (H.).

Calliphora vomitoria, L. Abundant everywhere (H.).

Euphoria cornicina, F. Penarth, common, July, 1914 (Hallett).

Lucilia cæsar, Linn. Abundant throughout the County (H.).

ANTHOMYIDÆ.

Hyetodesia variegata, Mg. (*populi*, Brit. Cat.). Roath Park, Cardiff, 28th March, 1916 (Grimes).

Mydea vespertina, Fln. Porthcawl, June-July, 1913 (Andrews).

Mydea (?) *impuncta*, Fln. Penarth, one specimen, May, 1916 (Hallett).

Spilogaster duplicata, Mg. Porthcawl, 1913 (Andrews).

Spilogaster communis, Dsv. Porthcawl, 1913 (Andrews).

Spilogaster quadrum, Fab. Porthcawl, 1913 (Andrews).

Spilogaster protuberans, Zett. Porthcawl, 1913 (Andrews).

Limnophora æstum, Vill. Porthcawl, 1913 (Andrews).

Limnophora, species ? Porthcawl, 1913 (Andrews).

Hydrotæa irritans, Fln. Porthcawl, 12th and 30th June, 1903 (also July, 1916 (Hallett)).

- Hydrotæa pilipes**, Stein. Porthcawl, 6th July, 1903.
- Hydrophoria divisa**, Mg. Porthcawl, 1913 (Andrews).
- Hydrophoria conica**, W. Porthcawl, 1913 (Andrews).
- Hydrophoria brunneifrons**, Zett. Porthcawl, 1913 (Andrews).
- Hylemyia variata**, Fln. Porthcawl, 1913 (Andrews).
- Hylemyia antiqua**, Mg. Porthcawl, 1913 (Andrews).
- Hylemyia penicillaris**, Rnd. Porthcawl, 1913 (Andrews).
- Chortophila** sp. ? Porthcawl, 1913 (Andrews).
- Phorbia arenosa**, Zett. Porthcawl, 1913 (Andrews).
- Phorbia discreta**, Mg. Porthcawl, 1913 (Andrews).
- Fannia (Homalomyia) sociella**, Zett. Porthcawl, 1913 (Andrews).
- Fannia (Homalomyia) canicularis**, L. Abundant in houses (Dean).
- Chirosia crassiseta**, Stein. Porthcawl, 7th June, 1906.
- Cœnosia albatella**, Zett. Porthcawl, 6th June, 1903, and 10th June to 3rd July, 1906; Pyle, 14th August, 1906.
- Cœnosia atra**, Mg. Port Talbot, 26th July, 1908.
- Cœnosia (?) lineatipes**, Zett. Penarth, May, 1916 (Hallett).
- Cœnosia steini**, Verr. Porthcawl, 28th May, 1908.
- Schoenomyza litorella**, Fln. Porthcawl, 26th May, 1st and 8th June, 1903.
- Myopina reflexa**, Dsv. Kenfig Pool, 27th June, 1903; Porthcawl, 18th July, 1906.
- Lispe tentaculata**, De G. Porthcawl, 1913 (Andrews).
- Lispe nana**, Mcq. Porthcawl, 8th and 12th June, 1903.
- Lispe pygmæa**, Fln. Kenfig Pool, 25th June, 1903, Porthcawl, 18th July, 1906, common.
- Lispe cæsia**, Mg. Pyle, 10th August, 1908, Port Talbot, 3rd June, 1908.
- Lispe pilosa**, Lw. Porthcawl, 13th and 21st May, 1903.
- Dexiopsis litoralis**, Zett. Porthcawl, Ent. Mo. Mag., June, 1913, p. 132.
- Dexiopsis rubricornis**, Zett. Porthcawl, June, 1903, and July, 1906,
E. M. M., 1913, p. 133.

But little attention was paid to the families, viz. : **Platipezidæ**, **Pipunculidæ**, **Syrphidæ**, **Tachinidæ**, **Muscidæ**, and **Anthomyidæ**; and this in some measure accounts for the meagre results recorded; it has, however, been found impossible to overhaul the specimens given to Mr. Verrall and the Hope Department, Oxford, therefore several species may be added from these sources. (J. W. N.)

CORDYLURIDÆ.

- Cordylura pudica**, Mg. Porthcawl, 27th June, 1906; Crwmllyn Bog, 14th June, 1906.
- Cordylura ciliata**, Mg. Mumbles (Pwll-dhu), 2nd and 5th September, 1908.
- Parallelomma albipes**, Flin. Porthcawl, 14th May and 4th and 16th June, 1903, 31st May and 5th and 12th June, 1906, mouth of Kenfig River, 10th and 13th August, 1908; Crwmllyn Bog, 6th June, 1906.
- Amaurosoma fasciata**, Mg. Porthcawl, 19th May and 5th June, 1906.
- Cnemopogon apicalis**, Mg. Crwmllyn Bog, 6th June, 1906.
- Leptopa filiformis**, Zett. Porthcawl, 26th and 27th May and 4th June, 1903. Not uncommon in a little wood near the station, the only place I have ever seen this rare species in any numbers.
- Norellia spinimana**, Flin. Bridgend, 23rd July, 1908, Port Talbot, 3rd August, 1908.
- Trichopalpus fraternus**, Mg. Kenfig Pool, 12th August, 1908.
- Trichopalpus punctipes**, Mg. Porthcawl, 2nd June, 1903, and 8th June, 1906.
- Spathiophora hydromyzina**, Flin. Porthcawl, 23rd June, 1903, Kenfig Pool, 12th August, 1908.
- Scatophaga scybalaria**, L. Mumbles (Fairwood Common), 27th August, 1908, Porthcawl, 8th and 25th June, 1903, Margam, 21st July, 1908.
- Scatophaga suilla**, F. Porthcawl, 27th May and 4th June, 1903, and 21st May, 1906; Mumbles (Bishopston), 30th August, 1908.
- Scatophaga inquinata**, Mg. Porthcawl, 31st May, 1906; Crwmllyn Bog, 6th June, 1906.
- Scatophaga maculipes**, Zett. Porthcawl, 14th and 20th May, 1903, and 31st May, 1906; Ewenny, 13th August, 1908.
- Scatophaga stercoraria**, L. Porthcawl, 29th June and 18th July, 1906, see also Poulton "Predaceous Insects," Trans. Ent. Soc., 23rd January, 1907, p. 392. The prey on this last occasion was **Macronychia viatica**, Mg., an addition to the British Fauna, and an insect of which a second specimen could not be obtained, in spite of careful search round the neighbourhood of the capture.
- Scatophaga sp. inc.** Porthcawl, 29th June, 1906, near **Scatophaga decipiens**, and may be a variety of that species.
- Scatophaga squalida**, Mg. Porthcawl, 6th June, 1903, probably common.
- Ceratinostoma ostiorum**, Hal. Porthcawl, 18th May, 1903, probably common.

PHYCODROMIDÆ.

Orygma luctuosum, Meig. Very common in decaying seaweed at Sully (Hallett).

Fucomyia frigida, Fln. Porthcawl, 24th June, 1906, probably two or three others of this family remain to be added.

BORBORIDÆ.

