CLEVELAND NATURALISTS'

FIELD CLUB

RECORD OF PROCEEDINGS
1928 TO 1932

VOL.IV. Part 2

Edited by
T.A. LOFTHOUSE F.R.I.B.A., F.E.S
AND
M. ODLING M.A., B.Sc.,F.G.S.

PRICE THREE SHILLINGS
(FREE TO MEMBERS)

MIDDLESBROUGH;
H & F STOKELD
1932

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OFFICERS

Elected at the 48th Annual Meeting on April 5th 1929

President: S A Sadler J.P.

Vice Presidents:

J J Burton O.B.E., J.P., M.I.M.E., F.G.S — Miss E Calvert
Frank Elgee — H Frankland F.I.C
E W Jackson F.I.C., F.C.S., F.G.S. — T A Lofthouse F.R.I.B.A. FE.S
J W.R Punch — M L Thompson F.E.S

Joint Honorary Secretaries:

M Odling M.A., B.Sc., F.G.S — H N Wilson A.I.C.

Honorary Treasurer: H Frankland F.I.C.

Committee (In addition to the above officers**)**

Rev A J Holloway M.A. — Mrs C Hood — Chas Postgate
Dr A S Robinson M.A. — C H Robertson — Mrs H N Wilson

Editor of Proceedings: E W Jackson F.I.C., F.C.S., F.G.S

(On October 31st Mr W Charlton was elected Treasurer to fill the vacancy caused by Mr Frankland's death)

Elected at the 49th Annual Meeting on March 26th 1930

President: S A Sadler J.P.

Vice Presidents

J J Burton O.B.E., J.P., M.I.M.E., F.G.S — J W R Punch
T A Lofthouse, F.R.I.B.A., FE.S. — Miss E Calvert
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Honorary Auditor: W W Sills

Elected at the 50th Annual Meeting on March 21st 1931

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Vice Presidents:

J J Burton O.B.E., J.P., M.I.M.E., F.G.S. — J W R Punch F.R.A.S.
Miss E Calvert — Dr A S Robinson M.A., M.B.
Frank Elgee — S A Sadler J.P.
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E L Davison — T F Newham — Rev A J Holloway M.A.
Chas Postgate — Mrs H N Wilson — W W Sills

Honorary Auditor: W W Sills

OFFICERS

Elected at the 51st Annual Meeting on April 6th 1932

President: T A Lofthouse F.R.I.B.A., F.E.S

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Frank Elgee	Dr A S Robinson M.A., M.B
Mrs C Hood.	S A Sadler J.P.
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Joint Honorary Secretaries:

M Odling M.A., B.Sc., F.G.S. H N Wilson F.I.C.

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E L Davison	T F Newham	W W Sills
Rev A J Holloway M.A,	Chas Postgate	Mrs H N Wilson

Honorary Auditor: W W Sills

PAST PRESIDENTS

1881 - Dr W Y Veitch M.R.C.S.	1907 – Mr J J Burton F.G.S.
1882 - Do	
1883 – Mr J S Calvert	1908 Do
1884 – Mr T F Ward	1909 – Mr T A Lofthouse A.R.I.B.A.
1885 - Do	1910 - Do
1886 – Mr Angus Macpherson	1911 – Mr J W R Punch
1887 - Do	
1888 – Mr J M Meek	1912 - Do
1889 – Dr W Y Veitch M.R.C.S.	1913 – Mr J S Calvert
1890 - Do	1914 – Mr W Sachse
1891 – Rev J Hawell, M.A.	1915 – Mr W H Thomas
1892 – Mr R Lofthouse	1916 - Do
1893 – Mr T D Ridley	1917 - Do
1894 – Mr Angus Macpherson	1918 – Mr M L Thompson
1895 – Rev J Hawell, M.A.	1919 - Do
1896 - Do	1920 – H Frankland F.I.C.
1897 – Mr J M Meek M.A.	1921 - Do
1898 – Mr W H Thomas	1922 – Frank Elgee
1899 - Do	1923 - Do
1900 - Do	1924 – Miss E Calvert
1901 – Mr T F Ward	1925 - Do
1902 - Do	1926 – E W Jackson F.I.C., F.C.S., F.G.S
1903 – Rev J Hawell M.A., F.G.S	1927 - Ald. S A Sadler J.P.
1904 - Do	1928 - Do
1905 – Rev J Cowley Fowler B.A., F.G.S	1929 - Do
	1930 - Do
1906 – Mr H Simpson	1931 – T A Lofthouse F.R.I.B.A., F.E.S

48th Annual Report
Session 1928 – 29

Since the last Annual Meeting, the Field Club has again had the pleasure of seeing the name of one of its members in the King's Honours List. In the autumn of 1928 Mr. J.J. Burton, our only remaining founder member and first Secretary, reached the age of eighty and in the Spring of 1929 His Majesty conferred on him the dignity of the Order of the British Empire. Both these occasions have been suitably recognised by addresses kindly lettered by Mr. Ivo Brunton. The Saturday Field Meetings have been well attended; on two occasions the attendance being greater than any since pre-war days. The Whitsun weekend meeting at Middleton-in-Teesdale was very successful in spite of the fact that it rained rather heavily on the Saturday afternoon and Sunday morning. It is regrettable however, that only those who attended the Coxwold meeting in 1927 took part in it. Your Committee recommend that the meeting this Whitsun should be held at a place that will allow of members joining the Yorkshire Naturalists at Pickering, and that the Field Club should meet at Pickering or at Goathland. The Wednesday Evening meetings have not been supported as well as could be desired, with one exception, when there was a record attendance, and your Secretaries consider that the question of continuing the same should be carefully considered. Two special Field meetings have also been held for the benefit of Associate members. The winter meetings have been well attended, and have included lectures from three non-members, one of whom has since become a member, and a lecture from one member elected only during this session. It is highly satisfactory to find that recently elected members not only come to meetings, enter into discussions or lead expeditions, but nominate new members.

Your Secretaries much regret that they have again to record a loss to the Club by death. Mr. W. G. Appleyard, M.B.E., who was elected to the Committee at the last Annual Meeting, died suddenly after a very short illness, ten days after making a very humorous speech at a meeting of the Field Club; only those who met him on expeditions and especially at the Whitsun week-end meetings, will realise what the Club has lost by his death. Although there has been a steady increase in membership, the numbers are still below what it once was, and it is hoped that members will endeavour to get the membership up to at least 150 before the commencement of the 50th year of the Club's existence. During the year the Club has lost one member by death, three members by resignation (of which two have left the district), and one Associate member who left the district) and one Associate member who has temporarily resigned owing to inability to attend meetings, having gained a scholarship at the University of Liverpool. Our membership therefore, now stands at 130 against 100 at the last Annual

Meeting, and the number of Associates remains at 7. The Field Club is affiliated to the Northern Naturalists' Union and the Yorkshire Naturalists' Union. Members are reminded that they are entitled to take part in all meetings of these two bodies. Owing to the fact that details of meetings are only received by your Secretaries a few days before and usually just after the Field Clubs meetings have been sent out, it is impossible for these details to be sent to every member, owing to the cost of postage, to say nothing of the Secretaries' time in addressing and folding same. Notices of these meetings can therefore only be sent to those members who ask for them in accordance with Rule 7. Your Club is also in touch with other local Natural History Societies -viz.- The Darlington and Teesdale Naturalists Field Club and the Whitby Field Club with a view to holding joint meetings. The Middlesbrough branch of the Geographical Association are also endeavouring to arrange their meetings so as not to clash with ours and are welcoming your members at any of their Field meetings: Much is to be gained by such co-operation; not only is the cost of printing circulars lowered by joint meeting (each party paying their share), but the interchange of ideas is of mutual benefit. The Club exists for the benefit of all its members, not for a limited few, and your committee cannot arrange expeditions, lectures, etc., to suit the greatest number unless members state their wishes. During the year a letter of congratulation was sent to the Ashmolean Naturalist History Society of Oxfordshire on the celebration of their centenary. Owing to a number of unexpected delays, the first part of Volume IV of your Proceedings has not yet been published. Your editor now has the complete typescript in his hands, and the galley sheets of all but about 3 pages have been corrected. Excavations have been continued at Eston Nab, and it is suggested that further excavations should be carried out if subscriptions for this purpose are forthcoming. The usual Congress of Natural History Societies was held at the Glasgow meeting of the British Association under the Presidency of Dr. Vaughan Cornish, whose address was "The Preservation of Scenic Beauty in Town and Country:" The report of the Congress will be available for members at the Dorman Museum. Owing to the British Association Meeting being held this year in South Africa, this year's conference will be held at Havre, under the Presidency of Dr. F. A. Bather.

49th ANNUAL REPORT.
SESSION 1929-30.

Since the last Annual Meeting, the activities of the Field Club have been well up to standard; and in spite of the abnormally hot summer, the attendances at the Field Meetings have been good. Several members, however, have complained of the discomfort of crowded buses, and have, as a consequence, not attended meetings involving bus journeys, especially as the return journey by bus cannot always be arranged to start at the terminus. This difficulty could largely be obviated if members would signify their hope of being able to be present on receipt of their syllabus card, as by this means it would be possible to provisionally book special conveyances. To arrange for special conveyances during the summer at a few days' notice is virtually impossible. During the session, 8 Field Meetings were held including one by invitation of the Darlington Naturalists' Field Club, and one to which the Whitby Naturalists' Field Club was invited. The subjects covered by these Expeditions were Geology and Topography, Archæology and Architecture, Ornithology, Field Botany, and Entomology. Malachology, (Conchology) and general Zoology do not seem to have a sufficient following to justify the arranging of special meetings for these. Owing to the lack of support, no evening meetings were held, but Mr. Lofthouse and Mr. Odling threw open their gardens on one evening a week; the number of members who availed themselves of this was so small as not to justify their remaining at home on the offchance of any members coming. The Winter lectures have been fewer than usual, owing to unfortunate circumstances largely due to the difficulty in arranging for the Lecture on Durham Castle, but the following lectures were delivered before an appreciative audience: (1) A meeting at the Dorman Museum at which Mr. Elgee described the new arrangement of the Archæological collections, and afterwards gave a graphic account of the results of the excavations on Eston Nab, explaining how the inhabitants of the camp boiled their water, and his reason for believing that cannibalism existed in the camp when the refugees were hard pressed. (2) A Lost Cleveland Industry at which Mr. H. N. Wilson very lucidly described the history of the Alum Industry, not only in early days, but with special reference to Cleveland, together with notes on its origin and the methods of manufacture. What appeared to puzzle the lecturer most was not that the yield was small, though for a time profitable, but that there should have been any yield at all; the Industry having been founded on the mistaken idea that what are now known as the Alum shales were similar to certain deposits in Italy from which Alum was obtained. (3) A Conversazione meeting which was extremely well attended, and at which the exhibits were very varied and covered most branches of the Field Club's activities. Amongst the exhibits

was a number of ship models with the rigging constructed of spun glass and human hair; war relics including fragments from the Zeppelin brought down near West Hartlepool, exhibited by Dr. Robinson. Drawings and sketches of Old Middlesbrough exhibited by Mr. T. A. Lofthouse. Early posters of the Stockton and Darlington Railway and an old Tinder Box, exhibited by Mr. Hudson; Entomological specimens, exhibited by Mr. M. L. Thompson. Caddis Cases, made by the Larvae of the May Fly, both of natural materials and of materials specially supplied to them; also living specimens, freshwater snails and a curious plant, exhibited by Mr. Odling, and a series of old books, etc., by Canon Atkinson, described by Mr. F. Elgee. After very enjoyable refreshments, provided by Alderman and Mrs. Sadler, Mr. Cleveland Hood showed an admirable series of cinematographic films. (4) The Evolution of the Lake District by Mr. J. W. R. Punch. At this exceptionally well attended meeting, Mr. Punch in his usual lucid manner, traced the history of the Lake District from early geological times, showing how the main features were the result of a steady upheaval in late or early post carboniferous times and not (as is commonly thought, owing to the presence therein of volcanic rocks) of a volcanic upheaval. The effect of the Ice Age in modifying the outline of the hills and valleys was very clearly described, and the Lecture was illustrated by a series of exceptionally beautiful slides to which the lantern did not do justice. (5) Durham Castle by Dr. C. E. Whiting. This lecture was not as well attended as could have been wished, in spite of the publicity given to it. The history of the Castle was traced from its commencement, and its importance as a Historical Monument was stressed. Not being a ruin, Government help towards protecting it from immediate disaster is unobtainable, and the only chance of its being saved is by public subscription. The lecture was illustrated by a number of beautiful slides.

Again the Club has had to record the loss by death of two valuable members. Mr. Henry Frankland was the third senior member of the Club, having been elected on June 10th, 1882, and was an active member throughout his 47 years connection with the Club, during which time he conducted numerous expeditions. He was President in 1920 since when he has been a Vice-President; it was however, as Treasurer, a post that he held continuously for 20 years, that he was best known. To his work as Treasurer the Club very largely owes its present healthy position. Mr. C. H. Robertson was elected a member on November 30th, 1926, and became a regular attendant at the winter meetings, and such of the Field Meetings as did not involve much climbing. In March 1928, he was elected to fill a vacancy on the Committee, which meetings he regularly attended. Since the last Annual Meeting 11 members have resigned and 13 have been elected. The position, however, in regard to Associate members is not satisfactory; of the 7, only 3 paid their subscriptions last year,

and of these, replies have only been received from one, and as Associate members are subject to annual re-election, all but the one whose subscription has already been received, automatically cease to be associates unless this meeting shall decide otherwise. The membership therefore, stands at 130, the same as last year with one Associate in lieu of 7. That there is an interest in Natural History and Natural Science in the district, is shown by the big attendances at the Gilchrist lectures last year and the Lectures for the People this winter, and the question arises as to whether it is not time that the activities of the Field Club should be widened to include other subjects such as Photography and Geography by means of providing facilities for these subjects which are at present being catered for by other societies who are not exactly flourishing. By this means, much overlapping of interests could be avoided, as well as dates of meetings, and one subscription in lieu of two or three would afford members an opportunity of following their particular speciality.

During the year, your Committee have met on six occasions, and a special general meeting was called under rule 10 at which Mr. W. Charlton was appointed Treasurer to fill the vacancy due to the death of Mr. H. Frankland. At Mr. Charlton's request, the Committee appointed an Honorary Auditor in Mr. W. W. Sills, Certified Accountant, 64, Borough Road West, Middlesbrough, who is a member of the Club. During the year the first part of the fourth volume of the Proceedings was published and distributed to all members whose subscription was not in arrear. At the Annual Meeting of the Northern Naturalists' Union, our third senior member, Mr. T. A. Lofthouse, was elected President, and as a result the Northern Naturalists will be meeting in Middlesbrough on Saturday, March 29th.

During the summer, further excavations were conducted on Eston Nab; the results of which were described by Mr. Elgee in October. During the year the Field Club has received the Naturalist and the Vasculum, also several other books and pamphlets have been presented.

50th ANNUAL REPORT.
SESSION 1930-3l.

The 50th year of the Club's activities has passed off without anything of special importance. Generally considered, meetings and lectures have been well attended. Field Meetings starting before about one o'clock however, have proved failures; but members are reminded that these meetings were arranged by a

sub-committee appointed at the last Annual Meeting and to places suggested at that meeting. During the year there have been a number of resignations owing to the inability of members to attend meetings or to their having left the district, and unfortunately there appears to be a probability of further resignations for these reasons. On the other hand, a number of new members have been elected, so that actually membership stands at 133, i.e., three above last year. With regard to Associate members, there seems to be every probability of an increase, as Miss Whitfield of the Kirby School is desirous of a number of her pupils joining. During the year the Club has lost by death two members. Dr. F. A. Stead, who, though not taking an active part in the Field Club, kept up the connection of his father, who was a very active member in the early days of the Club, and to whose (amongst others) energy the present flourishing condition of the Field Club is undoubtedly due. Sir Arthur Dorman had been a member for over twenty-nine years, and his interest in the Field Club was shown by the arrangements he made for our visits to Greytowers. Though best known to the general public by his industrial activities, his knowledge and interest in Horticulture, and especially Arboriculture, was known to many. The sympathies of the Field Club were also extended to our second senior member on the sudden death of Lady Bell, whose death occurred within a week of our visit to Mount Grace. During the year your Committee have carefully considered the question of the form celebrations of the Jubilee year should take, and they recommend that a fresh issue of Proceedings should be put in hand immediately to include all hitherto unpublished material, and that a Dinner should be held towards the end of October or early September, to which Delegates of neighbouring societies should be invited. Your Committee have also been considering the question of finance, and are somewhat perturbed by the fact that the surplus of income over expenditure allows of very little being put on one side towards future publications, which they consider most desirable. They feel that either expenditure must be curtailed or income increased; the latter by an influx of new members, rather than by an increase in subscriptions. It is estimated that if members would comply with Rule 7, a saving of about £10 a year would be effected, and this would allow of the publication of Proceedings bi-annually. Your Committee have also considered the question of being responsible for further excavations at Eston Nab, and consider that the Field Club as such, should accept no responsibility in this matter, though it is open to any member to subscribe personally to a fund for this purpose. Your Committee regret that you will be losing the services of Mr. Pohlmann, who is leaving the district, and tender him their best wishes for success in his new position.

51st ANNUAL REPORT.
SESSION 1931-32.

Owing to the abnormally wet and uncertain weather conditions prevailing the attendances at summer meetings were often rather sparse, which would also be somewhat accounted for by it being found necessary, for various reasons, to alter dates and programmes at short notice. The winter meetings have, in general, been more varied in character and less specialized than during recent years and this has resulted in better attendances. The presentation of a lantern and screen as a Jubilee gift has involved a large saving in the Club's expenses, by allowing of only a few slides being shown at a meeting without incurring the expense of a lanternist. In December, by invitation of your President, the Jubilee of the Club was officially celebrated in the form of a very successful and well attended conversazione, graced by the presence of the Mayor and Mayoress of Middlesbrough, at which Mr. J. W. R. Punch gave an account of the origin and history of the Club, deceased Presidents being illustrated by paintings or photographs. That members of the Field Club do not restrict their activities to purely local affairs is shewn by the fact that during the year, the much coveted Lindley Medal of the Royal Horticultural Society has been presented to your President; one of your Secretaries has become a Fellow of the Institute of Chemists and the other has had a fossil named after him. It is highly satisfactory to find that interest in Natural History is reviving, after the set-back it received during the war and difficult times immediately following it; this being shown by the fact that the present membership of the Club is the largest it has ever been. Your Committee, and especially the older members thereof, however, feel that they must look to the younger members for work in recording Natural History observations if the Field Club is to have the same status at its centenary as it now has. Nothing is too trivial to report, and seemingly quite minor observations may often prove of the utmost value. Work is, for instance, now being carried out on the spread of the Grey Squirrel and the damage done by it; on the periods during which Rats and Mice (especially Voles) are prevalent or otherwise; years and conditions during which Aphis and potato disease are prevalent, etc. During the year the club has had to deplore the loss of its two senior members in Sir Hugh Bell, Bart., who, though not an active member, kept up his interest in the club, and the visits to Mount Grace Priory during recent years under his guidance will long be remembered; also in your last surviving Founder Member, Mr. J.J. Burton, O.B.E., M.I.M.E., F.G.S., J.P., after a long illness. Materials for Vol. IV Part 2 of the Proceedings are now available and will yield approximately 100 pages of type. Tenders are being invited for the printing, and it is hoped that most of the papers will be in the selected printers hands within the next 10 days. Your Committee have met five

times, and much indirect work has been carried out by informal discussions between your President and other members. It has been suggested that in order that members may be kept in touch with the work of the Club, the Annual Report and Balance Sheet should be distributed as soon after the Annual Meeting as possible, and that the Proceedings which only appear periodically, should in the future, contain only original papers and observations.