Sphærocera subsultans, Fab. Common at Penarth, 1914 (Hallett).

Limosina acutangula, Zett. Porthcawl, 29th June, 1906.

Limosina sylvatica, Mg. Porthcawl, 9th June, 1906.

Limosina septentrionalis, Stenh. Porthcawl, 19th July, 1906.

HETERONEURIDÆ.

Heteroneura gentilis, Coll. Porthcawl (Collin).

Heteroneura verticalis, Coll. The Mumbles and Bridgend (Collin), 1908. See Collin, E. M. M., May, 1912, p. 106.

Heteroneura sp. inc. Porthcawl, 3rd June, 1908. B. M. May be the same as *Heteroneura gentilis* above.

DRYOMYZIDÆ.

Dryomyza anilis, Fln. Porthcawl, 24th May and 12th and 17th June, 1903, 12th and 25th June, 1906; Vale of Neath, 1st August, 1908; Mumbles (Ilston), 4th September, 1908.

Dryomyza flaveola, F. Porthcawl, 24th and 29th May and 3rd and 29th June, 1903; 12th June, 1906; Kenfig Hill, 5th June, 1903.

Cedoparea buccata, Fln. Porthcawl, 30th May to 10th June, 1903, and 17th June to 12th July, 1906.

Actora æstuum, Mg. Porthcawl, 20th June, 1903, probably more common than this single specimen seems to indicate.

HELOMYZIDÆ.

Helomyza inornata, Lw. Kenfig Hill, 5th June, 1903.

Helomyza variegata, Lw. Porthcawl, 20th, 22nd, and 30th May, 1903; Bridgend, 7th August, 1908.

Helomyza pectoralis, Lw. (*hilaris*, Zett.). Porthcawl, 1st and 3rd June, 1903.

Helomyza affinis, Mg. Porthcawl, 20th to 24th May, 1903, and 12th June, 1906; Bridgend, 6th and 7th August, 1908.

Helomyza flava, Mg. Porthcawl, 16th, 17th, and 25th June, 1903, 9th and 16th June, and 6th July, 1906; Port Talbot, 18th July, 1908.

Helomyza montana, Lw. (*fuscicornis*, Zett.). Porthcawl, 5th June, 1903.

- Helomyza zetterstedtii**, Lw. (*bicolor*, Zett.). Porthcawl, 3rd, 6th, and 29th June, 1903, 30th May, and 9th, 15th, and 25th June, 1906; Margam, 24th August, 1908.
- Helomyza pallida**, Fln. Porthcawl, 20th May to 18th June, 1903, and 30th May to 19th July, 1906; Bridgend, 6th August, 1908; Margam, 24th August, 1908, very common.
- Allophyla atricornis**, Lw. Porthcawl, 29th June, 1903; 1st and 14th June and 16th and 19th July, 1906.
- Æcothia fenestralis**, Fln. Porthcawl, 29th May and 15th, 18th, and 19th June, 1903.
- Tephrochlamys tarsalis**, Zett. Porthcawl, 13th June, 1902.
- Tephrochlamys læta**, Mg. Porthcawl, 22nd June, 1903.
- Tephrochlamys rufiventris**, Mg. Porthcawl, 12th, 15th, and 20th June, 1903, and 25th May, 8th and 23rd June, and 2nd and 14th July, 1906.
- Heteromyza commixta**, Coll. Porthcawl, 13th June, 1903.
- Blepharoptera (Leria) flavotestacea**, Zett. Bridgend (Candleston Castle), 20th, 22nd, and 24th May and 3rd June, 1903, and 30th May, 1906.
- Blepharoptera (Leria) inscripta**, Mg. Porthcawl, 15th May, 1903, ♂ and ♀ "in coitu," 16th, 18th, 20th, and 21st May and 29th June, 1903; 20th June and 4th July, 1906; Kenfig Hill, 5th June, 1903. Very common on carrion.
- Blepharoptera (Leria) halterata**, Mg. Porthcawl, 11th May to 10th June, 1903, common; 18th May and 1st and 30th June, 1906.
- Blepharoptera (Leria) duplicisetata**, Strobl. Kenfig Hill, 5th June, 1903.
- Blepharoptera (Leria) kerteszi**, Czerny. Porthcawl, 24th May and 3rd June, 1903.
- Blepharoptera (Leria) serrata**, L. Porthcawl, 15th and 17th May and 5th June, 1903, 27th May, 1906; and Crwmllyn Burrows, 23rd May, 1906.
- Blepharoptera (Leria) modesta**, Mg. Porthcawl, 10th to 18th May, 1903, and 17th May to 4th June, 1906. Very common on carrion.

THYREOPHORIDÆ.

- Thyreophora furcata**, F. Porthcawl, 13th, 15th, and 18th May, 1903, and 18th and 25th May, 1906.

SCIOMYZIDÆ.

- Pelidnoptera nigripennis**, F. Porthcawl, 3rd June, 1903, and 20th, 24th, and 30th May, 1903.
- Phæomyia fuscipennis**, Mg. Porthcawl, 29th June, 1903, the only specimen.

- Sciomyza albocostata, Fln.** Porthcawl, 14th and 20th June, and 4th, 5th, and 11th July, 1906; Bridgend, 29th July, 1908.
- Sciomyza griseola, Fln.** Porthcawl, 31st May, 1906.
- Sciomyza dorsata, Zett.** Kenfig Pool, 8th and 12th August, 1908; Porthcawl, 8th June, 1906.
- Sciomyza nana, Fln.** Port Talbot, 29th July and 4th August, 1908; Porthcawl, 25th June, 1903; Kenfig Pool, 12th August, 1908. "Eyes appear to vary with the light, generally dark purple red with a greenish line across them at the level of the antennae"; sometimes the upper third is dark reddish purple while the lower two-thirds is paler with a tendency towards green; a third label bears the following note:—"Eyes dark bronze green with a dark purple line at the level of the upper edge of the yellow patch above the antennae."
- Sciomyza dubia, Fln.** Porthcawl, 14th, 20th, and 27th May, 1903, and 31st May, 1906.
- Sciomyza ventralis, Fln.** Porthcawl, 8th, 10th and 25th June, 1903, and 18th and 24th May, 1906. Very common.
- Sciomyza pallidiventris, Fln.** Porthcawl, 17th June, and 1st and 2nd July, 1903; 26th June and 8th July, 1906; and Kenfig Pool, 12th August, 1908.
- Sciomyza (Ditænia) griseus, Mg.** Porthcawl, 25th June, 1903, ♂ and ♀ "in coitu"; 8th, 25th, and 27th June, 1903, and 4th June, 1906; and Kenfig Pool, 12th and 17th August, 1908.
- Sciomyza (Ditænia) virgata, Hal?** Porthcawl, 21st May and 2nd June, 1903; 18th, 21st, and 30th May, 1905, and 1st June, 1906; Bridgend, 21st and 25th August, 1908.
- Sciomyza (Ditænia) cinerella, Fln.** Porthcawl, 10th May, 1903, and 19th May and 4th June, 1906; and Kenfig Pool, 12th August, 1908.
- Sciomyza (Ditænia) schonherri, Fln.** Bishopston (Mumbles), 5th September, 1908.
- Tetanura pallidiventris, Fln.** Porthcawl, 29th May and 29th June, 1903; 12th, 20th, and 22nd June, 1906; and a pair "in coitu," 22nd June, 1906.
- Dicrochira leucopeza, Mg.** Port Talbot, 4th August, 1908. "Eyes in life unicolorous dull dark red."