REPORT ON EXCAVATIONS AT ESTON CAMP DURING 1929.

CARRIED OUT BY MR. FRANK ELGEE BY MEANS OF SUBSCRIPTIONS FROM MEMBERS OF THE CLEVELAND NATURALISTS' FIELD CLUB.

Seven weeks work at the Eston Camp resulted in important discoveries throwing light on its age and construction. A trench through the rampart showed that this had been piled up against a massive drystone wall, which must therefore have been erected earlier than the earthen rampart. How much earlier has yet to be determined, for no datable objects have been found in the rampart or wall. Three long trenches were made inside the camp. They yielded quartzite hammer-stones, stone rubbers, occasional burnt sandstones, flint scrapers and chips. On the south side of, and just below the higher central area of the camp, an occupation site was discovered. It consisted of two lines of sandstone blocks set on edge, 3-4 feet apart, nearly 100 feet long, parallel to one another and to the rampart from which they are distant about 100 feet. Traces of fire were numerous between and outside the lines, suggesting that they had been the sites of campfires. Burnt sandstones were very numerous; some of the large blocks were also burnt; and small fragments of calcined human bone were sporadic throughout the site. Cracked burnt stones had apparently been used as potboilers and fragments of a coarse reddish pottery were frequent. Other finds included hammer-stones; rubbers; a kind of stone chopper; an arrow-head of black chert; three stone discs from 1-$1^1/_2$ inches diameter; innumerable flakes and chippings of flint; and some pear-shaped stones, possibly sling-stones. Mr. S. F. Hawkes, of the British Museum, compares the pottery to that found with bronze implements in the Heathery Burn Cave near Stanhope. This gives a late Bronze Age date for the Eston pottery. The Club is indebted to the Surveyor of the Eston Urban District Council, Mr. C. W. Cockersoll, for the loan of tools and other help; to Sir Arthur Keith of the Royal College of Surgeons, for checking the identification of the calcined human bones; and to Mr. Hawkes, of the British Museum for reporting on the pottery.

FIELD MEETINGS AND LECTURES
HELD SINCE THE
ANNUAL GENERAL MEETING 1928

SUMMER SESSION 1928

May 5	Gainford Heronry by invitation of the Darlington Naturalist's Club
May 19	Ayton to Kildale
May 23	Mr J J Burton's Garden
May 26-28	Middleton - in-Teesdale
May 31	Mr T A Lofthouse's Garden
June 13	Greytowers
June 16	Grassholm and Hury Tees Valley Water Works
June 27	Coatham Marsh
June 30	Ingleby Church and Woods
July 7	Hummersea; Skinningrove
July 18	Mr W Brunton's Farm and Mr Odling's Garden
August 18	Eston Nab
August 22	Crown End, Westerdale

WINTER SESSION 1928 – 29

Octr 26	Crustacea, E H Wakefield
Novr 30	Structure of the Pennines – H C Versey M.S.C., F.G.S
Jany 4	Conversazione Meeting
Jany 25.	Plant Galls, Miss Boll M. Sc.
Feby 27	The Travels of Birds, J F Voelcker
April 5	Annual Meeting

SUMMER SESSION 1929

May 11	Stanwick and Fawcett with the Darlington Naturalists' Field Club
June 1	Greatham Creek
June 15	Scaling Dam and Rigg Lane
July 13	Kildale
July 20	Boulby and Rockcliffe
August 21	Eston and Guisborough
Sept 7	Hilton and Castle Levington
Sept 21	Durham

WINTER SESSION 1929 – 30

Octr 31	Special General Meeting at the Dorman Museum, followed by an account of the arrangements of the collections and of recent results of the excavations on Eston Nab, F Elgee
Novr 27	A Vanished Cleveland Industry, H N Wilson
Jany 17	Conversazione and Exhibit Meeting
Feby 4	Evolution of the Scenery of the Lake District, J. W. R. Punch F.R.A.S.
March 11	Durham Castle, Dr C E Whiting M.A.
March 26	Annual Meeting

SUMMER SESSION 1930

May 10	Mount Grace Priory
May 14	Grey Towers
May 24	Greatham Creek
June 4	Saltburn and District
June 21	Bog House and Danby
June 25	Marske Hall
July 2	Stewart Park and Marton
July 5	Kilton and Liverton by invitation of the Whitby Naturalists'
August 20	Glaisdale and Egton
Septr 6	Aldborough
Septr 27	Old Hartlepool

WINTER SESSION 1930 – 31

Octr 29	Continental Drift, H C Versey D.Sc., F.G.S
Novr 26	Naturalists and the Weather J B Nicholson M.A
Jany 28	Plant Hunting in the Sierra Nevada; Spain, T A Lofthouse F.R.I.B.A., F.E.S
Feb 25	The Eston Hills, Frank Elgee
March 21	Annual Meeting and Conversazione Floods in the Esk Valley J W R Punch F.R.A.S
March 25	Wading Birds on our Coast, G W Temperley

SUMMER SESSION 1931

May 2	Great Ayton and Easby
May 16	Greatham Marsh
June 3	Saltburn
June 10	Grey Towers
June 17	Upleatham
June 20	Kirkleatham
July 4	Staindrop and Raby Castle

July 15	Acklam Church and Hall
July 25	Marton inviting the Darlington Naturalists' Field Club
August 19	Baysdale and the "Cheese Stones"
Septr 12	Sedgefield and Bishopton

WINTER SESSION 1931 – 32

Novr 18	Colour Photography as an Aid to Nature Study, Randall B Cooke
Decr 2.	Bees. Rev. T Walters M.A.
Decr 16	Jubilee Celebration with Exhibits and History of Natural History Societies in Cleveland, J. W. R. Punch. F.R.A.S.
Jany 17	The Lure of Natural History, M Odling M.A., B.Sc., F.G.S.
Feby 17	Norman Architecture, T A Lofthouse F.R.I.B.A., F.E.S
	Notes on Insects M L Thompson F.E.S
March 16	Flint Instruments, T F Newnam
April 6	Annual Meeting followed by A Talk on Birds C E Milburn.

HISTORY OF NATURAL HISTORY SOCIETIES IN MIDDLESBROUGH

J. W. R. PUNCH, F.R.A.S.

The Cleveland Naturalists' Field Club having had fifty years of continuous existence, celebrated its Jubilee by a Conversazione held on the 16th December, 1931. The Meeting took the form of a Social and Exhibition Meeting under the presidency of Mr. T. A. Lofthouse, the oldest member of the Club. Owing to the untiring efforts of himself and the Honorary Secretaries, Messrs. M.Odling and H. N. Wilson, this meeting was highly successful. Many old members, and representatives from the families of deceased members and founders, were present. During the evening the Writer gave a short survey of the history of the various Naturalists Societies, which have from time to time existed in Middlesbrough, and it is thought desirable to put the facts relative to these on permanent record before they entirely pass out of memory.

The earlier, and indeed the present, of these Societies sprang out of the Cleveland Literary and Philosophical Society. This Society was founded on the 2nd October 1863, under the name of the "Middlesbrough Atheneum" at a Meeting held in the Lodge Room of the Oddfellows Hall.

"The Atheneum" had taken one or two summer excursions, particularly in 1866. These had apparently been so successful and instructive that on the 22nd March, 1867 the "Middlesbrough Atheneum Field Club" subsequently variously called "The Cleveland Field Club" and the "Cleveland Naturalists' Club" was formed as a branch of this Society but under separate management. The Rules provided that the President of the Atheneum should also be the President of the Club and, accordingly, the Rev. V. H. Moyle became ex-officio President. William Crossley, F.C.S. (then of Jones Dunning & Co:), was, the Honorary Secretary, J. F. Elgee, Treasurer, and five sections were formed. J. J. Jones was President of the Geology section, Dr. Veitch of Botany, J. Morris of Conchology, Dr .D. Glendenning of Microscopy, and Mr. Moyle of the Antiquity sections. The first excursion was held on the 24th April 1867, and was to Guisborough, and the second to Barnard Castle. This Society continued work for about five years and then appears to have lapsed. The name "Middlesbrough Atheneum" was changed to the “Cleveland Literary and Philosophical Society" in 1868.

In that year the Philosophical Society in conjunction with the Field Club, decided to establish a Museum. Mr. Morris gave a case of shells towards this. Jno. Stevenson gave a case illustrating the manufacture of pig iron; T. Allison gave cases of fossils especially fossils from the Lias. This was the first step taken in Middlesbrough towards bringing together the present large and valuable collections displayed in the Dorman Museum. In 1871 that Society leased rooms in the building known as No. 3 Railway Crossing, lately occupied by the "Evening World," and there established a Library and Reading Rooms. In the same year, a Scientific Section was formed, and a room was set apart for this section where "a portion of the members especially devoted to Scientific pursuits might hold meetings and study classes." A microscope was purchased for the use of the members. This section did very good work. Papers on scientific subjects were read and discussed, and the following, and probably others, were published.

SCIENCE TRANSACTIONS OF THE SCIENCE SECTION OF THE CLEVELAND LITERARY AND PHILOSOPHICAL SOCIETY.

December, 1868. 1 Vol. No.1:

(a) "Geological Structure of Cleveland" by John Jones, F.G.S.

(b) "Notes on Weathering of Ironstone and Shale" by W. Crossley.

(c) "Ironstone of Cleveland and Lincolnshire" by W. Crossley.

January, 1869.2 Vol. No.1:

(a) Origin of Jet by W. Crossley.

(b) Carbon in Cast Iron by W. Crossley.

(c) List of Plants by Dr. Veitch.

(d) President's Address on the value of Scientific Societies and knowledge by Jno. Jones.

March, 1869.3 Vol. No.1:

Whin Dyke of Cleveland by Thos. Allison.

1870. 5 Vol. No. II:

New Red Sandstone of Cleveland and the Rock Salt discovered in it. By W. H. Peacock.

February, 1871. 5 Vol. No.I

Experiments in Prevention of Deposit of Fungi in Solutions of Tartaric Acid and their bearings on the origin of life by W.H. Wood.

1880 "A Ramble on the Yorkshire Coast" by Dr. Veitch.

This Section of the Philosophical Society worked vigorously for a number of years all the time assiduously collecting objects for the Museum. It appears however, to have ceased its work about 1875 or 1876.

In September 1871, the Science Section of the Cleveland Literary and Philosophical Society established a Botanical Garden in the Albert Park, which had been opened in August 1868. The position of this Garden was a little West of the small lake near by the Cannon from Sebastopol, and in it about 400 of the rarer British flowering plants, obtained with the assistance of Professor Balfour, were planted and it was intended, to bring this number up to about 1,000. Dr. Veitch, Roger Lofthouse, and a Mr. Dawson, were nominated to take charge of this garden. The garden was not a success, owing, it is gathered, to the conflict of dual management under Municipal and private enterprise. The Writer remembers the late T. F. Ward showing him the position of this garden about the year 1910. It was thought a few of the plants of a shrubby nature could be distinguished, but the garden had then really ceased to exist.

In 1876 the "Tees Valley Naturalists' Field Club" was established with the object of "investigating the botany, geology, and general natural history of the vale of the Tees." With a view to confining the membership "to those who are really interested in carrying out the objects of the Club," it was decided that the number of members should not exceed 40.

The first field meeting of this Society was held on the 18th April, 1876, and there were present :-Isaac Lowthian Bell, M.P., F.R.S. (later Sir Lowthian Bell) who was President, J. C. I'Anson (Vice-President), Edward Williams, T. D. Ridley, T. Hugh Bell (afterwards Sir Hugh Bell), Thos. Allison, Jno. Gjers, S. Hannah, Dr. Veitch and Jno. Jones who were Honorary Secretaries, and there were several visitors not members. The Meeting was held at Great Ayton for the purpose of studying the whinstone dyke. The President gave a short address on the dyke and then read the paper communicated to the Cleveland Literary and Philosophical Society in February 1869 by T. Allison, which gave a detailed description of it with two coloured sections. The second meeting was held on the following Whit-Monday at the Forcett and Merrybent Limestone Quarries, and the third in July for the study of the geology about High Force.

The Writer has not been able to ascertain any more about the activities of this Society except that in 1880 it prepared notes on the Geology and Botany of Cleveland for the use of the Yorkshire

Geology and Polytechnic Society, who visited Middlesbrough on the 14th and 15th July of that year. A copy of these notes will be found in the Middlesbrough Free Library.

In 1881 Dr. Veitch in an address, stated the Society "could scarcely be said to exist", and T. F. Ward interjected "at any rate it sleepeth soundly." In November 1878, the new Hall and rooms of the Philosophical Society in Corporation Road, Middlesbrough, were opened. A gallery was constructed around the Hall and suitable cases provided to properly exhibit the collections of the Field Club and Science Sections of the Society. Subscriptions were collected and effort redoubled for the purpose of establishing a Museum worthy of the mental vigour of the Town, and the valuable natural history objects abounding in Cleveland.

In the spring term of 1881 Dr.R.D.Roberts (subsequently the Secretary of the Cambridge University Extension Syndicate) gave a course of Lectures on "Physical Geography" in the Hall of the Philosophical Society. These lectures dealt mostly with the geological aspect of geography. They were very successful and aroused deep interest, and those who attended them wished to follow up the subject. Accordingly Frederick Brewster, the then Honorary Secretary of the Philosophical Society, issued the following notice to the members:-

> "There will be a special general meeting of the Members of this Society on Monday, the 4th April, 1881, at 8 p.m., to consider the formation of a Field Club for the purpose of putting into practice the recent lectures which have been given on Physical Geography, at which all members are requested to attend."

The meeting was duly held under the presidency of Dr. Veitch. They were present Dr. Williams, H. Morton Hedley, Robert Moore, C. Forster, W. H. Thomas, Angus Macpherson, Fred. Brewster, T. F. Ward, Bruce Smith, Dr. Malcolmson, W. H. Burnett, Roger Lofthouse and J. J. Burton. Waynman Dixon and Thos. Allison wrote apologising for their inability to attend and offering to join such a Society as was proposed. It was resolved to form a Club to be known as the "Cleveland Naturalists Field Club," whose object was to be "the practical study of Natural History, Science, Archaeology and Antiquities". Rules were approved, several of which, for example that requiring six members of the Executive Committee to be members of the Council of the Philosophical Society, were to secure the Club's close association with that Society.

Officers were elected, namely:

President	Dr. W. Y. Veitch.
Vice-Presidents	Jno. T. Belk and T. F. Ward.
Hon. Treasurer	Waynman Dixon.
Hon. Secretary	J. J. Burton.
Committee	Dr. Malcolmson, W. H. Burnett, Robert Moore, R. Lofthouse, J.S.Calvert, Angus Macpherson.

Invitations to the meeting had been confined to members of the Philosophical Society, and in order to open the Society to others, the meeting was adjourned to a later date, and an invitation to all interested was inserted m the public press. About 70 members joined the Society.

Eight excursions were fixed, viz.: (1) Saltburn by the Shore to Loftus; (2) Brotton across the moor by the "British Village" site to Castleton; (3) Ayton to Kildale; (4) Gainford to Barnard Castle; (5) Welbury to Mount Grace; (6) Castle Eden Dene; (7) High Force, (8) Loftus to Staithes.

In September 1881, the British Association for the advancement of Science was celebrating its jubilee at York, and a party of the members were to visit the Salt workings at Port Clarence on the 8th September 1881. The Club prepared a Handbook of Middlesbrough and District. Three hundred copies were presented to the Association for use of its members and were much appreciated. This book contained very useful articles on the geology (with coloured diagrams), on the Town itself and its industries and its various activities, on the fauna and flora of the district and a sketch of the history of Guisbrough Abbey. The members of the Club joined the Association during the visit, which was highly successful. For a time the Club adopted the name of the "Cleveland Naturalists Field Club and University Extension Society", but the present name alone has been used since 1886. At the annual meeting of the Club held in March 1885, its constitution was amended so as to make itself entirely independent of the Philosophical Society, and rooms were then taken in No. 7 Zetland Road. These were only occupied for a short time, and the Club soon again began to hold meetings in the premises of the Philosophical Society. The Club was well started on a successful career by 1882, and since then it has had a continuous and active existence. It has held six or seven field meetings each summer season, and a similar number of winter meetings when Lectures by Specialists, and Lectures and Papers by members have been given on subjects touching the Society's objects, Microscopical and Museum Meetings, and Exhibition Meetings when the collections of members during the field meetings have been exhibited, discussed and identified.

The late Dr. Stead gave a series of lectures, illustrated by experiments, in 1882, and later Mrs. Christopher Hood (then Miss Young), gave a course on Botany. Both were of great practical use and very successful.

The first Proceedings of the Society were published in November 1889, as an isolated part, and somehow they have not been included in the sequence of the present issue. This first part included the Annual Report for 1889, Geological Notes and Notes on the Cleveland Dyke (with section) both by Dr. Veitch, Ornithological Notes by Roger Lofthouse, Conchological and other notes by T. A. Lofthouse, and a List of Flora noted by the members during the year.

The second issue of Proceedings covered the Society's work in 1895, and there has been a continuous series issued since then covering the Society's work each year, and now forming four volumes.

The Club has entertained the Yorkshire Naturalists' Union twice. The first occasion was on the 26th October 1900, when Colonel Sadler presided. Geo. T. Porritt, the President of the Union, gave his Presidential Address, and a Conversazione and Exhibition Meeting was held with great success.

Again, on the 7th December 1910, the Union were entertained by the Club on the occasion of its Annual Meeting. The Mayor, Sir Samuel Sadler, was again to have taken the Chair, but in his unavoidable absence, Dr. Stead presided, and the President of the Union, Professor Seward of Downing College, Cambridge, the most eminent palæobotanist of our time, delivered a most valuable address on "Jurassic Flora of East Yorkshire in relation to the Jurassic Flora of the World"

As has been seen, the movement for a museum originated in the two societies whose association during their early years was so intimate and whose membership was in a large degree common. It may not therefore, be out of place to very briefly outline here the further progress of the movement until it matured into the establishment of the present municipal museum.

The collections of the two Societies were housed in the Philosophical Society's Hall from 1878 to 1884, and during that time the members wrought assiduously in adding to them from every source. By the year 1884, these collections had become so large that the space available for display and storage in the gallery of the Society's Hall became utterly insufficient. Ultimately after some negotiation an arrangement was come to under which the

collections and their cases were placed in charge of the Free Library (afterwards the Public Library and Museum) Committee of the Middlesbrough Corporation. At first they were stored in rooms in Zetland Road, but later rooms were provided on the first floor of the Dunning Street wing of the Municipal Buildings, and this formed the first Public Museum of Middlesbrough. To these were added a collection of about 700 birds, which had been purchased partly by subscription, and the valuable collection of birds and their eggs given by the representatives of the late T. H. Nelson, the Author of "The Birds of Yorkshire."

In 1901 followed the gift of Sir Alfred Pease of his African and Indian collections, and finally in 1904, the Dorman Memorial Museum the munificent gift of Sir Arthur Dorman in memory of his son Lieut. G. L. Dorman was completed and opened, and the whole of the collections were at last, and as a whole, advantageously displayed in that attractive building. Thus the zeal of the two Societies extending over so many years, for the establishment of a Public Museum was at last rewarded.

The comprehensive collection of fossils, rock and mineral specimens and shells, and a Library of scientific books of the Rev. Jno. Hawell, a past President and worker of this Club, were bequeathed to Messrs. Lofthouse, Veitch, Ward and Meek, representing the Club for the benefit of the Club and Museum, and through these gentlemen the Hawell collection has been placed in the Museum. All the gentlemen who have been named as donors were members of the Club and it may be said obtained, at least some of their inspiration to contribute through their connection with it.

Amongst other members of the Club who have made valuable contributions to the museum may be mentioned J. J. Burton, Frank Atkinson, Baker Hudson, Frank Elgee and T. A. Lofthouse, and it is not without significance that both the successive Curators of the Museum have been selected out of the membership of the Club.

The Club has had many active workers whose researches it may be safely said, have added substantially to the sum total of human knowledge. The records of these appear in our own transactions, in those of other Societies, and in books, which have been published. In addition our transactions contain valuable permanent records of much of archaeological and other interest, which were in danger of being altogether lost. Amongst these more prominent workers may be mentioned Dr. Veitch, T. M. Fallow, J. M. Meek, Canon J. C. Atkinson, R. Lofthouse, T. H. Nelson, Rev. John Hawell, Dr. Stead, W. Hornsby, J. J. Burton, M. L. Thompson, Frank Elgee, M.Odling and T. A. Lofthouse, who has just (1932)

been awarded the Lindley Medal by the Royal Horticultural Society, for his work on the flora of Spain.

Thanks to the efforts of the present Honorary Secretaries, the Club was never more vigorous than at present. It has a membership of 157, and there is an Associate Junior membership of 14.

This Society, it is felt, has made a substantial contribution to the cultural activities of Cleveland, both directly by its research work, and by its spread of scientific knowledge and its stimulation of interest in the sciences, antiquities, etc., in our area, and also indirectly by its influence and enrichment of the lives of its members. How much a knowledge of natural history, science and archaeology adds to the interest and variety in life! Such a knowledge is an entrancing recreation. It stimulates bodily, mental and spiritual health; awakens a love of nature, an appreciation of beauty, and stimulates ideality in an age not conspicuous for it; and so leads on to an up-lift of the spirit and an inspiration of the soul.

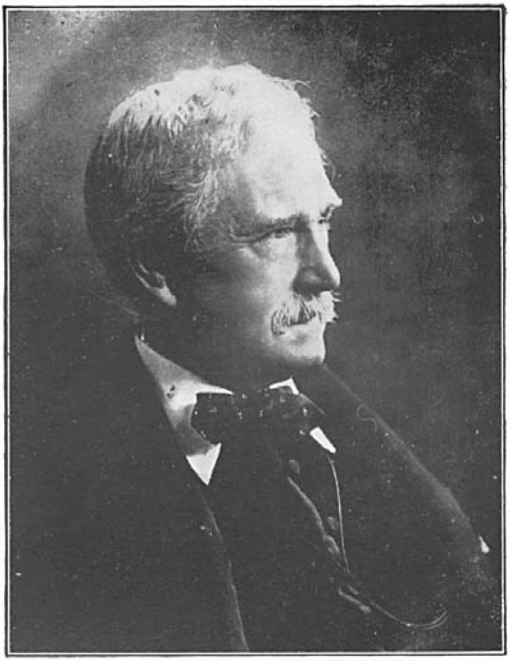
It is hoped that the unselfish work and loyalty of the members may increase the prosperity of the Society and so widen and deepen its influence for good in our Cleveland area.

February 1932

AT THE JUBILEE MEETING OF THE CLUB, PORTRAITS OF ALL DECEASED PAST PRESIDENTS WERE EXHIBITED. Those not already reproduced in the Proceedings are included herein. Obituary notes will be found in this and back numbers as follows:-

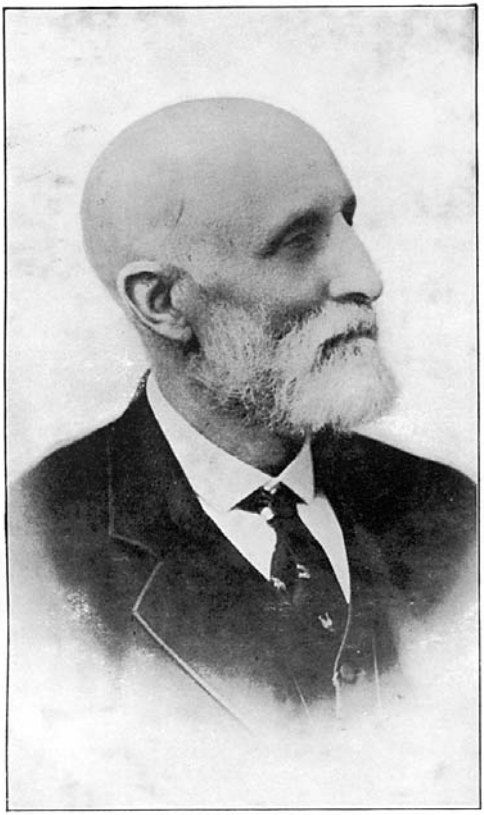
R. Lofthouse.	Vol. I, page 219.
Angus Macpherson.	Vol. II, page 57.
W. H. Thomas.	Vol. III, page 187.
Rev. J. Cowley Fowler.	Vol. III, page 161.
J. J. Burton.	Vol. IV, page 107.
H. Frankland.	Vol. IV, page 1l0.

W. Y. Veitch, M.R.C.S., L.R.C.P.
First President.
President 1881, 1882, 1889, 1890.



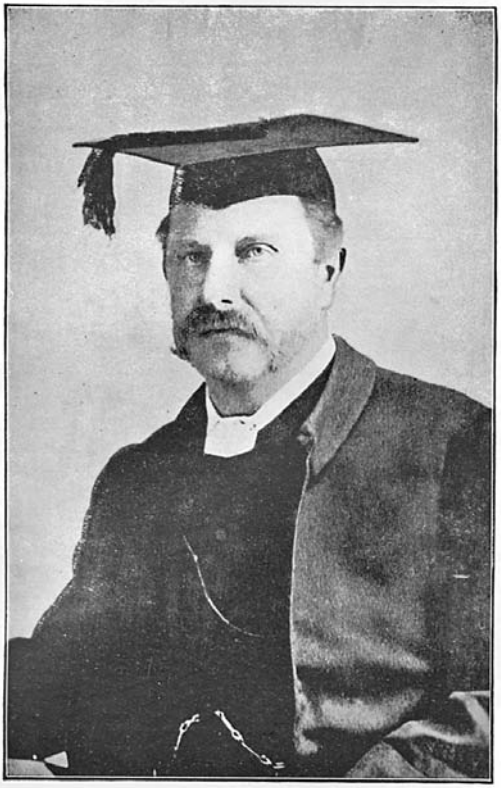
ANGUS MACPHERSON.
PRESIDENT 1886, 1887, 1894.

R. LOFTHOUSE, F.S.I.
PRESIDENT 1892.



T. D. Ridley.
President 1893.

W. H. Thomas, m.b.e., j.p.
President 1898, 1899, 1900, 1915, 1916, 1917.



REV. J. COWLEY FOWLER, B.A., F.G.S..
PRESIDENT 1905.

J. J. Burton, O.B.E., J.P., M.I.M.E., F.G.S.
First Secretary. President 1907, 1908.

HENRY FRANKLAND, F.I.C.
TREASURER 1910–1929. PRESIDENT 1920, 1921.

IN MEMORIAM

JOSEPH JAMES BURTON, O.B.E., J.P., F.G.S., M.I.M.E.

BORN 15TH SEPTEMBER, 1848. DIED 14TH NOVEMBER,1931.

By the death of Joseph James Burton, the commercial, social and cultural life of the North of England, and particularly of the Cleveland area, has sustained an irreparable loss.

Mr. Burton was born at Huby near Easingwold on the 15th September, 1848. He was a blend of good Yorkshire farming stock with that of the Cumberland "Statesman". For his great-grandfather, Adam Hope, lived at Caldbeck "behind" Skiddaw, and was an intimate crony of John Peel of hunting song fame. The song was composed by John Woodstock Graves, and he and Adam Hope, in the latter's house, tried over old border music until they pitched on the rousing tune to which the song is now sung all over the world.

Mr. Burton came to Middlesbrough in 1863, when the population was about 20,000, and entered the service of the Stockton and Darlington Railway at the Docks, then mostly used by small sailing vessels for the transport of coal.

Later he joined Swan Coates & Co., Blast Furnace Owners, who ultimately became the Cargo Fleet Iron Co., Ltd., and he served that firm as Accountant, Secretary and Director for 41 years. He then joined Sir Christopher Furness in developing the Roseberry Ironstone Mines.

His intimate knowledge of Cleveland Mining and Iron and Steel Trades in all their ramifications over many years was of unlimited service to the industry, and during and since the Great War that knowledge has been abundantly requisitioned for national purposes, and he served in many capacities.

He was one of four, nominated by the Admiralty to licence the export of pig iron, he was a member of the Committee of Control of Pig Iron appointed by the Ministry of Munitions, a member of the Cleveland Potash and the Limestone and Ironstone Committees, and also the North East Coast representative on the Central Ore Control Committee all exercising drastic powers under the Defence of the Realm Act. In 1917 he was appointed Chairman

of the Central Advisory Committee for the Iron and Steel Industry to deal with the labour question following the demobilisation of the forces, and a member of the Re-settlement Committee under the presidency of the Ministry of Labour. He was also Vice-President of the National Federation of Iron and Steel Manufacturers and

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presidency of the Ministry of Labour. He was also Vice-President of the National Federation of Iron and Steel Manufacturers and Chairman of its Standing Committee - the Central Council of Wages Association. He also served on the Executive Committee of the National Federation of Iron and Steel Manufacturers. He was appointed by the Government to be a permanent member of the Ministry of Mines Advisory Committee under the Metalliferous Mines Act and for many years he was its Chairman. He was elected President of the Cleveland Ironmasters Association in 1907 and again from 1917 to 1919, and he was also President of the Cleveland Mine Owners Association. He served on many other bodies, both national and local, connected with the Iron and Steel trade, and his valuable knowledge and experience was always and unreservedly placed at the service of his country.

These services were acknowledged on many occasions, in many ways and in 1929 he was awarded the O.B.E.

His energies were not however confined to his vocational occupations. He served his fellows in local government and in social, artistic and scientific spheres.

He served on the Stokesley Rural District Council for 19 years, and on the Guardians of the Stokesley Union for 21 years. He was chairman for 11 years and only retired when the Guardians passed in 1930.

He was a devoted Oddfellow for over 60 years and was Grand Master of the Middlesbrough-on-Tees District in 1879. He was a founder of the Middlesbrough Seamen's Mission and was its Honorary Secretary from 1885 to his death. Similarly he laboured unceasingly for the establishment of workshops for the blind, which culminated in the erection of the fine block of buildings known as the Cleveland and South Durham Institute for the Blind, at Newport, Middlesbrough.

He was an active member of St. John Ambulance Association, and was invested by H.M. the King with the honour of Knight of Grace of the Association of the Order of St. John of Jerusalem.

Mr. Burton was highly developed on the artistic side, and those who have had the privilege of visiting him in his house "Rosecroft," Nunthorpe, will have the most vivid and pleasing recollections of its artistic charm and of the many artistic treasures with which he had surrounded himself. He was a pen-and-ink sketcher and a painter in watercolours of outstanding merit. He was a founder of the Cleveland Sketching Club and frequently exhibited

at its Annual Exhibition, and he was a Fellow of the Royal Society of Arts

But we are in this note, concerned more with Mr. Burton's interest in the Sciences.

From his early manhood he has taken a deep interest in Geology, Microscopy and Horticulture. He was a capable geologist, and his intimate and detailed knowledge of the North Yorkshire Lias and especially of the Iron Stone Series was equalled by few. He spent many laborious but happy hours in working the plant beds in the Cleveland rocks, particularly those at Marske and Roseberry, and he supplied much material for examination by specialists. He was a member of the Yorkshire Naturalists Union for many years, and served on its Jurassic Flora, Coast Erosion, Glacial and Geological Photographs Committees. He was also on the Council of the Yorkshire Geological Society from 1908 to 1922, President for 1923-4, and Vice-President from 1925 to his death, and he served as a local Secretary from 1927. He was elected a Fellow of the Geological Society of London in 1909. He was one of the founders, and the first Honorary Secretary, of the Cleveland Naturalists' Field Club, and its President for the years 1907 and 1908. He contributed lectures, and addresses to these Societies and papers to their Proceedings.

Mr. Burton was a lifelong and expert gardener, and a specialist in Alpine plants and their cultivation. His garden at "Rosecroft," covering several acres, was one of the most interesting and beautiful in the North of England. There, Alpine plants, often the most difficult of culture, were at home and they flourished most happily and yielded flowers most lavishly to their cultivator's magic touch. To wander about in this garden on a sunny day in the Spring time, with its abundant blossom and marvellous sheets of colour, with its background of the Cleveland Hills and with Roseberry drawn with remarkable skill into the garden as it appeared, was almost to wander in Paradise, more especially if under the owner's informed and oft-times almost romantic guidance.

It is seldom that one can record of anyone person such a multitude of activities and interests as these (and there are many more which might be mentioned) all pursued with happy ardour and resulting in valuable contributions to the knowledge and welfare of the community.

Mr. Burton seized and used life at every side. He was a devoted churchman, of a genial, cheerful and happy disposition. He was a charming companion, whose temper was never ruffled, and there are many, who will cherish his memory as of a loyal, great hearted and beloved friend who passed on, full of honours, full of

years and an example to all of what one would wish to be the standard of a true English Gentleman.

He was interred in the Churchyard of the new Church at Nunthorpe on the 17th November 1931, and he now reposes surrounded by the quietude and beauty of the Cleveland Hills which he knew so well and loved so ardently.

J.W.R.P

IN MEMORIAM

HENRY FRANKLAND, F.I.C.
1860-1929.

Henry Frankland came as a boy to Middlesbrough from his native town of Whitby in 1880 to study Chemistry and Metallurgy under the late Dr. J.E.Stead, F.R.S., whose research work in these subjects became world famous.

At the completion of his laboratory training, he remained with the firm of Pattinson & Stead, first as Chief Assistant, then in charge of the commercial side of the business, and subsequently became a partner in 1905.

He was a Fellow of the Institute of Chemistry and of the Chemical Society, and held the appointment of Deputy Public Analyst and Deputy Agricutural Analyst for the Borough of Middlesbrough. These appointments and his partnership terminated on the death of Dr. Stead in 1923, and he retired to his much-loved native town where he continued to reside until his regrettable death on the 14th June 1929, when he had reached within a few days, the age of 69.

He was a keen student of nature. His love of country life and interest in wild flowers in particular, attracted him to the Cleveland Naturalists' Field Club, which he joined in 1882, subsequently becoming President in 1920 (being Treasurer continuously for 20 years until his death). He was an active member throughout the whole of his 47 years' connection with the Club, during which he conducted numerous expeditions, chiefly in the vicinity of Whitby.

For many years he acted as Honorary Auditor of the Cleveland Institution of Engineers, of which he was a Member of Council.

Hospital work in Middlesbrough claimed much of his attention, and for some time he was Chairman of the House Committee of the North Riding Infirmary.

In addition to his many other public duties he found time to support local football, being a Director, some years ago, of the Middlesbrough Football Club.

But, perhaps his greatest interest, outside his business, was centred in the Cleveland Benefit Building Society, of which for many years he was Chairman of Directors.

A typical Yorkshireman, he was reserved and somewhat difficult to know, but beneath his rather brusque manner he was always generous and helpful when his interest was once aroused. He was a keen churchman and staunch Conservative; and by his death, Middlesbrough and district, where he was widely known by reason of his many public activities, lost a worker who could ill be spared, but those of us with whom he was closely associated will recall with gratitude, not only his work, but the many kind and generous actions with which his whole life was punctuated, and join our sorrow with those of his kin who are left to mourn his passing.

E.W.J.

A FEW CLEVELAND PLACE NAMES.

MAJOR R. B. TURTON.

The day has passed when the only qualifications justifying an attempt to explain place names were a lively imagination, a general knowledge of classical languages and sufficient acquaintance with philology to recognise exceptions to the general (if mistaken) rule that "consonants are inter-changeable and vowels do not count:' Possibly even this third qualification was not an absolute *sine qua non.*

A very great deal more knowledge and experience is now required of one who ventures into this field of controversy. The specialist has taken the place of the intelligent observer, and like all specialists, warns trespassers off the ground, which he occupies.

I have no desire to disregard his warnings, but having interested myself for fifty years and more in the local history of Cleveland, and having had occasion to note the changes in the names of various places, it has been suggested that it might be desirable if some record of such changes should be preserved.

We are all most grateful that the English Place Name Society should have selected our Riding for the fifth volume of its series, but perhaps others besides myself are a little disappointed to find no light thrown upon well known names which have for so long taxed the ingenuity of local historians. No doubt considerations of space weighed heavily, and as it is, the volume (with one exception), contains more pages than any of its companions.

In what follows I do not propose to go far afield, and I shall confine myself to the neighbourhood of Kildale.

Overlooking the village of Ingleby Greenhow; like the westernmost bastian of that stretch of moorland to which Park Nab is the easternmost, is a very prominent landmark known as Turkey Nab.

My attention was recently called to this place by a member of our Society who wished to propound the same theory as one suggested by our Past President the late Rev. John Hawell, Perpetual Curate of Ingleby Greenhow, in a letter to Canon Atkinson, who inserted it in his copy of the Rievaulx Cartulary, [1] which is now in my possession.

Mr. Hawell was anxious to locate the road described on pp.19, 30 and 204 of that volume under the names of Thurchilesti,

[1] *Surtees Society Vol. 83.*

Thurkilesti and Thurkirsti as the road to Kirby Moorside, which ascends the moor above Ingleby Bank Foot. . This " sprunt of road" he writes "is what I am pretty familiar with in the Danish place names of Cumberland as a "sty" and the point round which it climbs is Turkey Nab. The road extending from the summit of this to an indefinite distance along the moor top might well be described as *magna via quae venit de Turkilesti*.'

The references in the Cartulary lead to the inference that the whole road and not merely the ascent from the plain had acquired the name of Turkilesti. Tracing from the South to North the road marks the boundary between Wombleton and Welburn (p. 30), passes below Skiplam Moor (p. 204) and cuts at right angles the boundary between Cleveland Bilsdale (p.19), a distance of 14 rather than 6 miles as Canon Atkinson makes out in his note. I should be inclined, while accepting in the main Mr. Hawell's suggestion to locate the road further to the West than he does, and to assume that keeping Turkey Nab to the left rather than the right it passed near Midnight House and ascended to Botton Moor and thence by a track still perfectly discernible passed over Urra Moor in the direction specified.

The exact location is immaterial to the argument so long as we agree that both the "sty" and the "nab" commemorate the same person whose full name was Thorketil or some cognate form. One would be hard put to identify the individual commemorated. No such name is to be found amongst those inscribed in letters of gold and silver (and therefore prior to the tenth century) in the Liber Vitae of Durham[2], but there are abundant examples amongst the later post-conquest additions in the same book.

The earliest notice of such a name is in the Anglo Saxon Chronicle under the year 915 when Thurkytel jarl submitted to Edward the Elder. Another Thurkyll jarl, with the sons of King Svein landed in 1069 and plundered York. Between the two dates others of like name but inferior rank, are mentioned.

There is a Thorkyll de Cliveland mentioned in the Whitby Cartulary who might be the individual required[3] His son Uctred, gave land in Burneston to Whitby Abbey, and his gift was confirmed by William Rufus. It is possible, if not probable, that this Uctred was the Uctred de Clivelanda mentioned in the foundation charter of Guisborough Priory[4]. In Domesday folio 16, Uctred is mentioned as having held land in Guisborough, Middleton and Hutton. Mr.A.S.Ellis in Yorkshire Archaeological Journal Vol 4, p 400,401

[2]*Surtees Society Vols.* 13 &: 136. [3]*Surtees Society Vol*. 69, *p. 4.*
[4] *Surtees Society Vol*. 86, *p.p. V. 3.*

discusses the difficulty of identifying any particular Turchil, Torkil or Thurketyl. If the road took the route past Midnight House it would traverse the Camisedale of Domesday. There can be no doubt that Mr. R. H. Skaife was right in identifying this manor with Greenhow on the strength of the reference in Kirkby's Inquest to Kemesdayll juxta Greneowe then in the possession of the Mennell family[5] and Canon Atkinson accepts this identification in his Cleveland Ancient and Modern Vol. 1, p. 263. On the other hand the Place names of the North Riding p. 147, not only ignores the find of Mr. Skaife, but suggests, though it is true with considerable hesitation, an identification with Camdale, between Round Close and Tidkinhow, and therefore clearly in the Brus fee, which Camisedale could not have been. Moreover there is no room in Camdale for the carucates attributed to Camisedale.