Tetanocerinae.

- Renocera pallida, Fln.** Porthcawl, 5th June, 1903, and 5th June, 1906; Crwmllyn Bog, 6th June, 1906; Margam, 27th July and 24th August, 1908; Bishopston (Mumbles), 30th August, 1908.
- Heteropteryx brevipennis, Zett.** Porthcawl, 23rd June, 1906. This is the only specimen of this species that I have ever met with.

- Ctenulus pectoralis**, Zett. Porthcawl, 25th and 27th June, 1903; 19th June and 3rd July, 1906; Kenfig Pool, 17th August, 1908.
Some of the labels bear the note:—"Eyes striped." Hendel Pal. Sciomyzidæ Abhl. K. K. Zool. Bot. Ges. Band II., Heft L., p. 84, however, separates **pectoralis** from the other two species of the Genus by the unstriped eyes,—either this character is inconsistent or else Hendel has been mistaken in applying it to **Ctenulus pectoralis**.
- Ctenulus distinctus**, Mg. Porthcawl (Collin). I can find no Glamorgan specimen of this species in my collection.
- Tetanocera elata**, F. Porthcawl, 4th June, 1903, and 23rd June, 1906; Port Talbot, 26th July, 1908; Park Mill (Mumbles), 27th August, 1908.
- Tetanocera lævifrons**, Lw. (*hyalipennis*, v. Ros.). Porthcawl, 16th June, 1903, and 25th, 27th, and 29th June, and 9th and 11th July, 1906; Kenfig Hill, 5th June, 1903; Bishopston (Mumbles), 30th August and 5th September, 1908.
- Tetanocera robusta**, Lw. Porthcawl, 15th and 18th June, 1903; Crwmllyn Bog, 24th July, 1908.
- Tetanocera punctata**, F. Porthcawl, 5th June and 10th July, 1906; Crwmllyn Bog, 6th and 14th June, 1906, and 24th July, 1908.
- Tetanocera coryleti**, Scop. Porthcawl, 18th and 23rd June, 1903, and 5th August, 1906; Bishopston (Mumbles), 4th August, 1908.
- Tetanocera umbrarum**, L. Port Talbot, 28th July, 1908, the only specimen.
- Tetanocera punctulata**, Scop. Porthcawl, 4th June, 1903, and 1st 8th, 9th, and 15th June, 1906.
- Limnia unguicornis**, Scop. Porthcawl, 30th May and 20th June, 1903, and 5th and 11th June, 1906; Port Talbot, 26th July, 1908.
- Limnia ruffrons**, F. Porthcawl, 13th and 23rd June, 1903, and 20th June, 1906; Mouth of Kenfig River, 14th August, 1908; Bridgend, 6th and 22nd August, 1908; Margam, 27th July and 24th August, 1908.
- Elgiva albisetata**, Scop. Porthcawl, 8th June, 1903, ♂ and ♀.
- Elgiva dorsalis**, F. Porthcawl, 23rd May, 1903, ♂ and ♀ "in coitu," 30th June, 1903, and 8th June, 1906; Port Talbot, 26th July, 1908.
- Elgiva lineata**, Flin. Porthcawl, 10th July, 1906, and 4th August, 1908; Crwmllyn Bog, 30th July, 1908; Margam, 27th July, 1908.
- Elgiva cucularia**, L. Porthcawl, 2nd and 8th June, 1906.
- Dichætophora obliterata**, F. Porthcawl, 10th, 13th, and 17th June and 1st July, 1903; Bridgend, 7th August, 1908; Margam, 24th August, 1908.

- Lucina fasciata, Mg.** Porthcawl, 11th May, 1903, and 12th June, 1906.
Sepedon sphegeus, F. Mouth of Kenfig, 4th August, 1908.
Sepedon spinipes, Scop. Porthcawl, 19th June, 1903, and 8th June and 7th July, 1906.

PSILIDÆ.

- Psila fimetaria, L.** Porthcawl, 20th June, 1906.
Psila nigricornis, Mg. Porthcawl, 1st June, 1903, ♂ and ♀ "in coitu," and 7th and 18th June, 1903, 26th and 28th May, 1906, and 4th and 9th June, 1906.
Psila rosæ, F. Porthcawl, 1st June, 1906. Although this species has to bear the burden of being called the "Carrot Fly," still I am of the opinion that this stigma ought to be transferred to the foregoing species, **Psila nigricornis**.
Chyliza leptogaster, Pz. Porthcawl, 8th June, 1906.
Loxocera aristata, Pz. Porthcawl, 27th June, 1906. Horton (Gower), July, 1914 (Hallett).
Loxocera albiseta, Schrk. Margam, 27th July and 24th August, 1908; Pyle, 10th August, 1908; Port Talbot, 3rd August, 1908; Fairwood Common (Mumbles), 27th August and 1st September, 1908.

MICROPEZIDÆ.

- Calobata cibaria, L.** Porthcawl, 1st June, 1903. Heretofore this specimen has stood in my collection as **Calobata trivialis**, though I have always doubted the distinction between the two species; for the last word on this subject see Collin E. M. M. Vol. XXII., 2nd series, p. 145.
Micropeza corrigiolata, L. Kenfig Pool, 17th August, 1908; Porthcawl, 1st, 3rd, 13th, 21st, and 27th June, 1903, 1st July, 1903, 20th and 22nd June, 1906.

ORTALIDÆ.

- Tetanops myopina, Fln.** Porthcawl, 28th and 30th May and 2nd and 25th June, 1903; 18th June, 1906; common, sitting on the Marram Grass on the Sandhills.
Ceroxys omissus, Mg. Porthcawl, 16th June, 1903, and 14th July, 1906.
Rivallia syngenesiæ, F. Porthcawl, 15th June, 1903, and 30th June and 3rd July, 1906.
Seoptera vibrans, L. Porthcawl, 1st and 4th June, 1903.
Pteropæctria frondescentiæ, L. Porthcawl, 18th June, 1903—probably far more common than this solitary capture seems to indicate.
Pteropæctria paludum, Fln. Ewenny, 13th August, 1908.
Pteropæctria palustris, Mg. Porthcawl, 27th and 29th June and 8th, 11th, and 17th July, 1906; Port Talbot, 26th July, 1908.

Pteropæctria nigrina, Mg. Porthcawl, 29th June, 1903, and 22nd June, 1906.

Pteropæctria afflicta, Mg. Porthcawl, 29th June and 11th and 17th July, 1906; Southerndown, 19th August, 1908.

TRYPETIDÆ.

Acidia cognata, Wied. Caswell Bay (Pwll-dhu), 5th September, 1908. (From disc "Eyes bright green no bands.")