On the boundary between Kildale and Battersby is to be found Gilsey wood. In 1537-8 an account was furnished of all manors, houses and lands of Sir Thomas Percy, Knight, then recently attainted and executed for his share in Aske's conspiracy[6]. Amongst these we find mention of the Manor of Kildale and a close therein named Kylbeck. It may not be irrelevant here to remark that though, from the date of their first appearance in Cleveland, the Kildale Percies were absolutely distinct from the family from which the Earls of Northumberland descended in the female line, yet in the early sixteenth century the then Earl of Northumberland purchased the manor from his namesake.

Thomas Earl of Northumberland was implicated in the Rising of the North, and on 3rd July, 1570, Humberston's Survey was taken to ascertain the extent of his possessions[7] Amongst his tenants at will in Kildale, William Chapman paid a rent of 7s. for Kylbie Close. When one considers how easily Kilbeck Close becomes Kilby Close, it is obvious that the older form is correct, besides everything points to the Hall Garth Farm adjoining the church having been the capital messuage of the manor of Kildale. Therefore we may safely reject the idea that the close marks the "by" or farm of the original owner.

So far we have no guide to the location of the close, but this is given by a very interesting estate map in my possession, dated 1617 and drawn by the order of the 9th Earl. The stream that divides Gilsey wood between Kildale and Battersby is there marked Kilbysike and Kilbye Close is shown as a field containing 6 acres

[5]Surtees Society Vol. 49, p. 137. [6]P.R.O. Minister's Account 28-29 H.8. York 131. [7]Humberston's Survey Vol. 1, fol. 239.

adjoining that site on the west, while its east corner has since been cut off to provide for the site for the present Low House.

I have no plan intermediate between 1617 and 1819; on a map of the latter date the close reduced from 6 to 5 acres, appears as Hill Rust Close and the wood for the first time appears as Gilsey.

Those who are acquainted with Arthur Young's Tour will remember that therein Kildale masqueraded as Gilsdale.

That the first element of Kildale is a personal name seems incontrovertible. Canon Atkinson (Cleveland Ancient and Modern Vol. 1, p. 66) had little doubt upon the point. He writes "In Kilton the prefix is the same as in Kildale (Childale, Chilton in Domesday) as is due to the unmistakeable old Danish Ketil contracted according to rule into Kell or Kel." Possibly the last word should have read Kil.

But Vol. 5 of English Place Names will have none of this, although under Killerby (p. 103) it is willing to admit an O.N. Ketill (frequently reduced in Scand. dithematic names to Kil.). In Kilton and Kildale (p. 143), it reproduces, though it is true with certain criticisms, the views of Professor Ekwall, that the former derives from a Scand. form of O.E. *cilda-tun* and the latter from O.N. *Kill* a narrow bay; but it would have been very much more instructive had reference been made to Canon Atkinson's theory and reasons given to show why it is valid for Killerby but inadmissable for Kilton and Kildale.

The next name to which I would call attention has completely fallen out of use. Most histories of Cleveland relate the tale how Lord William de Percy, Lord of the Manor of Kildale, with the confirmation of his overlord, Marmaduke Thwinge, granted to the Canons of Helagh Park the chapel of Saint Hilda[8], a road ten feet wide thence to the King's highway from Kildale to Stokesley, eight acres and a rood in culture to the east and north of the chapel, two acres of meadow nearby and to the south and seven acres of land in a culture called Symondcroft, below Symondcliff, and certain other rights. The service, which the Canons had to perform, was to find two priests to celebrate divine service in the chapel. Land at Crathorne was also granted for the same purpose. The date must have been somewhere about 1280, but apparently the Canons found the duties too onerous and later arranged with Arnold de Percy, the eldest son and successor of William, to release the lands at Kildale and to provide only one chaplain to

[8]*St Kilda in "Lawton's Collections" p. 488 is evidently a printer's error for St. Hilda.*

celebrate divine service for the soul of William in the chapel of St. Nicholas at Yarm. Arnold de Percy then permitted certain Crutched Friars to use the chapel, described as in his Park, though apparently it had never been dedicated and there they used to administer the sacraments to such Kildale parishioners as resorted to them, to the serious loss of the parish incumbent and laying themselves open to ecclesiastical censure.[9] Complaint was made to Archbishop William Greenfield, and after a delay of a year in order to enable the Archdeacon of Cleveland to hold the necessary enquiry, an interdiction was finally issued on 3rd February, 1314/5.

Canon Atkinson in Cleveland Ancient and Modern p.309 feared that it was impossible to identify the chapel. In fact it is not so very difficult. Both Symondcroft and Symondcliff have ceased to designate either croft or cliff, but a field below the wood that fringes the north side of Warren Farm, containing 5 acres 2 roods 30 poles, and known as Canon-fields, used for over a hundred years to provide hay for the cow keepers at Little Kildale, obviously represents the seven acres. It lies a long way from the site of the chapel.

The locality of this last is given to us by the same documents as in the case of Kilby Close. The minister's account of 1537-8 mentions "parcella terra vocata sent ylde Gardeyn" the parcel of land called St. Hilda's Garden. Humberston's Survey of 1570 includes amongst the demesne lands a parcel of land called Saint Ylde Garth, and Saint Ilde Garth is its description in some Court of Requests proceedings of date 1579, but in the Plan of 1617 where its position is clearly shown between the present sites of Low House and Park House, it has become Tyle Garth, and its extent is given as 5 acres 2 roods $26^{1}/_{2}$ poles, a portion having been as the plan shows, tacked on to the adjoining field.

In 1819 two small portions, bracketed and measured together as 2 acres 0 roods 30 poles, are labelled tile garth and far tile garth, the remaining portion of the cultivated land and the two acres of meadow being merged beyond recognition in other fields. The degeneration from St. Hilda to Tile is paralleled by an entry in a will, published, if my memory serves me, by the Surtees Society, the reference to which I have unfortunately mislaid. The three hunting enclosures of the Percies of Kildale were Hinderscough, the Park, and Golstandale. The position of the Park is easily fixed, the park dike can almost be traced yard by yard. At its highest part due south of Park Nab, there is a dike starting from nothing but

[9] *Surtees Society Vol. 89, p. 388.*

obliquely meeting the park dike so as to form an angle towards which the deer could be driven and slain. I have discussed this question so fully in the Yorkshire Archaeological Journal in my article on the Service of Horngarth[10], that I need here only add that those who are interested in the subject would do well to study the embankments at the horn of Farndale with a view to see whether they confirm or destroy my theory, or whether their purpose was other than that of sport.

The exact situation of Golstandale caused much perturbation to my friend Mr. William Brown, who on two notes to his Guisborough Cartulary propounded opposite solutions, neither of which is quite satisfactory[11]. I cannot find any distinction between Lonsdale and Golstandale. The former now consists of two horns both formed by a stream and a wider plain to the east through which the beck fed by the two streams runs. All three divisions have at one time or another borne the name of each. The open plain consisting of pasture lying between the beck and the wood to the north is still called Golstandale Ings, while the north western horn of the Colstandale is said in the same Cartulary to extend as far as Percy Cross[I2]. The plan of 1617 shows Goldstonedale beck as the stream forming the southwestern horn. The editors of Place Names of the North Riding quite rightly, if I may venture to say so, reject the absurd explanation of Lound-dale the quiet dale and attribute the first element to a personal name. Lounesdale appears in the Guisborough Cartulary as of date 1197 and therefore it cannot be described as a modern name, moreover, a deed preserved by Dodsworth, 17th August 1314, mentions both the vaccaria of Lounesdale and the wood of Golstayndale[13]

But whatever the true boundaries of the latter may be, the Pale Close appears to mark the position of its southern pale dike, of which the stone foundations of the fence running from the Whinstone Quarry top to Bankside Farm may have formed part. The form Golstandale seems to be the oldest; Golsendale and Golsingdale appear in 1280, and Kolstandale and Colstandale a generation later, assuming that the charters are correctly copied in the Cartulary.

The third wood, Hinderscog, is mentioned indifferently under that name as haya Ernaldi de Hindersog, and as Ie Heyning, or Heynning. One would expect Hinderscog to comprise

[IO]Yorkshire Archaeological Journal Vol. XX, p.51.
[Il] Surtees Society Vol. 86, p. 2 and Vol. 89, p. 61n.
[12]Surtees Society Vol. 86, p. 270. [13]Surtees Society Vol. 86, p.272n.

a large district of which haya or Ie Heyning formed an enclosed part[14] . Hinderscog is marked on an estate map in the possession

of Lord Gisborough. In his first volume, Mr. William Brown quite correctly placed it on the Basedale beck above Dibble Bridge, about at the point where the boundaries of Westerdale, Kildale and Guisborough intersect[15]. Then by a strange oversight, in his second volume[l6], he equated it with Thunderbush. In fact it could not have differed very widely from the present extent of Sloethorn Park, and it is quite likely that the haya or heyning was the eastern-most portion joining the intersection of boundaries to which Mr. Brown refers.

He calls attention to the fact that the termination is the same as in Schelderscoh, and that the wood (Norse-skógr) still existed in a modified form; a remark, which is only true of the eastern-most end.

There seems no reason why the prefix, hinder, should have other than its ordinary meaning, and the name of the adjoining farm marked on the O.S. as Huckaback, supports this view. When this distortion of the true name took its rise I am unable to state, but I certainly attribute the blame to the Royal Engineers who carried out the Ordnance Survey. In the estate map of 1819 it appears under its correct name of Haggaback, whose equation to Hinderscog needs no demonstration.

Some years ago when the Royal Engineers were again in the neighbourhood correcting their survey, I called the attention of the Sergeant in charge to the mistake. He was most courteous but his only reply was, when I suggested the substitution of Haggaback, "Why Sir, that is not a proper name"' So I fear that Huckaback being a proper name retains its position on the Ordnance Survey.

The last name to which I propose to refer is only indirectly connected with this parish. In two consecutive lists of payers of lay subsidies of 1327 and 1332 respectively[l7], in the Manor of Kildale, we find "de Thoma de Alburwyk 12d." and" de Thoma Albornhys 12d." The similarity of name, and amount, justifies the assumption of identity, and if the assumption is correct, it would appear that to his neighbours, wyk and hys had the same meaning. The name probably came from Abberwick, in the Parish of Edlingham, near Alnwick. Professor Hamilton Thompson records a Mr. Robert de Alberwyk who was provost of Beverley 1304-1306[18]

[14]Atkinson Cleveland Ancient and Modern Vol. 2, p. 62.
[15]Surtees Society Vol. 86, p. 9n. *[16]Surtees Society Vol. 89, p. 62n.*
[17]North Riding Records (IV. S.) Vol. 4, p.p. 146, 152.
[18]Surtees Society Vol. 141, p.p. 30, 159n.

THE CLEVELAND WHIN DYKE.

J. J. BURTON, O.B E., J.P., F.G.S., M.I.M.E.

A very striking feature in the landscape in the neighbourhood of Great Ayton, and particularly so as viewed from near Nunthorpe, is the Langbaurgh ridge, which continues to, and merges into Cliff Rigg. This hog-back formation is the upper limit of the well- known Cleveland Dyke; the deep, narrow gashes in which, caused by the enormous excavations of road-making material quarried therefrom, give it an appearance of having been rent and riven in some terrible cataclysmic disturbance. The heaps of spoil thrown out on the side of Cliff Rigg wood have by exposure assumed a fine warm colour from oxidation of the iron in the whinstone and give it a pleasing and picturesque appearance, especially in summer time when the foliage of the trees contrasts charmingly with the ground colour of the debris amongst which they grow.

The Dyke has been well described as a nearly vertical wall-like intrusion of "whinstone" or basalt-rock. It varies in thickness, not only in different districts but in all districts as the depth increases; thus, at Gribdale, it is only a few feet wide at the top, but the lowest workings give a width of 80 to 90 feet, and at Cliff Rigg workings there is a measured width of 91 feet. There are also local expansions and contractions known to exist in many parts of its long length.

It has been described by many investigators during the last 100 years, and early observations have been corrected and extended by later observers until there is now probably little more left to be discovered so far as surface character and appearances are concerned. Many geological experts have in recent years given much time and research to North of England Dykes and the Cleveland Dyke in particular as the most important of them all, so that there is probably not much more to be said, even on the geotectonic and petrological aspects of the problem presented by intrusive basaltic formations. There are nevertheless quite numerous important details of underground formation and effects which have only become known as the result of mining operations; and as deep mining is improbable in the near future to any considerable extent, if at all, such observations as have already been made should be put on record for the use of those who may at any future time desire to enter upon a further study of the phenomena of the dyke. Some of the deepest workings have been at Cliff Rigg and Gribdale by a Company in which I was interested, and I purpose describing some of the variations from the normal, or of particular features, which seem to throw light upon the history

and development of the dyke. Before doing so it may be of service to briefly review the conclusions reached by some of those who have made a special study of the subject.

Young and Bird, writing in 1822, tell us that the dyke has been traced on the surface from Cockfield Fell in the County of Durham to Maybecks - a distance of 60 or 70 miles, but that in many places it does not reach the surface, being covered by alluvium; and they discuss the possibility that at places it may also be covered by the regular strata, but apparently this is not their opinion. They note that the wall of basalt leans to the South and they correctly describe it as generally running in a straight line N.W. and S.E., but that it sometimes deviates from the rectilinear course, as for instance when it crosses a valley as it does below Silhoue, where it bends to the North, the deviation being due to the non-vertical character of the wall. At other places, as at Preston, they point out a real deviation where there is an abrupt bend to the South. They appear to favour a view that the dyke lies in a line of faults and regret they have not access to the strata on both sides at Cliff Rigg, which they think might probably show marks of dislocation.

Tate and Blake, writing in 1876, express a doubt as to its being a continuation of the Cockfield Fell Dyke, and they agree with other writers that it varies considerably in thickness. They state that it is "deposited in blocks of various sizes and shapes, generally oblong and transverse to the dyke, paralled to one another, and sometimes, as at Cliff Ridge and Ayton, assume a rudely columnar form". In no case did they observe any dislocation in the strata through which the dyke passes; and they had no unequivocal proof that the several shifts in the course of the dyke have been produced by faults but that there is on the other hand evidence, though scanty, that the basaltic intrusion was subsequent to the stratigraphical disturbance in the Liassic and Oolitic rocks. At Sunnycross it is shifted half a mile to the N. and resumes its appearance near Nunthorpe, where it cuts through the Lias and increases in altitude until it reaches 750 feet above sea level at Cliff Rigg. At Nunthorpe Quarries there is a slight declination to the North, and lateral bulgings give exaggerated thickness. In the cutting at Nunthorpe Quarries they noticed a simple induration of the calcareous Lias shales noticeable for 6 to 12 feet, and the parts in contact had been quite bleached and the ferruginous ingredients aggregated as blotches or grains, whilst the purer argillaceous strata showed little or no change. About a mile and a half further on it is shifted about 70 feet to the South. It has not passed through

the Oolitic sandstone on Coates Moor, but it merges through the Oolites at Commondale and Castleton. Beyond the Murk Esk the Oolitic rocks form its boundary walls on the surface.

Mr. George Barrow, writing in the Survey Memoirs of the Geology of North Cleveland mostly confirms the statement of previous writers that, taken as a whole, its course is remarkably straight, but that there are very sharp local bends and that its width is very variable. He comments upon the unevenness of its upper surface as being interesting, and points out that it frequently disappears for a considerable distance and then reappears: Where it occurs in soft shales, the shales by being comparatively watertight have protected the whin but where the dyke occurs in the oolitic sandstone, it is completely decomposed to a depth of nearly 200 feet. This is true, but not exclusively so, as even adjacent to the Lias shales considerable areas of decomposed stone are occasionally met with. Our Quarry Manager reported to me that at a depth of 150 feet "troubles" occur, mostly in the form of small flaky "rock and equal proportions of loam". May this decomposition not have an important bearing upon the uneven upper extension referred to by Mr. Barrow? The more the whin was broken up the easier the attack by the moving ice sheet and removal by the subsequent running water on the recession of the ice; and it is noteworthy that its lowest elevation in North Cleveland is largely covered by drift. Apart however, from any increased irregularity caused by denudation, or atmospheric disintegration, there is a marked irregularity in its upward extension in the rocks where it has not broken through. He agrees with Tate & Blake that in no case is the dyke known to be in a line of fault. There is one statement in the Memoir which needs qualifying, viz.: that for a few yards the contact bed dips into the dyke as if the intrusive rock had contracted on cooling and dragged down the adjacent rock with it. This phenomenon must have come under his observation, but it is not universally present nor, so far as I can see, even general. I have carefully noticed many exposures of shale, which have been in contact with the dyke and found the lines of cleavage often, altered to vertical and the original bedding planes slightly dipping away from but not into the dyke on each side. This seems to be what one might generally expect. There would be contraction of the dyke on cooling, but, as the adjacent walls of sediment deposits are bad conductors of heat, there is reason for believing that although, as in the case of masses of slag in containers, a thin crust would form first on the sides, this would take place slowly and be like an annealing process: and as the pressure of plastic or molten material from below (which there is evidence for believing must

have been long continued) would maintain the more solidified basalt in a static condition, so there would be an absence of any dragging down effect. The shrinkage or contraction would take the form of fracture of the mass on cooling to a sufficiently low temperature. Expansion of the adjacent walls in nearest contact is almost certain, for although much ancient rock must have been taken up by the dyke material in its advance either by absorption or inclusion, the heat would convert the moisture contained in the shales into superheated steam, and expansion in an anticlinal curve, broken or complete, would be the line of least resistance; the lateral pressure of the dyke would maintain the contact walls in the expanded position. This view of the effect of the intrusion of the dyke upon the bedding planes of the adjoining strata is strongly confirmed by what Mr. J. J. Harris Teall observed in a quarry near Cockfield, where he saw the upward abrupt termination of the dyke in a low irregular dome at a place where it had not forced its way to the surface, but was covered by coalmeasure shales. Here the adjoining strata show no sign of any dragging down and the superincumbent adjoining strata are distinctly bent upward as he shows in the sketch (See Fig. 1, p. 125). There were probably local variations of conditions as to porosity of the sedimentary rocks, moisture, the possibility of escape along the lines of bedding planes and joints, and also of the resistance encountered from the varying thickness of unpenetrated cover.

Mr. C. Fox Strangways, in the important Survey Memoirs of the Jurassic Rocks of Britain, devotes some space to the dyke, but he does not appear to have made it a personal study on the spot, and he acknowledges that most of his information is derived from the account given by Mr. Geo. Barrow, so we can pass it by.