Acidia lynchnidis, F. Porthcawl, 21st June and 7th July, 1906; Bridgend, 23rd and 29th July, 1908; Mouth of River Kenfig, 10th August, 1908.

Acidia heraclei, L. Margam, 24th August, 1908. (From disc "Eyes metallic green, centre coppery.")

Spilographa zoe, Mg. Porthcawl, 17th June, 1903; Bridgend, 7th August, 1908.

Trypeta acuticornis, Lw. Llantwit Major, 8th August, 1908, three ♂, three ♀. Southerndown, ♂, 9th August, 1908; Bridgend, three ♀, 7th August, 1908. Not uncommon on *Carduus eriophorus* along the coast between the Nash Lighthouses and Merthyr Mawr, and the record as a British insect was made on the above specimens; as this beautiful insect loses its colours soon after death and becomes a drab grey all over, the following notes taken from the discs on which the specimens are pinned may be of interest:—

"♀ General colour grey (? glaucous green), eyes bright green (yellow in some lights) with a bright yellow line across them at the level of the antennae. ♂ Colour grey green, the abdomen with yellow sides, which colour extends on to the belly, eyes bright green, in some lights yellowish, a bright yellow line right across them at the level of the antennae"; one specimen is marked "lowest third of the eyes blue green in some lights."

Trypeta serratulæ, L. Porthcawl, 28th and 30th June, 1903, not uncommon on thistles (but not on *Carduus eriophorus*) on the Newton Burrows. The following remarks on the colour of fresh specimens is taken from the notes on the discs on which they are pinned:—

"Eyes bright green, with a yellow line across at the level of the antennae, palpi and antennae bright yellow, general colour grey green."

The colours of these two insects as recorded above are remarkably similar, nevertheless they are easily separated by the larger size longer ovipositor in the ♀ and the faint clouding near the tips of the wings of **Trypeta acuticornis**.

Trypeta tussilaginis, F. Margam, 27th July, 1908, in numbers, two pairs "in coitu"; Bridgend, 6th August, 1908.

Trypeta onotrophes, Lw. Porthcawl, 17th July, 1906; Pyle, 31st July, 1908.

- Urophora solstitialis, L.** Porthcawl, 27th June, and 6th and 7th July, 1906; Pyle, 10th August, 1908.
- Urophora cardui, L.** Llancarfan and Penmark (C. Waldron), see C. N. S. Trans. Vol. XVIII., p. 89.
- Urophora stylata, F.** Porthcawl, 4th, 8th, and 15th July, 1906.
- Sphenella marginata, Fln.** Porthcawl, 2nd to 30th June, 1903; Bridgend, 22nd August, 1908; Pyle, 17th August, 1908.
- Carphotricha guttularis, Mg.** Port Talbot, 26th July, 1908.
- Tephritis (Oxyphora) miliaria, Schrk.** Porthcawl, 29th June, 1903, and 20th and 26th June, 1906; Bridgend, 19th August, 1908.
- Tephritis vespertina, Lw.** Fairwood Common (Bishopston), 29th August, 1908.
- Tephritis bardanæ, Schrk.** Porthcawl, 29th June, 1903; Bridgend, 29th July, 1908—common on burdock.
- Tephritis (Oxyyna) plantaginis, Hal.** Port Talbot, 3rd August, 1908; swept in numbers off sedge near the edge of the sea.
- Urellia stellata, Fuessl.** Porthcawl, 6th June, 1903, and 1st July, 1906.

LONCHÆIDÆ.

- Lonchæa chorea, F.** Porthcawl, 3rd July, 1906.
- Lonchæa nigra, Mg.** Porthcawl, 13th June, 1903.
- Paloptera ustulata, Fln.** Porthcawl, 7th June, 1903.
- Paloptera parallela, Lw.** Porthcawl, 7th June, 1906.
- Paloptera arcuata, Fln.** Porthcawl, 25th May, 1906.
- Paloptera saltuum, L.** Porthcawl, 20th June, 1906.

SAPROMYZIDÆ.

- Peplomyza litura, Mg. (Wiedmanni, Lw.)** Porthcawl, 1913 (Andrews).
- Sapromyza (Minettia) fasciata, Fln.** Porthcawl, 7th June, 1906.
- Sapromyza (Minettia) plumicornis, Fln.** Porthcawl, 1913 (Andrews).
- Sapromyza (Minettia) trispina, Rnd.** Porthcawl, 1903 and 1906 (Collins).
- Sapromyza notata, Fln.** Porthcawl, 1913 (Andrews).
- Sapromyza præusta, Fln.** Porthcawl, 1913 (Andrews).
- Sapromyza nitidifrons, Beck.** Porthcawl, May, 1906 (Collin).
- Sapromyza opaca, Beck.** Porthcawl, June and July, 1903 (Collin).
- Sapromyza limnea, Beck.** Porthcawl, June, 1903 (Collin).
- Lauxania elisæ, Mg.** Porthcawl, 5th June to 12th July, 1906.

SEPSIDÆ.

- Henicita annulipes**, Mg. Porthcawl, 8th June, 1903.
Nemopoda cylindrica, F. Porthcawl, 24th May, 1903, a pair "in coitu."
Themira minor, Hal. Porthcawl, 4th and 10th June, 1903.
Themira superba, Hal. Porthcawl, 13th June, 1903.
Themira spinosa, Verr. (*pusilla*, Zett.) Porthcawl, 23rd June, 1903.

PIOPHILIDÆ.

- Piophila nigriceps**, Mg. Porthcawl, 18th May, 1906.
Piophila vulgaris, Fln. Porthcawl, 13th and 27th May, 1903.
Piophila varipes, Mg. Porthcawl, 25th May, 1903.

GEOMYZIDÆ.

- Diastata punctum**, Mg. Porthcawl, 19th May, 1906, 9th June, 1906,
and 16th July, 1906.
Diastata obscuripennis, Mg. (*nigricornis*, Lw.). Porthcawl, 17th and 23rd
June, 1903.
Diastata fuscula, Fln. (*inornata*, Lw.). Porthcawl, 11th and 12th May
and 3rd June, 1903.
Diastata unipunctata, Zett. Porthcawl, 25th May, 1903, and 8th, 10th,
20th, and 23rd June, 1903.
Geomyza obscurella, Fln. Porthcawl, 28th May to 1st July, 1903.
Common, sitting on the sand.
Balioptera tripunctata, Fln. Porthcawl, 22nd and 24th June, 1903, and
18th July, 1906.
Balioptera combinata, L. Porthcawl, 18th July, 1906.
Anthomyza sordidella, Zett. Porthcawl (Collin).

MILICHIDÆ.

- Rhicoessa cinerella**, Hal. Porthcawl, 15th June, 1906.
Tethina illota, Hal. Porthcawl, 31st May, 1903, and 12th June, 1906.
Phyllomyza securicornis, Fln. Porthcawl, 16th and 20th June, 1903,
and 4th, 20th, and 28th June, 1906.

DROSOPHILIDÆ.

- Drosophila transversa**, Fln. Porthcawl, 22nd June, 1903.
Drosophila funebris, F. Porthcawl, 2nd June, 1906.
Drosophila phalerata, Mg. Porthcawl, 12th, 15th, and 23rd June and
4th July, 1906.

Scaptomyza graminum, **Fln.** Porthcawl, 6th June, 1903, and 23rd May and 24th June, 1906.

Noterophila (Camilla) glabra, **Fln.** Porthcawl, 28th May, 1906.

EPHYDRIDÆ.

Notiphila nigricornis, **Stnh.** Porthcawl, 10th, 12th, and 30th June, 1903.

Notiphila stagnalis, **Dsv.** Porthcawl, 4th June, 1903, and 8th July, 1906.

Notiphila riparia, **Mg.** Porthcawl, 18th June, 1903.

Notiphila cinerea, **Fln.** Porthcawl, 12th June, 1903.

Notiphila dorsata, **Stnh.** Porthcawl, 12th June, 1903.

Psilopa nitidula, **Fln.** Porthcawl, 3rd June, 1903.

Discocerina obscurella, **Fln.** Porthcawl, 30th June, 1906.

Glenanthe ripicola, **Hal.** Porthcawl, 30th June, 1903, and 15th June, 1906.

Hydrellia griseola, **Fln.** Porthcawl, 8th June, 1903.

Hydrellia modesta, **Lw.** Porthcawl, 10th and 25th June, 1903.

Hydrellia ranunculi, **Hal.** Porthcawl, 12th June, 1903.

Hydrellia flavicornis, **Fln.** Porthcawl, June, 1903 (Collin), and 10th June, 1906.

Philhygria punctatonervosa, **Fln.** Porthcawl, 6th, 27th, and 28th June, 1903.

Hyadina guttata, **Fln.** Porthcawl, 25th, 28th, and 31st May, 1903; 6th June, 1903; and 27th and 30th June, 1906.

Hyadina humeralis, **Beck.** Porthcawl (Collin, "Additions, &c., British Muscidæ Acalyptratae," E. M. M., August, 1911, p. 185).

Pelina nitens, **Lw.** Porthcawl, 30th June, 1906.

Canace nascia, **Hal.** Porthcawl, 12th June and 2nd July, 1906.

Parhydra fossarum, **Hal.** Porthcawl, 8th and 25th June, 1903.

Parhydra coarcata, **Fln.** Porthcawl, 8th June, 1903.

Ilythea spilota, **Hal.** Porthcawl, 6th June, 1903.

Cœnia palustris, **Fln.** Porthcawl, 2nd July, 1906.

Scatella quadrata, **Fln.** Porthcawl, 20th June, 1903.

Scatella sorbillans, **Hal.** Porthcawl, 18th, 23rd, and 24th June, 1903.

Scatella æstuans, **Hal.** Porthcawl, 8th and 17th June, 1903.

Scatella stagnalis, **Fln.** Porthcawl, 10th May and 19th June, 1903.

CHLOROPIDÆ.

- Platycephala planifrons*, F. Port Talbot, 3rd August, 1908.
Meromyza pratorum, Mg. Porthcawl, 12th June, 1903, and 1st July, 1906.
Meromyza nigriventris, Macq. Porthcawl, 14th June, 1906.
Centor (Cetema) myopinus, Fln. Porthcawl, 24th June, 1906.
Eutropha fulvifrons, Hal. Porthcawl, 19th June, 1906.
Diptotoxa messoria, Fln. Porthcawl, 25th May, 1903, and 3rd June, 1906.
Chlorops tæniopus, Mg. Porthcawl, 28th May and 20th June, 1903.
Chlorops humilis, Lw. Porthcawl, 22nd June and 1st July, 1903.
Chlorops hypostigma, Mg. Porthcawl, 26th May and 2nd June, 1903.
Chloropisca circumdata, Mg (*ornata*, Lw., *nec*, Mg., and ? *notata*, Zett.).
Porthcawl, 20th and 26th May, 2nd June and 7th July, 1903.
Chloropisca glabra, Mg. Porthcawl, 27th June, 1906.
Chloropisca obscurella, Zett. Glamorganshire (Collin).
Siphonella oscinina, Fln. Glamorganshire (Collin).
Siphonella tristis, L. Porthcawl (Collin).
Dicræus tibialis, Macq. Porthcawl, June, 1906.
Elachyptera cornuta, Fln. Porthcawl, 26th June, 1903.
Gaurax ephippium, Zett. Porthcawl (Collin).

AGROMYZIDÆ.

- Agromyza geniculata*, Fln. Porthcawl, 18th June, 1906.
Agromyza scutellata, Fln. Porthcawl, 27th May, 1906.
Agromyza cunctans, Mg. Porthcawl, 31st May, and 15th June, 1903.
Ceratomyza (Cerodonta) denticornis, Pz. Porthcawl, 25th June and 10th July, 1903; 3rd, 27th, and 29th June, 1906.
Leucopis griseola, Fln. Porthcawl, 1st July, 1906.
Ochthiphila polystigma, Mg. Porthcawl, 25th, 28th, and 30th May, 1903.
Ochthiphila juncorum, Fln. Porthcawl, 28th May and 6th and 17th June, 1903.

PHYTOMYZIDÆ.

- Phytomyza populicola*, Wlk. Porthcawl, 10th July, 1906.
Phytomyza terminalis, Mg. Porthcawl, 22nd June, 1903.
Phytomyza flavicornis, Fln. Porthcawl, 20th May, 1903.

Phytomyza geniculata, Macq. Porthcawl, 4th, 18th, and 28th June, 1906,
and 16th and 20th June, 1903.

Chromatomyia ilicis, Curt. Porthcawl, 20th May, 1903.

HIPPOBOSCIDÆ.

Hippobosca equina, L. Cadoxton-juxta-Neath, 11th October, 1898
(Dr. Thomas).

Ornithomyia avicularia, L. Porthcawl, 1st July, 1903, on hotel window.
Lavernock, one ♀ off a Wood Pigeon, 23rd September, 1916
(Hallett).

BIOLOGICAL AND GEOLOGICAL SECTION.

REPORT FOR THE 31ST SESSION, 1917-18.

COMMITTEE.

THE PRESIDENT AND HON. SECRETARY OF THE C.N.S. (*ex-officio*).

Professor T. FRANKLIN SIBLY, D.Sc., F.G.S. (*President*).

Professor W. N. PARKER, Ph.D., F.Z.S. (*Vice-President*).

WM. EVANS HOYLE, M.A., D.Sc.

HAROLD EVANS.

J. J. NEALE, J.P.

ERNEST HEATH, F.R.M.S., } *Hon. Secretaries for Field Walks.*

H. EDGAR SALMON (*Hon. Treasurer*).

J. DAVY DEAN (*Hon. Secretary*).

The number of Members on the books of the Section at the time of the Annual Meeting was 78.

During the Session Mr. R. W. A. Southern resigned the office of Hon. Treasurer, and Mr. H. Edgar Salmon was elected in his stead.

In the course of the Session five Ordinary Meetings, one Exhibition Meeting (January 17th, 1918), and the Annual Meeting (October 24th, 1918), have been held, with an average attendance of 17.