More recently Mr. W. Norman King, M.Sc., made a systematic examination of the dyke, and in a paper communicated to the Leeds Geological Association, gives some valuable data for discussion. He, like most other careful enquirers, could not find any Easterly extension beyond Fylingdales Moor, although he searched for evidence in Hollin Gill and in Jugger How Beck, where if it reached the surface at all it might be expected to show some indication of its presence. My own searches in the same neighbourhood were equally fruitless. The abrupt discontinuity of the dyke near Great Ayton and the shifting of its course there, and in several other places, are satisfactorily accounted for as being a diversion of the main stream of the original flow along two lines of weakness found in its upper course, each exhausting itself in converging dumb ends. This is very convincingly demonstrated

by Professor Percy Kendall and proved by workings at Cliff Rigg, where the lower levels were almost vertically below the discontinuous outcrop. The discontinuity and diversion from the rectilinear between Sunny Cross and Nunthorpe and the abruptly crooked course near Eaglesdiffe are not quite so simply explained, and may have been caused by some cross fracture in the strata at depths not accessible to observation. Mr. King notices one important feature at Silhoue Quarries where the dyke is found *overlying the Estuarine sandstones* and shale, and he describes this as a small surface overflow. If this is a correct description it would indicate that the date of the intrusion was during the Jurassic period, or at least long prior to the Tertiary period, unless we are to believe the highly improbable; viz. it occurred after all the other deposits had been laid down and denuded. I venture to suggest that it is not a surface flow at all, but a lateral intrusion between two weak bedding planes of the estuarine deposits, the upper beds of which have since been denuded leaving the intruded basalt exposed. What Mr. King saw was probably a repetition of what Dr. Teall describes as occuring at Bolam Quarry, where he says
"it expands laterally in the form of a 'sill' or bed which is approximately parallel with the stratification and attains a width of 200 or 300 yards." Mr. King brings forward a piece of evidence which I think very clearly demonstrates an internal flow of the basalt and a strong argument in favour of the molten material having eaten away and absorbed the fissured rocks originally filling the position now occupied by the dyke. At Eaglescliffe at depths of 25 feet and 50 feet respectively, there are two large blocks of the country rock apparently embedded in the whinstone. The blocks are "stream laid" horizontally. He gives the measurements of these blocks as respectively:

16 feet x 12 feet x 16 feet
and
30 feet x 30 yards x unascertained depth.

He also points out other evidence of horizontal "stream flow" of the magma at Wood End, where the rock contains, amongst other constituents, amygdules from 2in. to $2^1/_2$ in. x 1in, and these have been distributed in the centre of the dyke with their long axes in a longitudinal direction.

With minor omissions the known physical features have been fairly and fully given by the writers I have quoted, but there are other variations from the normal which have only come to light during mining operations. In the course of working ironstone at Ayton Banks Mine, it was necessary to cut headways through the dyke where it severs the ironstone seam, and a section of the

cutting is shown in Fig. 2, p. 125. In this case it will be seen from the side elevation which gives a cross section that the dyke has cut into the Ironstone seam very deeply, say at least 27 feet on the North side, and probably to some slight extent also on the South side as the hanging wall seems reversed, and its declination is greater than normal. The headings cut through the dyke not far from Gribdale Gate are about 10 feet high and are vertically much above the lower workings places of the whinstone winnings. In one of the working levels of the Gribdale whinstone mine at no great distance superficially from the ironstone cutting referred to, the miners came across what they described as an intrusion of white back into the body of basalt as shown in the diagram Fig. 3, Page 125. In the absence of what might have been revealed by further workings, which have been suspended, one can only conjecture that this departure from the normal may arise from an inclusion of Lias shale in the basalt in somewhat the same way as occurred with the sandstone at Eaglescliffe, noted by Mr. King, and that the shale has been metamorphosed by the long continued action of the hot magma surrounding it. Another possibility is that there was local thinning of the dyke due to the lava finding a less resistant obstruction to its upward flow than by cutting away the shale in its path, but I do not accept this as a satisfactory explanation.

Covered by drift is a notch in the surface of the dyke between Slack's Quarry and Gribdale adit near Great Ayton. Slack's is a deep gully and the surface rises rather sharply to the East. It was thought that by driving an adit from the quarry into the dyke good stone could be won without the heavy cost of baring and unwatering. The workings proceeded eastward for a short distance, and the dyke came to an abrupt end in quicksand, which quickly filled up the adit. Successive adits at lower levels were put in with the idea that they would get below the quicksand, but they also came to an abrupt end in the same material and drift a little further in than the first and were choked up by it. Converging adits from the Gribdale end came to an equally abrupt termination in drift material. This notch is probably largely or wholly due to glacial action and the flow of water from melting ice pent up in a local lake.

EFFECT OF BASALT CONTACT UPON SEDIMENTARY STRATA.

This has been stated in widely different terms by different writers, no doubt mostly from personal observations; and this diversity is at once a testimony to the wide difference between the effect of contact in different localities under different conditions, and also a call for caution in generalising from the particular. In some descriptions the alteration is stated to be very slight

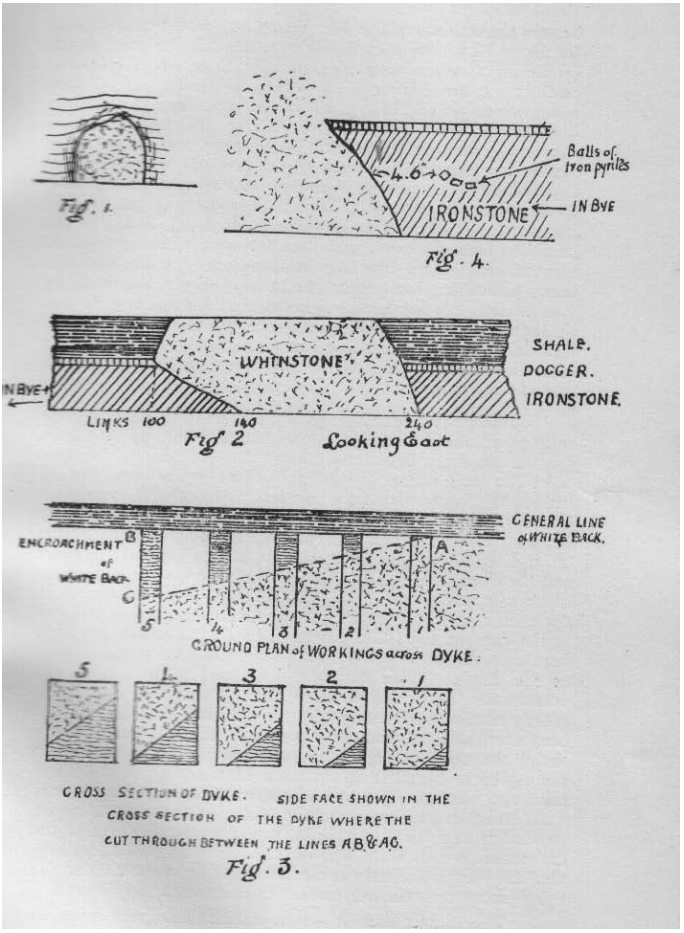

Fig. 1.

Fig. 4.

Fig 2 Looking East

GROUND PLAN of WORKINGS across DYKE.

CROSS SECTION OF DYKE. SIDE FACE SHOWN IN THE CROSS SECTION OF THE DYKE WHERE THE CUT THROUGH BETWEEN THE LINES AB & AC.

Fig. 3.

Others, like Mr. Young, say that it can be found for 10 or 12 yards on each side; or, like Mr. Barrow, that it extends for a few feet at most, or, like Dr. Teall, who says that at one of the quarries at Cockfield, which he visited, the adjacent rocks, which are shales and sandstones, have been altered for a distance of 20 or 30 yards. Collecting all the information supplied by different observers it would appear that the Estuarine sandstones in contact have been altered variously, extending from two feet to seven feet on each side of the dyke in the same locality (Sneaton High Moor); and not far away (Egton Bridge) the alteration in the Lias Shale extends to 12 feet. In the neighbourhood of Great Ayton the effect on the Lias Shale at the upward limit of the intrusion is scarcely noticeable, but at a depth of 300 feet there is a marked alteration, which extends for 9 to 12 feet. In the same neighbourhood where the dyke cuts through the main Ironstone seam in Ayton Banks Mine of the Gribdale Mining Co. Ltd., at a much higher horizon, the effect of the intrusion is easily traced for twenty yards on each side, and is very marked.

Had this information about the effect upon the Ironstone seam stood alone, some quite legitimate but entirely erroneous conclusions might have been drawn, but fortunately the same seam has been worked by Messrs. Pease & Partners Ltd., a little further eastward and cutting through the dyke was a necessity of such working. The experience in the latter case was entirely different to that of the Gribdale Mining Co. Instead of the effect extending for twenty yards, the utmost limit was five feet and the change very slight. The adjacent strata did not appear to be affected by the dyke. The nature of the alteration in the contact rocks differs not only as the material varies but also in the same material in different places. The sandstones have been changed into a closegrained quartzite, the effect diminishing as the distance from the dyke increases. The quartz; has occasionally been re-crystallised, the original crystals being often difficult to identify under the microscope. Calcite has been developed and Chlorite is present. In the Estuarine sandy shales the sandy matter is recrystallised to a quartzite, while the argillaceous matter shows signs of a development of new minerals. In Cliff Rigg quarries cavities up to 4ins. diameter were found containing crystals of quartz; and dog tooth calcite covered with a dark oily liquid, probably a distillation of the carbonaceous Lias shale, and in Gribdale whinstone quarries and also very abundantly in the Ironstone seam abutting on the dyke-sooty carbonaceous matter filled cavities and fissures.

The contact rock at Ayton is Lias shale, and there, as already stated, the metamorphic effect extends from zero at the top of the dyke to 9-12 feet at a depth of 300 feet; and the change is so

complete that to the eye the material gives a first impression as being part of the dyke. The dark, soft shales have been converted into a hard, flinty, grey-coloured rock, known as "White Back"-an appropriate name given to it by the quarrymen.

In the year 1922 some of this "White Back" was sent to a gentleman in the South of England who was much interested in dykes. From slides, which he made, he formed the opinion that the material was an altered igneous rock, and he showed the slide to another expert who had been working at petrology for 20 years. This authority confirmed that opinion without any doubt, and said there were felspars of two generations standing out as conspicuously as in the rock of the dyke itself. "When polarised light is used they are almost indistinguishable from the ground mass. The rock is entirely different from the altered sedimentary rock that I have had from the dyke contact, and corresponds to what Geikie calls White Trap." This is another instance of the difficulty of generalising from the particular.

The report was so contrary to the usual opinion that I had fresh samples of the White Back taken from the outside area, from the centre and also from the area in close contact with the dyke but from a different area of the mine. Lieut. Col. E. L. Johnson, of the Cleveland Technical Institute, was good enough to have slides prepared and he submitted them to experts in Paris for their opinion. They reported the material to be an altered sedimentary rock; and of the correctness of this opinion I think there could be no reasonable doubt when the slides were examined under the microscope, but the question was finally settled when I discovered in the White Back at Nunthorpe quarries the unmistakeable cast of an ammonite.

There is in the Great Ayton area a distinct parting between the basalt and the White Back, so that the mining tools work the former and leave the latter standing. Where this happens in open quarry workings the White Back remains as a precipitous cliff, whilst the unaltered shale behind it crumbles away and sometimes leaves the White Back standing as an isolated projecting dyke-like wall.

In the only two places where the ironstone seam has been worked on both sides of the dyke, there are remarkable differences. In Ayton Banks Mine the ironstone has been charred for a distance of twenty yards on each side, increasing in intensity as the dyke is approached. The fissures were full of soot, and within ten yards of the basalt there were many pockets containing irregular shaped heavy balls of iron pyrites, generally about the size of a big fist. The surface of the balls was very rough, full of shallow

hollows and coated with a crust of scoriaceous material and soot; on clearing this off the balls were seen to contain streaks of metal. They were mostly found singly, but I have three of them, which were found disposed in a curved line in one pocket about $4^1/_2$ feet from the basalt (See Fig. 4, p. 125). When the cutting was made through the dyke the section was as shown in Fig, 2, p. 125, showing on the North side a partial cutting by the basalt into the ironstone for a distance of about 27 feet, the total thickness of the dyke from extreme to extreme being $92^2/_5$ feet. In the adjoining royalty of Ayton Mines the only change is a slight darkening of the ironstone and an increase of its hardness as already mentioned, making it more difficult to drill. There was no cutting into the seam, and the thickness was 85 feet. In Ayton Banks the difference in level of the seam on each side was only $5^1/_2$ inches, there being a rise on the N. to that extent, and there was no evidence of any fault. In Ayton Mines, only a short distance away, there was, on the contrary, a drop on the N.side of six feet six inches in the seam; and there was the further peculiarity that the centre of the dyke was composed of rubble and sand, the section being:

Whinstone	21 feet.
Rubble and Sand	43 feet.
Whinstone	21 feet.

I have not had the opportunity of inspecting this cutting, but I understand the material in the centre was broken up and decomposed whinstone, with sand in addition; the latter might be from the breaking up of the basalt. In another part of the dyke, a little further West, a similar feature was observed penetrating very deeply from the surface but not so wide as that shown in the Ayton Mine. This does not seem to be a repetition of what was observed by Mr. King at Wood End, where he found distributed in the centre of the dyke amygdules of small size, but rather that there is a breaking up of the basalt. As the ironstone seam at this point is 145 feet below the surface, and the strata above the seam is mostly, if not wholly, Lias Shale, it is difficult to account for the disintegration and decomposition of the basalt on such a large scale, but as there is clearly a fault of 6ft. 6ins. on the N. side of the dyke between it and the ironstone, it is evident that the dyke here either lies in the line of a pre-existing local fault, or the fault has been created at a period subsequent to the eruption. May the latter not be the case? And if so, is it not possible that the fault is not in the adjacent strata but in the dyke itself? So it may be in the other cases where the dyke is broken up in some portion, to a great depth. This possible explanation deserves some investigation.

It is interesting to note that the position of Ayton Mines Adit near the Monument is 676 feet above sea level. The seam dips until it reaches a level of 570 feet and then rises until it reaches the dyke, which cuts the bottom of the seam at a level of 602 feet.

ABSORPTION OF SECONDARY ROCKS BY THE DYKE.

The question whether the dyke has absorbed into its own mass that portion of the country rock through which it has forced its upward way is one which has been productive of widely different views by scientists, and is probably still one of controversy. Mr. Teall points to the inclusion of sandstone blocks in the dyke as an argument against absorption, and he appears to doubt that it exists to more than a limited extent. Professor Judd says absorption of aqueous rock into igneous rocks presents great difficulty; and probably the balance of scientific opinion is against it. Undoubtedly petrological and chemical considerations tell against it. The dyke has passed through various strata, some very acid, some very basic, some highly siliceous, some highly aluminous and some highly calcareous. The sides of the dyke abut on such rocks, which differ so widely in character and composition, and yet the character and composition of the basaltic rock remains practically uniform throughout the mass in its whole course, allowing for differences in crystallisation due to differential cooling between the sides and the centre.

For comparison the following analyses are given on p. 130. From these comparative analyses, which, with the exception of Nos. 6 and.7, I have taken from Mr. Teall's papers read before the Geological Society of London, it will be seen that the composition of the rocks in contact with the whin dyke or whin sill, seems to have had no practical share in determining the composition of the basalt, although the removal of Secondary rock material often seems equal in area to that occupied by the intruded basalt. If we compare Nos 5 and 6, the sample 6 taken at the Junction with the Saccharoid limestone is practically identical in lime contents with the sample 5 taken at Cauldron Snout, not in contact with the Limestone. Again, if we take No.7, which is from a sample of Saccharoid Limestone *in actual contact* with the basalt

	1	2	3	4	5	6	7
	Dyke Great Ayton	Dyke Great Ayton	Altered Dyke Preston	Dyke Armathwaite	Whin Sill Cauldron Snout	Whin Sill White Force	Saccharoidal Limestone
AUTHORITY ...	W.F.K. STOCK.	J.E. STEAD.	J.E. STEAD.	W.F.K. STOCK.	J.J.H. TEALL.	A. CADDICK.	A. CADDICK
Silica SiO_2 ...	57.57	59.25	56.10	58.07	51.22	48.56	1.87
Alumina Al_2O_3 ...	14.25	16.75	17.24	13.22	14.06	17.43	
Phosphorus pentoxide P_2O_5 ...	.15	...	...	...	.25	...	.76
Titanium oxide TiO_2 ...	trace	...	...	...	2.42	...	
Ferric oxide Fe_2O_3	6.04	4.00	4.76	10.10	4.32	16.23	
Ferrous oxide FeO	3.95	4.82			8.73		
Ferrous disulphide FeS_2	...	...	...	...	.49	...	...
Manganese oxide MnO ...	.27	...	...	...	.16	...	...
Lime CaO ...	6.87	6.88	11.20	7.04	8.33	8.68	53.70
Magnesia MgO ...	4.24	3.81	2.29	4.46	4.42	5.10	4.32
Potash K_2O ...	1.08	1.92	1.38	1.58	1.25	Not estimated	
Soda Na_2O ...	2.98	2.56	2.04	2.59	2.55		
Sulphur S ...	.19	...	...	...	...	...	...
Carbonic anhydride C_2O	.30	trace	3.60	...	.19	...	...
Combined Water H_2O ...	1.25	...	1.55	1.50	1.28	...	...
Sulphuric anhydride SO_3 ...	...	...	...	...	...	1.10	.61
Carbonic anhydride & combined water	...	...	...	...	...	1.33	38.00
Moisture ...	...	...	...	...	...	.37	.07
	99.14	99.99	100.16	98.56	99.67	98.80	99.33
Specific Gravity	2.77			2.77	2.98		

of No.6 sample, we do not find the lime contents diminished by contact with the silica of the whin sill, and the stratigraphical and chemical line of demarcation remains perfectly distinct and unaffected by the prolonged contact of one with the other. There are, however, other factors in the problem, which I shall refer to later; and it must be said here by way of caution, that any decision against absorption on the grounds of chemical physics should be very hesitatingly reached, as we cannot reproduce in the laboratory or study, the conditions as to the nature and mass of material, nor the time occupied in the process of eruption and consolidation or the pressures and temperatures of the unknown subterranean areas from which the intrusive material came; and that in such a case any argument or verdict must be somewhat empirical and unconvincing.

Great as are the difficulties of absorption raised by chemical considerations there are still greater ones to face on stratigraphical grounds if this solution is rejected. The dyke has been proved by actual workings to a depth of over 300 feet at Great Ayton, with a thickness of over 90 feet at that depth and no indication of diminishing mass. It may be reasonably assumed that its source is deep seated. It is agreed that in its long course from West to East it does not follow any general line of fault. Where it has not broken through the sedimentary rocks and reached the surface it is found that those rocks are bent upward, as at the Cockfield Quarry, but not fissured. Had the flow and pressure of molten material continued, the superincumbent strata must have been either absorbed or forced upward in broken up debris. Where it has pierced to the surface any broken-up strata might have disappeared owing to subsequent denudation, but as there is no appearance of debris or dislocation where it has stopped a little short of piercing through, that explanation fails.

It is impossible to conceive of an immense cavern, hundreds or thousands of feet deep and of considerable width, in the Carboniferous, Triassic or Jurassic rocks, and continuing in an approximately straight course for 90 miles, into which basaltic material under pressure has welled up and completely filled the space, leaving the covering strata undisturbed and unfissured.

If the removal of the secondary rocks by the physical force of an upward thrust is disproved by the evidence still remaining, and the pre-existence of a huge cavity in the earth, capable of accommodating the dyke, is inadmissible, there seems to be left to us only two ways of accounting for the severance of the strata:

(a) By lateral compression; (b) By absorption.

There is ample evidence of lateral compression in the contact rocks, but there is no satisfactory evidence that this is much greater in the thickest part of the dyke than in the thinner parts, and contortion is not common, if it exists at all. In no case where the walls of the dyke are open to inspection is the amount of compression great enough to account for the mass of strata, which has disappeared. Lateral compression may, I think, be dismissed as anything more than a slight contributory agent. We are therefore driven by a process of elimination to place absorption in the forefront as the principal agent, or to leave the question unanswered or unanswerable.