The following papers have been read:—

- Nov.* 15, 1917. H. M. HALLETT, F.E.S. "Insect life on the Wallesey Sand Dunes" (communicated).
 J. DAVY DEAN. "A new *Xerophile* Mollusc in Glamorgan, *Helicella heripensis* (*Mabille*)."
- Dec.* 13, 1917. JOHN GRIMES. "Notes on plants and wood-boring insects."
- Feb.* 14, 1918. A. E. TRUEMAN, D.Sc., F.G.S. "Ammonites."
- Mar.* 14, 1918. A. LOVERIDGE. "Notes on East African Fauna" (communicated).
 F. T. HOWARD, M.A., F.G.S. "The Cloud-burst in the Vale of Neath."
- Apr.* 18, 1918. Professor T. FRANKLIN SIBLY, D.Sc., F.G.S. "The Carboniferous Limestone of the Cardiff District."

The following exhibits were made and commented on :—

- Nov. 15, 1917. WM. EVANS HOYLE, M.A., D.Sc. A specimen of *Vipera berus*, showing the genital organs.
- Dec. 13, 1917. J. DAVY DEAN. Specimens of *Anopheles maculipennis* and *Theobaldia annulata*.
- Jan. 17, 1918. MISS E. VACHELL, F.L.S. Rare Plants.
- J. DAVY DEAN. Snails used as food in parts of Europe.
- T. BUTT EKINS. Rare *Lepidoptera* from Glamorganshire and Gloucestershire.
- JOHN GRIMES. Wood-boring insects.
- E. HEATH, F.R.M.S. *Foraminifera*.
- W. EVANS HOYLE, M.A., D.Sc. Selections from the Briggs Collection of *Neuroptera* and the T. W. Proger Collection of Birds.
- JOHN HUTCHINSON. Iron Ores from the Llanharry Mines.
- D. PUGH-JONES. Fossils.
- F. F. MISKIN. New Zealand Coal with Fossil Gum attached. Specimens from the Rhætic Beds at Lavernock.
- H. EDGAR SALMON. Termites from East Africa. Mole Cricket and nest of bird from the Balkans.
- Professor T. FRANKLIN SIBLY, D.Sc., F.G.S. Iron Ore from the Forest of Dean. Igneous Rocks from Cornwall.
- F. G. TRESEDER. Flower, vegetable, and grass seeds.
- A. E. TRUEMAN, D.Sc., F.G.S. Ammonites from the Lias.
- Oct. 24, 1918. J. DAVY DEAN. *Lepidoptera* from the Rippon Collection (by permission of the Director, National Museum of Wales), illustrating the "Moths of the Limberlost," by Gene Stratton-Porter.

J. DAVY DEAN,

Hon. Secretary.

CARDIFF NATURALISTS' SOCIETY.
BIOLOGICAL AND GEOLOGICAL SECTION.

Treasurer's Account for the 1917-18 Session.

	£	s.	d.	£	s.	d.	
1917.							
Oct. 1.	To 5 per cent. War Loan ..	52	12	7			
	„ Cash at Bank ..	27	3	10			
	„ Cash in hand ..	0	12	7			
		—————			80	9	0
1918.							
Sept. 30	„ Interest on War Loan ..	2	12	6			
	„ Interest on Deposit Account ..	0	10	7			
	„ 53 Subscriptions at 2s. 6d. ..	6	12	6			
		—————			£90	4	7
	Sept. 30.						
	By Printing, &c. ..						
	„ Postages and Sundries ..						
	„ Hire of Lantern ..						
	„ Balance —						
	5 per cent War Loan				£52	12	7
	Cash at Bank				26	17	8
	Cash in Hand				7	4	3
					—————		
					86	14	6
					£90	4	7

H. EDGAR SALMON,

Hon. Treasurer.

Audited and found correct.

ERNEST HEATH.

14th November, 1918.

JOHN GRIMES.

PHOTOGRAPHIC SECTION.

REPORT FOR THE SIXTH SESSION, 1917-18.

The Committee has much pleasure in presenting its Seventh Annual Report on the work of the Photographic Section for the Session 1917-18. The interest, considering the trying times through which we have passed, was quite good, and attendances at the Meetings still maintained.

The syllabus for the year included two demonstrations, one of "Ozobrome Printing" and one on "Development of Roll Films," also three lectures illustrated by lantern slides and several exhibitions of prize slides and pictures.

During the Session, three members were successful in the London Salon of Photography, namely, Mr. J. A. Lomax, who had no less than six pictures accepted and hung, Mr. Hugo van Wadenoyen, and Mr. Harry Storm, had three pictures each accepted and hung.

The membership of the Society was fully sustained and it, was reported that 25 were on service. The Committee regretted however, to report that one of the most popular and active members of the Society, namely, Mr. Joseph Bridge, had passed away. He was taken ill while at home on leave from the Forces and his illness resulted in his death.

The Statement of Accounts presented at the Meeting also showed that the financial position of the Society had been maintained.

The best thanks of the members were accorded to Mr. J. Stuttard, who had remained in office as President of the Society for two years, and also to Mr. Harry Storm, the Honorary Secretary, to whose joint energies and enthusiasm the continued satisfactory state of the Section was mainly due.

HARRY STORM,

Hon. Secretary.

REPORT OF THE COUNCIL.

FOR THE

Year ending September 30th, 1918.

The Council has pleasure in submitting to the Members the Fifty-first Annual Report of the Society.

The number of Members at September 30th,					
1917, was	..	..	..	..	461
Elected during 1917-18	..	..	..	..	79
					<hr/>
					540
Deaths	..	..	..	..	4
Removals	..	..	..	..	5
Resignations	..	..	..	..	10
					— 19
					<hr/>
Total Membership September 30th, 1918					521
					<hr/>

The Members are distributed thus:—

Honorary Members	..	..	..	..	4
Ordinary Members	..	..	..	..	490
Life Members	..	..	..	..	15
Non-Resident Members	..	..	..	..	5
Corresponding Members	..	..	..	..	7
Associates	..	..	..	..	0
					<hr/>
					521
					<hr/>

The Council regrets to report the death of the following Members during the year:—Mr. J. W. Barker, Mr. George David, Mr. William Lewis, and Second-Lieutenant A. Rumbelow, S.W.B. (killed in action on April 16th, 1918).

The following is a list of papers read at Members' Meetings, viz. :—

1917.

Oct. 18. Fiftieth Annual Meeting. Presidential Address by Mr. J. J. Neale, J.P.—“The Survival of the Unfittest.”

- Nov. 8. Mr. R. Bonner Morgan—"Shakespeare and Music."
Dec. 6. Mr. John Ballinger, M.A.—"The Buildings and Work
of the National Library of Wales."

1918.

- Jan. 10. Dr. W. Evans Hoyle, M.A.—"Animal Toilets"
(Children's Lecture).
Feb. 7. Mr. W. P. James—"Books and Travel."
Mar. 7. Dr. D. R. Paterson—"The Vikings in Glamorgan."

The following Public Lectures have been delivered during
the year, viz. :—

1917.

- Oct. 25. Mr. Edgar Griffiths—"Aeroplane Development."
Nov. 22. Professor Bernard Pares—"Russia's Chance of
Recovery."
Dec. 20. Miss Bennet Burleigh—"Twice through the German
Lines."

1918.

- Jan. 24. Dr. Vaughan Cornish, D.Sc., F.R.G.S., F.G.S.—
"The Strategic Geography of the British
Empire."
Feb. 21. Mr. Edgar Bellingham—"Spain, Past and Present."
Mar. 21. Dr. Marie C. Stopes, F.L.S.—"The Cinema and the
Naturalist."

The Meetings were held in the Whitehall Rooms, with the
exception of the last, for which the Cory Hall was used.

The thanks of the Society are due to Members who have
read papers, and also to those who entertained the Lecturers.

During the Session messages of congratulation were received
from several kindred Societies on the attainment of the
Society's Jubilee, but it was decided to postpone all celebration
of the event until the end of the War. On June 15th, 1918,
the President and several Members of the Council paid a visit
to Mr. Evan John, J.P., of Llantrisant, the sole surviving
original Member of the Society.

Owing to the War, Field Meetings were not held during the
Summer, but in order to preserve the continuity of the Annual
Ladies' Day a visit was paid to Llandaff Cathedral on the
afternoon of Wednesday, July 3rd, 1918. Over 80 Members
attended, and were met by the Rev. Canon David Davies, M.A.,

who kindly conducted the party over the Cathedral, and explained its principal features. At the conclusion, a Meeting of Members was held in the Prebendal Hall, when Mr. H. Edgar Salmon was elected President for the 1918-19 Session.

Most of the material for Vol. L. of the Transactions is in hand, but publication has been deferred for the present. The question of publication will shortly be further considered by the Editorial Committee.

The Conference of Corresponding Societies of the British Association was held in London on July 4th, 1918, and was attended by Mr. J. Davy Dean as the Society's Delegate.

The projected visit of the British Association to Cardiff in 1918 has been postponed, and will probably not be held until after the end of the War.

Mr. H. M. Hallett, F.E.S., has been re-appointed for a period of three years as the Society's representative on the Court of Governors of the National Museum of Wales.

In January, 1918, an announcement was made to the effect that it was intended to use the British Museum and the Natural History Museum as Government Offices. At a Special Meeting of the Council the following Resolution was unanimously passed, viz. :—

“ That the Council of the Cardiff Naturalists' Society has
“ heard with surprise and dismay of the scheme for using
“ the British Museum and the Natural History Museum
“ as Government Offices. If the specimens are packed
“ with due care, the task will occupy a very long time ; if
“ the work is done hurriedly, irreparable damage to the
“ collections will result. The collections, especially those
“ of the Natural History Museum, constitute a mine of
“ information which has been of service during the War,
“ and should be kept available for future reference. The
“ Council respectfully, but with all earnestness, requests
“ the Government to reconsider its decision.”

This was telegraphed to the Prime Minister and other Members of the Government and it was gratifying to find that the protests made by this and other Scientific Societies throughout the country had the desired effect.

Representations were made by the Council to the Committee of the Privy Council for Scientific and Industrial Research requesting that the work of the Committee should be extended, at the earliest opportunity, to the Natural History Sciences, and that an Assessor should be appointed as a representative of those Sciences. Other Natural History Societies made similar representations.

The Memorial Tablet to the late Dr. C. T. Vachell (kindly designed by Sir W. Goscombe John, R.A.) has now been cast in bronze, and will be fixed in the National Museum of Wales when the building is completed. The Architects of the National Museum have designed a suitable setting and framing for the tablet.

In view of the impending departure of Principal E. H. Griffiths, Sc.D., F.R.S., from Cardiff, the Council entertained him to supper on July 11th, and made a presentation to him as a memento of the active interest he had taken in the work of the Society since 1900.

The Council desires to express its thanks to Dr. E. Walford, D.P.H., F.R.Met.Soc., for again kindly editing the Meteorological Report.

The Biological and Geological, and the Photographic Sections have held several meetings during the year, and have been able to maintain a fair measure of activity. It has not been possible to arrange any meetings of the Archæological Section, but it is intended to resume field work as soon as the War ends. Many Members of the Sections are engaged on Military duty or National Service, but it is hoped that the Members who remain will make a special effort to support the work of the Sections until normal conditions return.

The Annual Statement of Accounts is presented herewith.

J. J. NEALE,

President.

GILBERT D. SHEPHERD,

Hon. Secretary.

CARDIFF NATURALISTS' SOCIETY.

Dr. Revenue Account for the Year ending 30th September, 1918. Cr.

	£	s.	d.	£	s.	d.
To Members' Meetings			38			6
„ Stationery, Printing, etc.			19			17
„ Reserve for Printing, etc.			100			0
„ General Expenses			73			3
„ Field Meetings			2			11
„ Lectures			95			10
„ Less Receipts			1			3
			94			7
„ Conversazione Reserve			23			2
„ Balance to next year's Account			521			3
			£872			11
						0
By Balance from last year's Account						481
„ Subscriptions—Ordinary						349
„ Life Subscriptions						7
„ Dividends and Interest						34
„ Sundry Receipts						0
						8
						0

CARDIFF NATURALISTS' SOCIETY.

Balance Sheet, 30th September, 1918.

LIABILITIES.	£	s.	d.	ASSETS.	£	s.	d.
Sundry Creditors .. .. .	..	25	12	Value of Furniture .. .. .	..	..	10 10 0
Subscriptions paid in advance .. .. .	..	..	2	Library .. .. .	..	..	26 3 6
Reserve for Printing, etc. .. .. .	..	..	100	Reports unsold .. .. .	..	..	5 0 0
Conversazione Reserve Account .. .. .	..	..	156	" Cardiff Flora " unsold .. .. .	..	..	0 1 0
Balance, being excess of Assets over Liabilities .. .. .	..	521	3	" Glamorgan Flora " unsold .. .. .	..	..	0 1 2
				£350 5 per cent. War Loan, 1929-47, at Issue Price of 95 .. .. .	..	..	41 15 8
				£200 Barry Railway Company Consolidated 4 per cent. Preference Stock (at 74) .. .. .	..	..	332 10 0
				Cash at Lloyds Bank, Limited, viz. :—			
				Deposit Account .. .. .	..	..	203 14 7
				Current Account .. .. .	..	..	79 0 11
							282 15 6
							£805 1 2

(Signed) A. BROWN, Hon. Treasurer.
CARDIFF, 7th October, 1918.

(Signed) T. W. PROGER, Hon. Auditor,
CARDIFF, 8th October, 1918.

CARDIFF NATURALISTS' SOCIETY.

ESTABLISHED 1867.

Past Presidents.