One objection to absorption is that the basalt is nearly uniform in composition irrespective of the composition of the contact rocks, the absent portion of which, if absorbed, should affect the composition of the dyke in contact. I think this is met by the accepted fact that there has been both vertical and horizontal flow. The orientation of the amygdules observed by Mr. King at Wood End and also that of the included sandstone at Eaglescliffe, is good evidence of horizontal flow. From Mr. Teall's Petrological notes on the dyke I quote the following paragraph :-

> "The long feldspars are frequently in the condition of fragments; and sometimes a crystal may be seen to be fractured and to have had its parts slightly displaced but not actually separated from one another. The fragmentary state of many of the large feldspars, as also the fact that they occur in the same condition at the sides and in the centre of the dyke, proves that they have not been formed in situ but have been brought into their present position from below."

This is not only evidence of a vertical flow but also of intermittent eruption and pressure of molten material from subterranean sources-probably of long duration and of repeated occurrence, during which the component parts of the whole mass must have become thoroughly mixed and homogeneous in composition. The inclusion of country rock observed is not inconsistent with this opinion, as at some phase of the formation of the dyke, the active forces must have decreased in intensity, and blocks which had become detached, but not completely absorbed, would remain in that condition.

In addition to the vertical and horizontal flow, the difference in temperature between that portion of the dyke nearest to the source and that farthest away would cause an internal

circulation during the time when the basalt was in a liquid state, even when the flow was quiescent; and complete diffusion of elements and intermixture of parts would result, leaving little or no evidence of the effect of local difference of penetrated strata, included or absorbed. Direct evidence of absorption is supplied in the workings of Ayton Banks Mine where as already recorded, the basalt has invaded the main ironstone seam for a distance of 27 feet (See Fig. 2, p. 125).

PETROLOGY OF THE DYKE.

This has been very exhaustively investigated by Mr. Teall. I shall only give some of the more important of his determinations, but his very full notes should be carefully studied. He tells us that the original constituents were mainly:

(a) PORPHYRITIC FELSPARS and

(b) FELSPARS OF THE GROUND MASS, belonging to two different stages of consolidation:

(c) AUGITE, which like the feldspars, occurs in two conditions, and by far the largest portion occurs in the form of minute crystals and crystalline grains:

(d) MAGNETITE AND ILMENITE (?) in the form of fairly well developed crystals, and also as skeleton crystals and small granules:

(e) BIOTITE, found in specimens from Armathwaite and Ayton, but not constantly present:

(f) APATITE, not abundant:

(g) Interstitial matter with globulites, longulites, microlites, etc., with many structural variations, and this matter consists of a number of imperfectly individualised substances and occupies about half the groundmass. For reasons which he gives, he considers that the magna which remained fluid after the formation of the large feldspars, the magnetite and many of the augite crystals and grains still contained the chemical constituents of feldspars and augite, and that the peculiar structures of the ground mass owe their origin to the crystallising power of their constituents acting under unfavourable circumstances and making a final attempt to assume a crystalline condition.

QUARTZ is seen in either definite crystals or as crystalline grains, and from its frequent association with calcite he is inclined to class it under the secondary minerals.

CALCITE occurs in irregular crystalline plates and also in the condition of crystalline powder; this latter indicating an advanced stage of decomposition.

STRUCTURAL VARIATIONS. Only two well marked structural types are recognizable, differing merely in crystalline growth. In the marginal parts of the dyke the ground mass consists of mineral felspar, microlites, indistinct brownish granules (? Augite), and specks of magnetite in clear isotropic glass. In the central portion the felspars of the ground mass and the augite grains are much more fully developed and the base appears completely devitrified.

Taking into account not only their petrological similarity but their common peculiarities, Mr. Teall regards the Cleveland, Cockfield and Armathwaite dykes as one in composition, structure and geological age, and he classes them together as one dyke of *pyroxene-andesite*, about 90 miles long; and as the pyroxene is monoclinic, he says it may fairly be called an *augite-andesite*.

On the question of the age of the dyke, Mr. Teall thinks this must be placed in the Tertiary period. A few years ago I was a guest at a Geological Club Dinner, and had the honour of sitting between Mr. Geo. Barrow and Sir Jethro Teall, the conversation turned on the Cleveland dyke and its geological age. He said if we could show that the dyke passed through the oolites, there would be no doubt of its age. Mr. Barrow considered this penetration was settled, but Sir Jethro was unconvinced and drew a sharp distinction between penetration into and penetration through. He was, however, firm in his conviction that it was post Jurassic and saw no reason to alter his published opinion, that as there was no known evidence of Volcanic activity in Western Europe between then and the Tertiary period, and the dyke pointed in the direction of Northern Ireland and Western Scotland, "districts celebrated for the enormous development of Miocene volcanic rock, we seem compelled to regard it as of Miocene age."

CONCLUSIONS.

Among the facts definitely disclosed or reasonably inferred are the following:

The dyke extends from Armathwaite, near Penrith, to Maybecks, near Robin Hoods Bay.

Where observable it runs in a generally straight direction between the two places, but is broken here and there by slight deviations. From this it may be deduced that where it has not reached the surface it is continuous at some depth on the interrupted line, and also at places where it has reached the surface but is broken off abruptly and shifted laterally.

Disturbance of adjacent strata is extra-ordinarily slight.

The flow of molten material has been interrupted and resumed.

It is nearly uniform in composition and character throughout its length, including the Cockfield and Armathwaite sections.

Its metamorphic effects upon the contact rocks are very uneven in character and extent, and not always due to the nature of the contact rocks.

Its upward extension is very irregular, and where it has reached the surface there is no conclusive evidence of any overflow, and no evidence at all of any breaking up and dispersion of the sedimentary rocks by the intrusion of the dyke.

There are local extensions and contractions in the width of the dyke, occurring at different levels or depths below the surface, and consequently the width found at any particular level does not carry assurance of its general continuance, even at that level.

There may have been some weakness or fracture in the rocks through which the dyke passes, but there is no evidence that it is a line of faulted strata.

It seems certain that there has been removal of rock substance to make space for the basalt.

It is clear that the enlargement of the original fissure in the strata has been uneven and that where the strata has had any weak place, or the material has been less resistant, the hot magma has attacked it and caused bulgings in the dyke with occasional penetration for a short distance into the divisions of the bedding planes.

Much of the original country rock must have been absorbed into the dyke when it was molten, and I think a study of Fig. 1, p. 125, is convincing on this point, but there is no evidence of this from differences in chemical composition, and the only observable difference in character between the sides and the centre is differential crystallisation-probably largely due to difference in the time or rate of cooling and to partial resumption of flow of liquid material. This adds proof to the belief that there was not only an upward flow, but that there was internal circulation of the basaltic material, which continued after the forces of propulsion ceased to operate, and that thus homogeneity of composition was produced

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NOTES ON WILD FLOWERS

OBSERVED BY MR. CHAS. POSTGATE, AND MR. ODLING DURING RECENT YEARS.

The Masterwort *Peucedanum Ostruthium* at Thornton-in-Cleveland, a dried specimen has been deposited in the Dorman Museum; the Monkey Flower *Mimulus lutea* is well established near Egton Bridge, also near Kildale. Other interesting plants, not of frequent occurrence, include the following :-Stagshorn Moss *Lycopodium clavatum* and Bog Aspodel *Narthecium ossifragum* on Eston Hills; Meadow saxifrage *Saxifraga granulata* and the Altemate-leaved "Golden saxifrage" *Chrysoplenium alternifolium* from Little Ayton. The Chickweed Winter-Green *Trientalis Europaea* has also been recorded from Easby Hill and the Perfoliate Claytonia *Claytonia perfoliata* which, though a native of N.W. America, is well established at Ingleby Greenhow. The Grass of Parnassus *Parnassia palustris* has long been known in the Whitby District, and its star-like flowers are to be seen in profusion in two of the "bays" on the cliff top between Whitby and Saltwick, also on the marshy slopes of Boulder Clay between Upgang and Sandsend; here it is to be seen by the thousand, and with the constant slips and the washing away of the Boulder Clay at spring tides, hundreds must be carried out to sea. The interesting insectivorous plant, the Common Sundew, *Drosera rotundifolia* is still plentiful between Commondale and Castleton, and it is hoped that it will be allowed to seed itself, and not ruthlessly dug up for planting. Other unusual plants are the Lesser Toadflax *Linaria minor*; Orange Hawkweed *Hieracium aurantiacum*; Whitlow Grass *Draba verna*; and the Yellow Loosestripe *Lysimachia vulgaris* from Castleton; the Snakeweed *Polygonum bistorta* from Wilton, Kildale and Thomton-in-Cleveland.

REPORT ON CLEVELAND LEPIDOPTERA
T ASHTON LOFTHOUSE F.E.S.

** Denotes species recorded in Proceedings for first time.*
*** Denotes species recorded for first time in Yorkshire.*

The following Report on Lepidoptera in the Cleveland District is from observations made from 1916 to 1930.

RHOPOLOCERA.
Vanessa atalanta. On flowers of Buddleia variabilis in garden at Linthorpe in September, 1917.

SPHINGIDAE.
Acherontia atropos. A specimen sent to the Middlesbrough Museum in June, 1930, in perfect condition.

***Choerocampa nerii**. Oleander Hawk Moth. Two specimens of this rare and beautiful Hawk Moth were received at the Middlesbrough Museum in August, one on August 28th, 1930, obtained at Redcar, the other specimen from Middlesbrough district. There were records of this species in other parts of the country about the same time, which seems to indicate a partial migration of this Southern European insect.

BOMBYCES
***Porthesia similis**. A specimen of the Gold-tail moth was seen at rest on a gate pier in Cambridge Road, Linthorpe, 30th July 1927.
***Dasychira pudibunda**. Bred from larvae obtained at Normanby in 1919.
Poecilocampa populi. Male at light. Cambridge Road, Linthorpe, 7th November, 1922.
Notodonta chaonia. Bred from larvae obtained at Kildale by Professor J. W. H. Harrison.
***Notodonta dodonea**. Great Ayton district. J.W.H.Harrison.

NOCTUAE.
Triphaena janthina. In garden at Linthorpe.
Plusia moneta. Pupa of this species found by Mr. M.Odling in a garden at Marton on plants of Delphinium and Aconite, also as larvae at Linthorpe in 1927 from which specimens were bred. See records in Proceedings, Vol. IV. Part 1, pp.57-58.
Euclidia mi. Ingleby Greenhow.

GEOMETRAE.

Crocallis elinguaria. Linthorpe, August 1917:

Phigalia pedaria. Several specimens including one female in Ingleby Manor Grounds on 16th February 1919. All but two on Oak tree trunks.

Strenia clathrata. Males and females flying in afternoon sun by roadside near Easby on 24th June. 1917.

Hybernea leucophearia. Several specimens, Ingleby Greenhow, 16th February, 1919, including a very dark unicolorus specimen.

Hybernea leucophearia var. **marmorea**. Two or three specimens of this pretty variety.

****Oporabia christyi**. Near Nunthorpe, J.W.H.Harrison.
Kildale.

Larentia salicata. Ingleby Greenhow, 20th May, 1918.

Melanthia bicolorata. Garden, Linthorpe, 28th July, 1917.

Anaitis plagiata. Garden, Linthorpe, July, 1916 and August 27th, 1917.

PYRALIDES.

Scoparia crataegella. Linthorpe, 25th July, 1918.

Homoeosoma nimbella. Linthorpe, 4th August, 1917.

Ephestia elutella. Lealholm, 7th July, 1917.

***Ephestia ficulella**. Bred from figs, Middlesbrough, 1925.

TORTRICES.

Tortrix rosana. Mandale Bottoms, Thornaby.

Leptogramma literana. Ingleby Greenhow, 1919.

Leptogramma literana var **sqammana.** Ingleby Greenhow February, 1919.

Peronea mixtana. Ingleby Greenhow, May 18th, 1918.

Peronea variegana var. **argentana.** (Sheldon). A beautiful form of this species described and named in 1931 from specimens taken in the garden at Linthorpe, Middlesbrough.

Dictyopteryx forskaleana. Garden, Linthorpe, July 28th, 1916.

Ptycholoma lecheana. Ingleby Greenhow.

Penthina betulaetana. Common on Birch at Eston.

Penthina dimidiana. At Linthorpe flying freely along hedge sides between 7-30 and 8-30, Summer time. June 16-18th, 1917.

****Penthina nigrocostana**. Mandale Bottoms, June, 1918.
L. S. Brady.

Spilonota rosaecolana. Kildale, July, 1919.

Spilonota roborana. Mandale Bottoms. July 28th, 1916.

Sciaphila hybridana. Linthorpe. July, 1918.

TORTRICES-continued.

***Phoxopteryx unguicella**. Two specimens "poked" out near "Midnight:" Ingleby Greenhow. May 18th, 1918.
Grapholitha trimaculana. About elm in garden, Linthorpe. July 22nd, 1917.
Grapholitha naevana. Off holly in garden, Linthorpe. July 28th, 1917.
Phloeodes immundana. Linthorpe. July, 1918.
***Paedisca ratzeburghiana**. A specimen taken about spruce fir in Kildale Wood, August 13th, 1916. Only once recorded in Yorkshire List.
****Paedisca sinuana**. Pierce. Two specimens taken among birch, Eston, August, 1919. This is a recently described species near **P. solandriana.**
Halonota trigeminana. Great Ayton, July 7th, 1922.
Coccyx argyrana. Several off oaks, Ingleby Greenhow. May 4th, 1921.
Coccyx splendidulana. Ingleby Greenhow, May 14th, 1921.
Coccyx taedella. Garden, Linthorpe, July 9th, 1918.
Coccyx nanana. Flying freely around spruce firs in garden, Linthorpe, early evening. August 9th, 1916.
Coccyx vacciniana. Lealholm. June 4th, 1918.
Dichrorampha petiverella. Flying freely in early evening about Ononis on sea banks, Redcar, June 27th, 1921.
Dichrorampha plumbana. Saltburn, June 1919.
Dichrorampha plumbagana. Saltburn, June 16th 1919.
****Lipoptycha aeratina**. Lea1holm, June 1918. Recently described British species.
***Endopisa nigricans**. Linthorpe, July 1st, 1918. Only one record in Yorkshire List. .
Stigmonota coniferana. Eston, July 15th, 1916. Linthorpe, July 17th, 1917.
Stigmonota regiana. On fence, Cambridge Road, Linthorpe, 1929 and 1930.
Argyrolepia badiana. Garden, Linthorpe, July 28th, 1916. Bred from Ingleby Greenhow larvae, July 12th, 1917. .

TINEAE.
Epigraphia steinkellneriana. Grinkle, May 15th, 1920.
***Scardia granella**. Redear.
***Tinea miaella**. Ingleby Greenhow, May 13th, 1917. Single record in Yorkshire List.
***Tinea pellionella**. About firs in garden, Linthorpe, August 7th, 1918.
Tinea lapella. Garden, Linthorpe, June 5th. 1918.

TINEAE-continued.

***Adela croesella**. A specimen of this lovely little moth taken at Ingleby Greenhow by M. L. Thompson in June, 1918. Only two previous records in Yorkshire List.
*** Anesychia funerella**. Two specimens of this pretty and rare **Tinea** taken near Grinkle on the occasion of a Cleveland Naturalists' Field Club Meeting on May 15th, 1920. Only previous Yorkshire records being at Richmond, and in Yorkshire, opposite Barnard Castle.
Exaeretia allisella. Linthorpe, August, 1919.
Gelechia diffinis. Great Ayton, June, 1918. Eston, July 5th, 1918.
***Gelechia solutella**. Great Ayton, June 10th, 1916.
Gelechia affinella. Yearby, July, 1918.
Lita aethiops. Ingleby Greenhow, May 26th, 1916.
***Lita tricolorella**. Great Ayton, July, 1922.
Lita fraternella. Flying about Cerastium in garden, Marton, August 9th, 1917.
Oecophora fuscescens. Linthorpe and Danby, 1918.
Argyresthia dilectella. Linthorpe about Junipers, July 28th, 1930.
****Argyresthia glabratella**. Off palings, South Bank.
***Ornix torquillella**. Kildale, June, 1918. L. S. Brady.
Coleophora alcyonipennella. Saltburn.
Coleophora caespititiella. Cases and larvae on *Juncus gerardi*, Coatham Marshes.
****Coleophora adjunctella**. Cases and larvae on *Juncus gerardi,* Coatham Marshes.
Elachista kilmunella. Eston, August, 1920.
***Elachista mergerlella**. Ingleby Greenhow, July 27th, 1918.
Elachista cerusella. Linthorpe, May 21st, 1921.
Lithocolletis faginella. Ingleby Greenhow. Beech. May 26th, 1916.
***Lithocolletis nicellii**. Bred on hazel. Glaisdale, May 21st, 1916.
****Buccalatrix maritima**. Taken among *Artemesia maritima* near Cargo Fleet, June 14th, 1919.

The first report on Lepidoptera (Butterflies and Moths) observed in Cleveland, appeared in the Club's Proceedings published in 1895, and they have been continued up to the present issue.

In the early years members interested in local Lepidoptera who assisted in the records included W. Gribble of Stokesley, Frank Elgee, W. Sachse, Frank R. Atkinson and Professor J. W. Heslop Harrison.

The War period 1914-19 with its anxieties, restricted leisure and limited traffic conditions, brought about a cessation in outdoor scientific pursuits. From that period to the present almost all the records are from my own observations.

A little before 1914 I became interested in the garden and what spare time I had was devoted to the garden at home; this entailed little expense and provided a great deal of pleasure, and I am afraid it is now my dominant hobby.

Natural History pursuits have somewhat altered. In pre-war days there were large numbers in all parts of the country who collected and studied the Lepidoptera of the British Isles. Now there appear to be comparatively few, and more time is devoted to the more obscure orders such as Coleoptera, Hemiptera, Diptera, etc., and much more to studying insects from the economic and commercial standpoint.

As I am not working at the Lepidoptera now, and this is probably my last report for this section, it may be of interest to those who take up the study (and I sincerely hope some of our members will), if a short summary of the results of the work done by our members and others interested was given for the period from 1895 to 1930.

SUMMARY.

The following numerical table gives the number of species recorded for the Cleveland district in each of the Orders. The records are all included in our Proceedings excepting about 30 Cleveland Records, mostly Tineae, taken at Redcar by J. Sang of Darlington, and included in Porritt's list of Yorkshire Lepidoptera.

Rhopalocera (Butterflies)	25
Sphinges	9
Sesiidae and Zygaenidae	4
Bombyces	43
Noctuae	156
Deltoides	3
Geometrae	134
Pyralides	23
Pterophori	10
Crambi etc.	16
Tortrices	143
Tineidae	201
TOTAL	767

1,379 Species are recorded for Yorkshire in Porritt's list of Yorkshire Lepidoptera published in 1904, out of a total of 2,140 British species at that period.

The List includes twenty-two species not included in the Yorkshire List of 1904, which are as follows :-

Xylophasia zollikoferi.
Oporabia chrystii.
Peronea nnaccana.
Peronea fissurana.
Penthina nigrocostana.
Orthotaenia antiquana. (1905).
Grapholitha cinerana.
Paedisca rubiginosana.
Paedisca rufinnitrana.
Paedisca sinuana.
Ephippiphora grandaevana.
Lipoptycha aeratina.
Blabophanes weaverella.
Argyresthia atnnoriella.
Argyresthia glabratella.
Cedestis gysselinella.
Coleophora adjunctella.
Laverna hellerella.
Elachista nnonticola.
Cenniostonna wailesella.
Opostega salicella.
Buccalatrix maritima.

The following species recorded in the Proceedings are not correct and should be deleted :-

Paedisca profundana. Vol. I, p. 144, 1896-7-8.
Sciaphila conspersana. Vol. II, p. 127, 1903-4.