- 1868—WILLIAM ADAMS, C.E., F.G.S.
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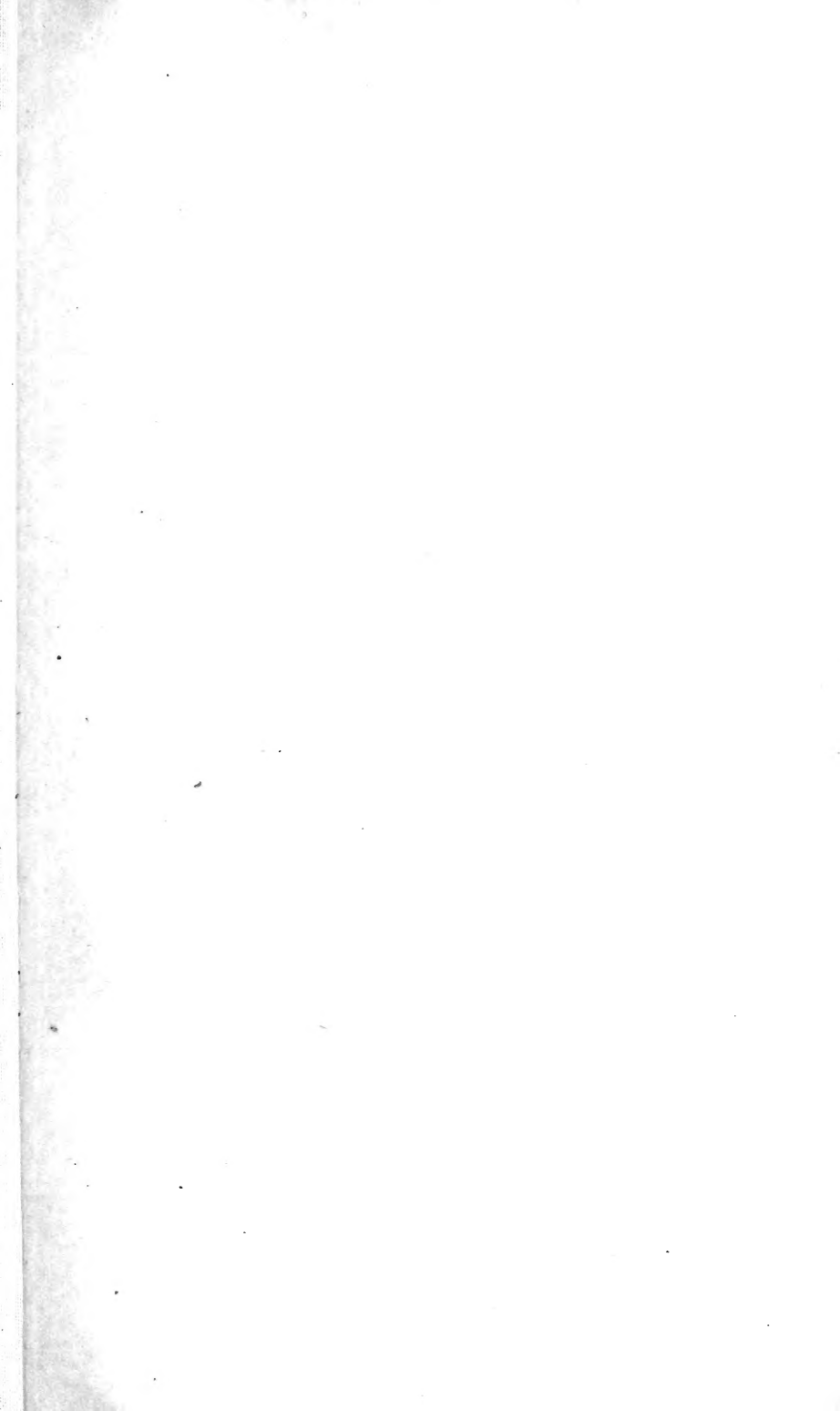
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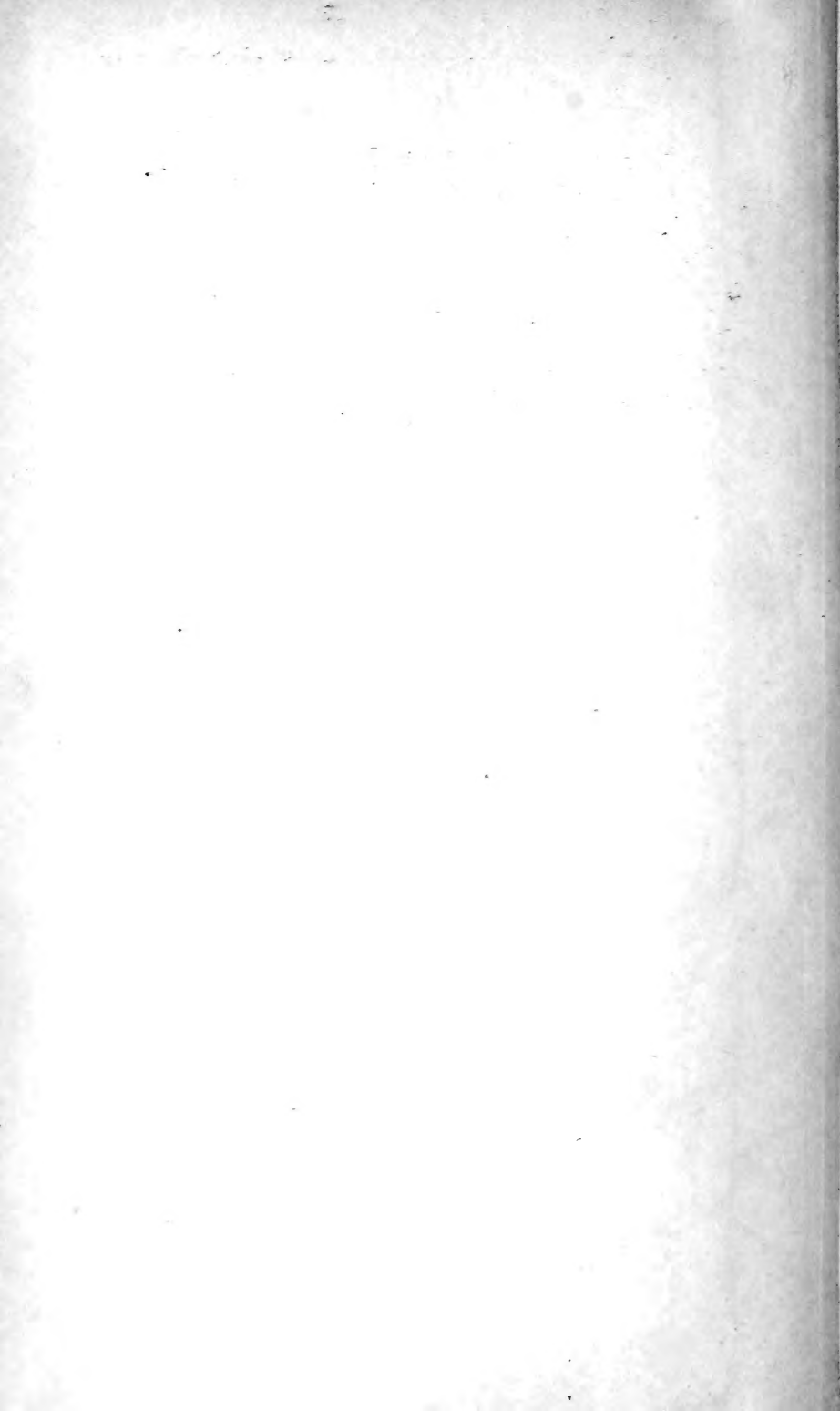
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