ERRATA.

Gelechia discordella. Vol. IV, p. 54, should be Coleophora discordella.

PREVIOUS REPORTS IN PROCEEDINGS.
Vol. I. pp. 16A, 19A, 35, 120, 127, 137, 144,205,266, 270.
II. pp. 50, 125, 180, 219.
III. pp. 53, 57.
IV. pp. 64, 73.

COLEOPTERA OBSERVED IN CLEVELAND.
M. LAWSON THOMPSON, F.E.S.

The following Report on Beetles occurring in the Cleveland district is compiled from observations made during the years 1925-1931. To these have been added the records of some interesting species made by my friends Dr. W. J. Fordham, of Barmby Moor, near Pocklington, and Mr. Geo. B. Walsh of Scarborough, both of who have investigated this district at various times. Their help in communicating the results of their work, as on previous occasions, I am glad to acknowledge.

Those insects marked with an asterisk are additions to the Cleveland list since the last Report was published and amount to 29 species. With these additions, the list of Cleveland Coleoptera recorded in these Proceedings, now numbers 1,113 species.

COLEOPTERA.

Elaphrus riparius, L. On the banks of the Leven at Leven Bridge.
Bembidiunn andreae, F., var. **fennoratunn,** Sturm. On the margin of a pond in Arncliffe Wood, Glaisdale.
Bembidiunn saxatile, Gyll. On the banks of the Leven at Leven Bridge.
Ocys harpaloides, Serv. (*Bembidium rufescans*, Guer.). At Middlesbrough.
***Haliplus confinis**, Steph. In a pond on the Moor above Ingleby, June, 1931.
***Aleochara moesta**, Grav. (*crassiuscula*, Sahl.). Arncliffe Wood, Glaisdale, in rotten wood of hollow tree, September ,1925. A rare insect. .
***Oxypoda umbrata**, Gyll. Arncliffe Wood, Glaisdale, 1927 .
***Atheta oblonga**, Er. (*longiuscula*, Sharp.). At Acklam, Middlesbrough, on the banks of the Tees. One specimen in August, 1925.
Atheta graminicola, Grav. Coatham Marshes.
Atheta flavipes, Thams. (*halobrectha*, Sharp). Grangetown, under seaweed on the shore (G. B. Walsh.).
***Atheta nigella**, Er. On Eston Nab (G. B. Walsh).
Atheta islandica, Fr.• *(eremita*, Rye). At Kirby-in-Cleveland (G. B. Walsh).
***Atheta gyllenhali**, Th. At Marton, May, 1922 (W.J.Fordham).

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***Bolitochara mulsanti**, Sharp. In the rotting branch of a tree on the ground in Kildale Wood. One specimen in June, 1917. This insect was recorded in my Report for 1917 as **B. lunulata**, Payk, a closely allied species. - Further examination recently reveals it to be **mulsanti,** a species not hitherto recognised as British.
Tachinus proximus, Kr. Arncliffe Wood, Glaisdale, in decaying fungi, September, 1926.
***Philonthus fulvipes**, F. Amongst shingle on the banks of the Leven at Leven Bridge. One specimen, August, 1926.
***Philonthus nigritulus**, Grav. Crathorne, 1921 (W. J. Fordham).
Stenus bimaculatus, Gyll. On the margin of a pond in Arncliffe Wood, Glaisdale, May, 1927.
Stenus tarsalis, Ljun. Arncliffe Wood, Glaisdale.
***Trogophloeus arcuatus**, Steph. At Glaisdale (G.B.Walsh).
***Arpedium brachypterum**, Gr. On Burton Head, near Ingleby, June, 1931. One specimen in moss. .
Deliphrum tectum, Pk. At the head of Farndale, in dung,1917.
***Phyllodrepa puberula**, Bernh. Two specimens of a **Phyllodrepa,** which have been in my collection for some years, were recently pronounced to belong to this species by a competent authority. Both examples were taken at Saltburn, one in 1900 and the other 1906. Specimens in other collections examined at the same time, have confirmed the species as a British insect.
Micropeplus porcatus, Payk. At Leven -Bridge.
Catops Kirbyi, Spence. Arncliffe Wood, Glaisdale, in moss.
Catops longulus, Fell. Arncliffe Wood, Glaisdale, in moss.
Omosita colon, L. At Middlesbrough.
***Micrurula melauocephala**, Marsh. On the flowers of bird cherry in Arncliffe Wood, Glaisdale, May, 1925 (G.B.Walsh).
***Paramecosama melanocephalum**, Hbst. Arncliffe Wood, Glaisdale, September, 1929.
Meligethes lumbaris, Battersby, on Whitethorn.
Corticaria pubescans, Gyll. In old thatch at Egton (G. B. Walsh).
***Endomychus coccineus**, L. At Sandsend, 1929 (B. R. Lucas).
Latelmis volkmari, Panz. At Leven Bridge.
Agriotes acuminatus, Steph. (*sobrinus,* Kirs.). At Kildale.
Helodes marginata, F. Arncliffe Wood, Glaisdale.
***Cantharis darwinianus**, Sharp. Eston, on the coast. One specimen in June, 1900.
***Cantharis fulvicollis**, Fab. Stokesley, one specimen by sweeping, July, 1926.

Cantharis paludosa, Fall. At Kildale, and on the moor at Ingleby. .
***Malthinus frontalis**, Marsh. At Kildale, July, 1925.
***Platycis minutus**, F. MuIgrave Woods, Sandsend. Two specimens in August, 1925 (J. M. Brown).
***Niptus unicolor**, Vill, (*crenatus,* Fab.). In an outhouse at Middlesbrough, 1931.
***Priobium (Grynobius) eichoffi**, Schdk. At Kildale. One specimen in June; 1917, and only recently determined as distinct from
P. castaneum, F., the more common species.
Grammoptera ruficornis, F. Battersby, on whitethorn .
***Tetropium gabrieli**, Weise, *var* **crawshayi**, Sharp. Middlesbrough, 1925, to where the insect had doubtless been imported with timber.
***Donacia vulgaris**, Zsch. Arncliffe Wood, Glaisdale, 1926 (C. E. Stott).
***Lema melanopa**, L. At Acklam, Middlesbrough, 1931.
Phytodecta pallida, L. Battersby, on whitethorn, June, 1927.
***Prasocuris junci**, Brahm. In Arncliffe Wood, Glaisdale.
Phaedon cochleariae, F. Coatham Marshes, and Acldam.
•**Phyllotreta tetrastigma**, Com. Arncliffe Wood, Glaisdale, May, 1927.
Longitarsus membranaceus, Foudr. On *Teuaium Scorodonia* in Arncliffe Wood, Glaisdale.
***Phyllobius maculicornis**, Germ. Near Ingleby, June, 1931.
Polydrosus tereticollis, De G. Arncliffe Wood, Glaisdale.
Poophagus sisymbrii, F. Coatham Marshes and Acklam.
Liosoma deflexum, Panz. *(ovatulum*, Clair.), ab**. collare**, Rye. At Glaisdale, 1930.
***Apion craccae,** L. At Egton, on *Vicia cracca*, September, 1929.
***Hylesinus fraxini**, Pz. At Sandsend (B. R. Lucas).

Previous Records of Cleveland Coleoptera by Mr. M.L. Thompson will be found in the back numbers as follows:

Vol. I, for 1895 pages 21-23; for 1896-1898 pages 40-46; for 1899-1900 pages 147-153; for 1901 pages 210-212; for 1902 pages 271-273. Vol. II, for 1903 pages 59-64; for 1904-1906 pages 128-136; Sundry Records (chiefly from those made by the Rev. T. G. Rudd and L. Rudd) pages 186-193; for 1909 pages 214-218. Vol. III, for 1910-1911 pages 58-64; for 1912-1913 pages 125-182; for 1914-1919 pages 175-182; for 1920-1924 pages 222-225.

A PRELIMINARY LIST OF CLEVELAND HEMIPTERA.

M. LAWSON THOMPSON, F.E.S.

The order of insects Hemiptera is divided into two sub-orders. The first, Hemiptera-Heteroptera, contains the plant bugs, water-skaters (Gerris), water boatman (Notonecta) and water scorpion (Nepa). The second, Hemiptera-Homoptera, contains the little jumping insects commonly called "frog-hoppers", and which are bred in many cases in the frothy secretions so common on grass and other plants in summer time, and called in the country "cuckoo-spit." Many plant bugs lead innocent enough lives, feeding upon the plants they frequent, whose sap they extract by means of their proboscis; but a majority of them are carnivorous, and feed upon the juices of insects, or their larvae. All the species have the power of emitting at will a most penetrating odour, and the evil doings of our domestic pest -the bed bug- are well known.

This Preliminary List of the Cleveland species has been compiled from information contained in lists and notes published from time to time in "The Naturalist." In 1921 Dr. W. J. Fordham of Barmby Moor, published a list of the Yorkshire Heteroptera and followed it up in 1922 by one of the Homoptera. Mr. J. M. Brown of Sheffield, published a long series of very full notes on the occurrence of species of both sub-orders at Sandsend, and the immediate neighbourhood in "The Naturalist" for 1925. Prof. J. W. H. Harrison of Birtley, published, when living in Middlesbrough, a list of the Psyllidae of Cleveland in "The Naturalist" for 1915. To all these records have been added my own notes on these insects met with in this district during the last few years. To my friends Mr. J. M. Brown and Dr. W. J. Fordham, I am very much indebted for assistance in connection with this List. The former for naming for me many critical specimens, and the latter, for kindly looking through the compilation, and supplying additional information, which had escaped my notice.

Finally, I have followed the arrangement and nomenclature of the catalogue of British Hemiptera compiled by Edward Saunders, F.R.S., and James Edwards, F.E.S. (August, 1908).

The abbreviations are as follows :-J.M.B.-J. M. Brown, W.J.F.-W. J. Fordham; J.W.H.H.-J. W. Heslop Harrison; G.B.W.-Geo. B. Walsh. The late Mr. E. A. Butler (E.A.B.), the author of 'The Biology of the British Hemiptera-Heteroptera,' visited the Sandsend district some years ago, and met with several interesting insects.

HEMIPTERA-HETEROPTERA.

FAMILY PENTATOMIDAE.

Piezodorus lituratus, F (*purpureipennis,* D. &: S). On gorse plants growing on the cliffs at Sandsend. It occurred in profusion in August, 1925. (J.M.B.)

Pentatoma (Tropicoris) rufipes, L. Common at Glaisdale and Kildale.

Zicrona coerulea, L. Stanghow Moor under heather.

Elasmostethus griseus, L (*interstinctum*, Reut., Saund.) On birch trees at Glaisdale. (J.M.B. and G.B.W.)

FAMILY COREIDAE.

Enoplops, scapha, F. Sandsend, a small colony on the Cliffs in July, 1924 (J.M.B.).

FAMILY BERYTIDAE.

Berytus signoreti, Fieb (*pygmaeu*s, Reut. (*brach*). Runswick at roots of *Ononis* (E.A.B.); Sandsend, on the cliffs -J.M.B.).

FAMILY LYGAEIDAE.

Nysius thymi, Wolff. On the coast at Eston and Warrenby, common.

Ischnorhynchus geminatus, Fieb. (*resedae*, D. &: S.). Sleights and Hutton-Mulgrave Moor. Very common under and on Erica, July, 1924 (J.M.B.). Aislaby (E.A.B.).

Chilacis, typhae, Perr. Stockton-on- Tees, in profusion in November in bulrush spikes (G. T. Rudd).

Macrodema micropterum, Curt. Sandsend, a number at the roots of plants in the old alum workings, 1925. (J.M.B.).

Stygnocoris rusticus, Fall. (*incanus*, Fieb. (macr.) Lythe (E.A.B.): near Sleights.

Stygnocoris pedestris, Fall. (*sabulosus*, Schill.). Sandsend (I.M.B.) : Eston, on the coast.

Trapezonotus arenarius, L. *(agrestis*, Fall. *dispar*, Stal.) Great Ayton, (J.M.B.).

Drymus sylvaticus, F. Sandsend (J.M.B.).

Drymus brunneus, SahIb. Common and widely distributed in Cleveland.

Drymus piceus, Flor. (*sharpi*, D. &: S. (Lamproplax).). Great Ayton, June, 1915 (J.W.H.H.).

Scolopostethus affinis, Schill) (*adjunctus*, D.&: S.) Common in Cleveland. .

Scolopostethus thomsoni, Reut. *(neglectus*,Edw.) Sandsend, at the foot of the cliffs (J.M.B.).

Scolopostethus decoratus, Hahn. (*ericetorum*, Leth). Hutton Mulgrave and Aislaby under heather (.J.M.B.).

FAMILY TINGIDIDAE.
Acalypta cervina, Germ. Runswick in moss (E.A.B.).
Acalypta parvula, Fall. (*obscura,* D. & S.) The less common long-winged form plentiful in turf on the cliff top at Sandsend in 1925 (J.M.B.).
Dictyonota tricornis, Schr. (*crassicornis*, Fall). Runswick -(E.A.B.).
Derephysia foliacea, Fall. Lythe (E.A.B.). Sandsend, one amongst grass on the cliffs, August, 1924 (J.M.B.).
Monanthia cardui, L. Common on thistles in Cleveland.

FAMILY GERRIDIDAE.
Velia currens, F. Common in streams in Cleveland.
Gerris lateralis, Schum, (var. costae, H.S.) Eston Nab (G.B.W.); Arncliffe Wood, Glaisdale, common.
Gerris lacustris, Linn. Arncliffe Wood, Glaisdale.

FAMILY REDUVIDAE.
Ploiariola vagabunda, L .. Lythe (E.A.B.)
Nabis major, Cost. (*pilosulus*, Fieb.,*flavomarginatus,* D.& S.) Sandsend, on the cliffs, August, 1924 (J.M.B.).
Nabis flavomarginatus, Schotz;. Sandsend and Runswick (J.M.B.) ; Ruswarp (W.J.F.).
Nabis limbatus, Dahlb. Common and widely distributed in Cleveland.
Nabis rugosus, L. (*dorsali*s, Duf.). Kildale and Arncliffe Wood, Glaisdale.

FAMILY SALDIDAE.
Salda littoralis, L. Banks of the river at Acklam, common; Teesmouth (W.J.F.).
Salda saltatoria, L. On the banks of Leven at Leven Bridge ; Arncliffe Wood, Glaisdale.
Salda C-album, Fieb. (*stellata*, Curt.). Mulgrave Woods (I.M.B.).
Salda cincta, H.S. Eston, on the coast, September, 1929; Crathorne, near Yarm (W.J.F.).
Salda cocksi, Curt. (elegantula, D. & S. Ugthorpe Moor, in Sphagnum (E. A. B.).

FAMILY ClMICIDAE.
Cimex lectularius, L. Only too common in the towns. The bed bug.
Lyctocoris campestris, F. *(domesticus*, D. & S.) Sandsend . .A.M.B.); Eston (G.B.W.).
Piezostethus galactinus, Fieb. Middlesbrough (J.W.H.H.).

Temnostethus, pusillus, H.S. Sandsend, on old oaks; plentiful where it occurs. All were brachypterns, August, 1924 (J.M.B.).
Anthocoris confusus, Reut. Common in Cleveland.
Anthocoris memoralis, F. Common in Cleveland.
Anthocoris sarothamni, D. & S. Aislaby, plentiful on broom, 1924 (J.M.B.).
Anthocoris nemorum, L. (*sylvestris*, F., Saund). Common in Cleveland.
Tetraphleps vittata, Fieb. On firs and larches, Glaisdale (G.B.W.); Mulgrave Woods (J.M.B.).
Acompocoris pygmaeus, Fall. (*lucorum*, D. & S.). On fir trees. Common in Cleveland.
Microphysa pselaphiformis, Curt. Egton Moor, on Scotch fir (J.M.B.); Kirby in Cleveland (G.B.W.).
Microphysa elegantula, Baer. Mulgrave Park, on bark (E.A.B.).

FAMILY CAPSIDAE.
Pithanus maerkeli, H.S. Common in Cleveland.
Miris calcaratus, Fall. Common in Cleveland.
Miris holsatus, F. Common in Cleveland.
Megaloceraea ruficornis, Fourc. Common in Cleveland. **Teratocoris saundersi**, D. & S. On the moor near Sleights) August, 1922.
Leptopterna ferrugata, Fall. Common in Cleveland.
Leptopterna dolobrata, L. Common in Cleveland.
Monalocoris filicis, Lin. Common on ferns In Cleveland.
Bryocoris pteridis, Fall. Common on *Pteris* and other ferns in Cleveland.
Lopus gothicus, L. Sandsend, at the roots of plants on the cliffs, August, 1924 and 1931 (J.M.B.).
Phytocoris tiliae, F. Arncliffe Wood, Glaisdale (M.L.T.); Mulgrave Woods (J.M.B.).
Phytocoris longipennis, Flor. (*dimidiatus*, D. & S.) Mulgrave Woods, August, 1924 (J.M.B.).
Phytocoris dimidiatus, Kb. (*dubius,* D. & S.) Sandsend, August, 1924 (J.M.B.).
Phytocoris varipes, Boh. (*ulmi*, D. & S.) Sandsend, on the cliffs, August, 1924 (J.M.B.).
Phytocoris ulmi, L. (*divergens*, D. & S.). Common on elms in Cleveland.
Calocoris ochromelas, Gmel. (*striatellus, F.*). Kildale, on oaks
Calocoris sexguttatus, F. Common in Cleveland.

Calocoris roseo-maculatus, De G. f*errugatu*s, D. &: S.). Eston, on the coast; also at Runswick (J.M.B.).
Calocoris bipunctatus, F. Common in Cleveand.
Calocoris lineolatus, Goeze. (*chenopodii*, Fall.). Redcar and Eston, on *Chenopodium* and *Ononis* on the Coast: common.
Plesiocoris rugicollis, Fall. Common on sallows in Mulgrave Woods (J.M.B.).
Lygus pabulinus, L. Common in Cleveland.
Lygus contaminatus, Fall. (*sulcifrons*, D. &: S.) On birch trees. Common in Cleveland.
Lygus viridis, Fall. (*contaminatus*; D. &: S.). Sandsend, on ash, August, 1924 (J.M.B.).
Lygus lucorum, Mey. Leven Bridge and near Redcar.
Lygus spinolae, Mey. Grosmont and Sandsend (I.M.B.).
Lygus pratensis, L. Common in Cleveland.
Lygus rubricatus, Fall. Mulgrave Woods, on firs, August, 1924 (J.M.B.); also by (E.A.B.).
Lygus cervinus, H.S. Mulgrave Woods (J.M.B.).
Lygus kalmii, L. On *Umbelliferae*, Lythe (E.A.B.); near Sleights.
Camptozygum pinastri, Fall. Hutton Mulgrave, plentiful on pines (J.M.B.) ; Acklam ((M.L.T.).
Liocoris tripustulatus, F. Common on nettles in Cleveland.
Rhopalotomus ater, L. Common in Cleveland.
Macrolophus nubilus, H.S. Sandsend, on brambles and *Stachys sylvatica,* August 1924 (J.M.B.).
Dicyphus constrictus, Boh. Sandsend and Mulgrave Woods, August, 1924 (J.M.B.); Lythe, on *Lychnis diurna* (E.A.B.).
Dicyphus epilobii, Reut. (*pallidus*, D. &: S.). Common on *Epilobium i*n Cleveland.
Dicyphus stachydis, Reut. On *Stachys sylvatica* at Battersby and Glaisdale.
Dicyphus pallidicornis, Fieb. Aislaby, on Foxglove; chiefly *brachypterns* (E.A.B.).
Dicyphus globulifer, Fall. Not uncommon on *Lychnis dioica* near Sandsend (J.M.B.).
Dicyphus annulatus, Wolff. Runswick, on *Ononis* (E.A.B.).
Campyloneura virgula, H.S. Sandsend, on oaks (J.M.B.).
Cyllocoris histrionicus, L. Common on oaks in Cleveland.
Aetorhinus angulatus, F. Common on alders in Cleveland.
Mecomma ambulans, Fall. Common in Cleveland.
Cyrtorrhinus caricis, Fall. Glaisdale, on rushes, in October, 1927.
Orthotylus marginalis, Reut. (*nassatus*, Fall.). Mulgrave Woods, on Salix (J.M.B.).

Orthotylus tenellus, Fall. (*angustus*, D. &: S.). Sandsend, on oak, August, 1924 (J.M.B.).
Orthotylus viridinervis, Kb. On elm at Sandsend, August, 1924 (I.M.B.); Leven Bridge.
Orthotylus flavosparsus, Sahlb. (*prasinus,* D. & S.). Eston, on the coast; on *Atriplex littoralis*. Common in October, 1927
Orthotylus chloropterus, Kbm. Common on broom in Cleveland.
Orthotylus concolor, Kb. Near Sleights, on broom.
Orthotylus adenocarpi, Perro (*douglasi, Saund*) Grosmont, on Broom, August, 1924 (J.M.B.).
Orthotylus ericetorum, Fall. Common on heather in Cleveland.
Heterocordylus tibialis, Hahn. Common on broom in Cleveland.
Malacocoris chlorizans, Fall. Grosmont, on hazel in August, 1924 (J.M.B.).
Macrotylus paykulli, Mey. Sandsend, on *Ononi*s, August, 1924 (J.M.B.).
Phylus palliceps, Fieb. Sandsend, on oaks, August, 1924 (J.M.B.).
Phylus melanocephalus, L. Sandsend (J.M.B.); Kildale on oaks.
Phylus coryli, L. (var. *avellanoe,* Mey. Sandsend, on hazel, August, 1924 (J.M.B.). .
Psallus, variabilis, Fall. Common in Cleveland.
Psallus lepidus, Fieb. At Leven Bridge.
Psallus alnicola, D. & S. (*alni,* D. & S.) Sandsend, August, 1924 (J .M.B.).
Psallus varians, H.S. (*distinctus*, Fieb.) Common in Cleveland.
Psallus diminutus, Kb. Mulgrave Woods, (E.A.B. and J M.B.).
Psallus roseus, F. (*sanguineus*, F., *querceti,* F., *dilutus*, D. &: S.). Sandsend and Grosmont (J.M.B.) ; Leven Bridge.
Atractotomus magnicornis, Fall. Mulgrave Woods, on firs, August, 1924 (J.M.B.).
Plagiognathus chrysnathemi, Wolff. (*viridulus*, Fall.). Common in Cleveland.
Plagiognathus arbustorum, F. Common in Cleveland.
Asciodema obsoletum, D. & S. Common on furze and broom in Cleveland.

FAMILY NEPIDAE.
Nepa cinerea, L. Common in Cleveland

FAMILY NOTONECTIDAE.

Notonecta glauca, L. Common in Cleveland, variety **furcata***,* Fab. Eston Nab and Marton (G.B.W.).

FAMILY CORIXIDAE.
Corixa geoffroyi, Leach. Marton and Saltburn (G.B.W.).
Corixa hieroglyphica, Duf. Saltburn (G.B.W.).
Corixa nigrolineata, Fieb. *Fabricii,* Fieb.). Arncliffe Wood, Glaisdale (M.L.T.); Burton Head, Ingleby (J.M.B.).
Corixa praeusta,. Fieb. Arncliffe Wood, Glaisdale, and Stokesley (M.L. T.); Burton Head, Ingleby (J.M.B.).

HEMIPTERA-HOMOPTERA.

FAMILY CERCOPIDAE.
Aphrophora alni, Fall. Common on alders in Cleveland.
Philaenus spumarius, L. Common in Cleveland.
forma **leucophthalmus**, L. Mulgrave Woods (J.M.B.)
forma **lateralis,** L. Middlesbrough and Stokesley (M.L.T.).
forma **leucocephalus***,* Germ. Nunthorpe (W.J.F.) and Mulgrave Woods (J.M.B.).
forma **praeustus,** Fab. Runswick (J.M.B.).
forma **populi***,* Fab. Stokesley (M.L.T.).
Philaenus lineatus, L. Common in Cleveland.

FAMILY JASSIDAE.
Ulopa reticulata, Fab. Common under heather in Cleveland.
Megophthalmus scanicus, Fall. Sandsend (J.M.B.).
Tettigonia viridis, L. Nunthorpe, (W.J.F.).
Euacanthus interruptus, L. Common in Cleveland.
Batracomorphus (Macropsis) lanio, L. Common on oaks in Cleveland.
Oncopsis (Bythoscopus) alni, Schr. Common on alders in Cleveland.
Macropsis (*Pediopsis*) **rubi**, Boh. Sandsend, on brambles, 1925 (J.M.B.).
Macropsis (*Pediopsis*) **cerea**, Germ. Near Runswick, by beating sallows on the cliff (J.M.B.).
Idiocerus adustus, H.S. Grosmont and Sleights, on sallows (J.M.B.).
Idiocerus confusus, Flor**.** Common on sallows in Cleveland.
Idiocerus albicans, Kbm. Sleights (J.M.B.).
Agallia puncticeps, Germ. Sandsend (J.M.B.); Leven Bridge (M.L.T.).
Agallia venosa, Fall. Runswick (J.M.B.).
Acocephalus nervosus, Schr. (*rusticus,* Fab.). Common in Cleveland.

Acocephalus bifasciatus, L. Baysdale on heather (M.L.T.); Runswick and Sandsend (J.M.B.) ..
Acocephalus albifrons, L (*interruptus*, Scott.). Sandsend and Runswick (J.M.B.); Middlesbrough.
Acocephalus trifasciatus, Foure. Sandsend, one specimen on the cliffs, 1925 (J .M.B.).
Acocephalus flavostrigatus, Don. Sandsend, 1925 (J.M.B.).
Eupelix cuspidata, Fab. Sandsend, in turf, 1925 (J.M.B.).
Eupelix producta, Germ. Hutton Mulgrave Moor in turf, 1925 (J.M.B.).
Doratura stylata, Boh. Sandsend, amongst the turf on the cliff top (J.M.B.).
Athysanus sordidus, Zett. Sandsend (J.M.B.); Middlesbrough.
Athysanus plebejus, Fall. (*communis,* J. Sahl., Edw.). Grosmont and Sandsend, common (J.M.B.).
Athysanus lineolatus, Brulle (*obscrurellus*, Kbm.). Mulgrave Woods and Runswick (J.M.B.); Acklam (M.L.T.).
Athysanus obsoletus, Kbm. Common in Cleveland. var, *piceus*, Scott, common on Hutton Mulgrave Moor (J.M.B.).
Deltocephalus ocellaris, Fall. Aislaby (J.M.B.).
Deltocephalus distinguendus, Flor. Sandsend (J.M.B.).
Deltocephalus pascuellus, Fall. Sandsend, 1925 (J.M.B.).
Deltocephalus puticaris, Fall. Sandsend (J.M.B.).
Deltocephalus thenii, Edw. Sandsend, 1924 (J.M.B.).
Jassus (Allygus) mixtus, Fab. Acklam, September, 1931 (M.L.T.).
Thamnotettix prasinus, Fall. Common in Cleveland.
Thamnotettix subfusculus, Fall. Mulgrave Woods, amongst grass (J.M.B.).
Thamnotettix splendidulus, Fab. Sandsend, 1925 (J.M.B.).
Limotettix striola, Fall. Eston Marshes, amongst rushes (M.L.T.).
Limotettix 4-notata, Fab. Sandsend, 1920 (W.J.F.).
Limotettix sulphurella, Zett. Common on grasses in Cleveland.
Limotettix persimilis, Edw. Mulgrave Woods and Runswick; common amongst grass, 1924 (I.M.B.).
Cicadula variata, Fall. Sandsend in considerable numbers on *Teuerium scorodonia* at the foot of the cliffs, August, 1924 (J.M.B.).
Cicadula sexnotata, Fall. Coatham Marshes.
Alebra albostriella, Fall. Glaisdale, August, 1930 (J.M.B.).
Mulgrave Woods, along with the vars. *wahlbergi*, Boh. and *fulveola*, H.S. August, 1924 (J.M.B.).
Dikraneura flavipennis, Zett. Eston Marshes, amongst *carices* ; common.
Dikraneura, variata, Hdy. Sandsend, common amongst grass (J.M.B.).
Empoasca (Kybos) smaragdula, Fall. Common on willows and sallows in Cleveland.
Eupteryx vittatus, L. Sandsend (J.M.B.); Arncliffe Wood, Glaisdale, on *Mentha*.

Eupteryx urticae, Fab. Common on nettles in Cleveland.
Eupteryx stachydearum, Hdy. Sandsend (J.M.B.).
Eupteryx auratus, L. Common in Cleveland.
Eupteryx atropunctatus, Goeze, (*pictus,* Auctt.). At Egton.
Eupteryx signatipennis, Boh. Sandsend and Runswick, plentiful on *Spiraea ulmaria* (J.M.B.).
Eupteryx germari, Zett. Hutton Mulgrave, on pines, 1925 (J.M.B.).
Eupteryx pulchellus, Fall. Mulgrave Woods, common on oaks (J.M.B.).
Eupteryx concinna, Germ. Mulgrave Woods, on oaks, August, 1924 (J.M.B.).
Typhlocyba ulmi, L. Glaisdale (J.M.B.).
Typhlocyba douglasi, Edw. Arncliffe Wood, Glaisdale, common on the beech (J.M.B.); Sleights, common on roadside limes (J.M.B.).
Typhlocyba crataegi, Dougl. Sandsend, on the hawthorn (J.M.B.).
Typhlocyba quercus, Fab. Sandsend, common on blackthorn (J.M.B.) ; Leven Bridge, on oaks.
Typhlocyba nitidula, Fab. Mulgrave Woods, very common on elms, August, 1924 (J.M.B.).
Typhlocyba geometrica, Schr. Grosmont and Sleights, on alders (J.M.B.).
Zygina alneti, Dahl. Sandsend (J.M.B.).
Zygina coryli, Toll. Sandsend (J.M.B.).
Zygina flammigera, Geoffr. *(blandula*, Auctt.). Mulgrave Woods (J.M.B.). .
Zygina scutellaris, H.S. Sandsend and Runswlck, plentiful amongst grass (J.M.B.).
Zygina negtecta, Edw. Grosmont, 1924 (J.M.B.).

FAMILY FULGORIDAE.
Cixius nervosus, L. Common in Cleveland.
Cixius brachycranus, Scott. (*intermedius*, Scott.). Mulgrave Woods, rather common on nettles (J.M.B.).
Kelisia vittipennis, J. Sahl. Hutton Mulgrave, on rushes, 1925 (J.M.B.).
Conomelus limbatus, Fab. Common on rushes in Cleveland.
Delphax (Liburnia) difficilis, Edw. Kildale, July, 1927.
Delphax discolor, Boh. Kirby-in-Cleveland (G.B.W.); common on the moor at Ingleby.
Delphax fairmairei, Perris. *(neglecta*, Flor., *extrusa,* Scott.). Sandsend (J.M.B.).
Dicranotropis hamata,Boh. Common at Sandsend (J.M.B.); near Osmotherley.

FAMILY PSYLLIDAE.
Livia juncorum, Latr. Common on rushes in Cleveland.
Livia crefeldensis, Mink. Near Stainton, rare on sedges around a pond (J.W.H.H.)

Rhinocola aceris, L. Gunnergate, Marton (J.W.H.H.).
Rhinocola ericae, Curt. Common on ling *(Calluna vulgaris*) in Cleveland. .
Aphalara calthae, L. (*polygoni,* Scott.). Marton, fairly common on larch and spruce, although its food is knotgrass (J.W.H.H.).
Aphalara exilis, Web. & Mohr. Eston Wood (J.W.H.H.).
Pysllopsis fraxinicola, Forst. Common on ash in Cleveland.
Pysllopsis fraxini, L. Common on ash in Cleveland.
Psylla pyricola, Forst. A single specimen beaten from mountain ash in Lonsdale (near Kildale) (J.W.H.H.).
Psylla costalis, Flor. Common throughout the district (J.W.H.H.).
Psylla peregrina, Forst. (*crataegicola,* Scott.). Common on whitethorn in Cleveland.
Psylla mali, Schmdbg. Common on crab-apple (*Pyrus malus*) in Cleveland.
Psylla alni, L. Common on alder in Cleveland.
Psylla forsteri, Flor. Cleveland, on alder, but much rarer than **alni** (J.W.H.H.).
Psylla buxi, L. Common on box in Cleveland (J.W.H.H.).
Psylla hartigii, Flor. *(sylvicola*, Scott.). Great Ayton, a few beaten from birch in June (J.W.H.H.).
Psylla melanoneura, Forst. Common late in the year; not on its reputed food plant, hawthorn, but on oak, conifers, etc., generally distributed (J.W.H.H.).
Psylla nigrita, Zett. (*pineti,* Flor.) Common on firs in Cleveland. .
Psylla salicicola, Forst. Hemlington and Nunthorpe, on sallows; not common (J.W.H.H.).
Psylla ambigua, Forst. (*stenolabis*, F. Low.). Marton and Nunthorpe, very common on sallow, in May and June (J.W.H.H.).
Psylla spartii, Guer. (*spartiophila*, Forst.). Lonsdale (near Kildale), sparingly on broom (J.W.H.H.).
Arytaena genistae, Latr. (*ulicis*, Scott.). Common on broom In Lonsdale (near Kildale) (J.W.H.H.); and Grosmont (J.M.B.).
Trioza albiventris, Forst. Nunthorpe sparingly from sallow and silver fir in October and November (J.W.H.H.).
Trioza urticae, L. Common on nettles in Cleveland.
Trioza galii, Forst. Sandsend, common on *Galium cruciata,* August, 1925 (J.M.B.).
Trioza chenopodii, Reut. (*dalei,* Scott.). Eston; on the coast: abundant on *Atriplex littoralis*.

THE FLOODS IN THE ESK VALLEY IN JULY 1930.

J. W. R. PUNCH, F.R.A.S.

The floods which occurred in the Esk Valley between the 20th and the 23rd July, 1930, were, as far as is known, the heaviest of any on record in that area.

Floods are not infrequent in this valley and happen to some extent every year. Probably the lower fields on each side of the river, such as the Tennis Court to the Writer's house "Ellerstang" Castleton, are under water as often as, on an average, once every two years. These floods quite frequently occur in July. There was heavy flooding in July 1915, and the highest recorded flood before that under description was in July 1840.

These floods rise quickly and as quickly subside. The writer has walked across "Ellerstang" Bridge on the Castleton-Danby End Road, and when he desired to return in a few minutes the road over the Bridge has become flooded, and he has had to wade through water to reach home.

This is not because the rainfall of this part of Cleveland is heavy for an upland district, but is due to the topography of this part of the moorland area of North Yorkshire.

Compared with Middlesbrough and Seathwaite in Borrowdale, (said to have the heaviest rainfall In England), the rainfall of this area is as follows :-

	MIDDLESBROUGH.	CASTLETON	SEATHWAITE.
1927	29.27	39.95	150.00
1928	23.99	32.74	182.15
1929	20.31	28.16	136.52
1930	28.79	51.89	122.87

The topography comprises the great moorland anticline - an arch of rock-which runs practically west and east from Botton Head above Ingleby-Greenhow to Robin Hood's Bay. From this arch, deep basin-shaped valleys falling North and South have been carved out. These valleys known as “dales" have steep sides falling to the stream draining them. Each dale forms a most efficient catchment basin receiving a large area of rainfall, and rapidly guiding that rainfall into the stream, which, as rapidly delivers the flow-off in a concentrated volume into the main river valley at its foot. The outfall of the southern valleys is the plain of Malton, which is open and expansive country, and so the floodwater can dissipate more or less harmlessly. This is not so however with the Esk Valley. That valley is narrow and troughlike with an almost unbroken wall to the

north of it. The flood water which is collected by the valleys falling northward from the moorland ridge, such as Sleddale, Baysdale, Westerdale, Danbydale, the two Fryups, Glaisdale, Egton Bridge, etc., is delivered into this troughlike Esk valley, which, even if there was an uninterrupted flow seawards, could with difficulty be coped with. The flow is however, obstructed by three remarkable defiles. The deep gorge of Crunkly Gill, which is only about 170 yards wide in parts, comes first after the flow-off of the first named six valleys, has flushed into the main valley. Then comes the second defile of "Oak Scar Woods" between Lealholm and Glaisdale, and lastly there is the long, rather winding defile of East Arncliff Woods, commencing at Beggars Bridge, and extending almost to Egton (See Plate X).

So what happens is, that after the dales have become, may we say waterlogged from a prolonged wet spell, and a heavy and persistent rain follows, all this rain water falls into the dale streams which normally are quite gently flowing streams in deep channels cut in the alluvium. These streams become turbid torrents and the water from each one races into the main valley. The river in this main valley soon overflows its banks. The flow of water is retarded by the defiles, even if one or more of the defiles does not become plugged. If one does, the plug holds up the water for a time and gives way when the pressure becomes too great for it to withstand. This gives rise to a heavy flush of water which breaks away carrying with it stones, trees, brushwood, and so on. This is again met by the next defile and may be repeated.

It is in this way that the usually peaceful and picturesque Esk is apt to flood its valley and become a raging torrent dealing out destruction on every hand.

The rain, which caused the floods of July 1930, commenced about 3 p.m. on the 20th and ceased about noon on the 23rd. The striking feature was its persistence rather than its heaviness at first, but as will be seen, much rain fell on each of the four days. The rain was incessant except for two or three hours on the afternoon and night of the 21st, and became absolutely torrential on the 22nd and the 23rd, when it poured down in floods from an inky sky. The floods were at their height during the night of the 22nd-23rd and the Sleights and Egton Bridges gave way about 5-30 a.m. on the 23rd. During the morning of the 23rd the floods began to subside and the rain stopped about noon when the subsidence became rapid.

The table on page 159 shows the rainfall records in the neighbourhood.

This table is most striking and of exceptional interest to the Writer. It shows that the rain gauge in his garden (which is standard and in a position approved of by the Meteorological Office) recorded not only the highest total for the four days, but the highest for each individual day. Thus the centre of heaviest rainfall is demonstrated to be at or about Castleton.

The stations supplying the records each way have been arranged in the table in order as they receded from Castleton eastward (i.e. down the Esk Valley), westward, northward, and southward. It will be observed that the rainfall increased, broadly speaking, as each station approaches Castleton, and diminishes in each direction as the distance increases from there.

The totals recorded at Castleton, Middlesbrough and Seathwaite for the month of July for the last four years, are as follows:-

	Castleton	Middlesbrough	Seathwaite
1927	2.49	4.32	11.50
1928	0.86	1.17	15.86
1929	2.67	2.08	13.87
1930	13.65	4.89	6.10

RAINFALL IN CLEVELAND MOORLAND AREA
JULY 20TH – 23RD 1930

Eastward Rainfall increasing towards Castleton					
	20th	21st	22nd	23rd	Total
Whitby	2.27	1.47	1.28	0.12	5.14
Aislaby	2.60`	2.46	3.11	0.31	8.48
Sleights	2.48	2.44	3.01	0.38	8.31
Egton Bridge	2.44	2.62	4.07	0.65	9.78
Glaisdale	2.17	2.24	3.68	0.24	8.33
Danby (School)	2.46	2.25	5.20	1.13	11.04
CASTLETON					
"Ellerstang"	**2.70**	**2.23**	**5.07**	**1.25**	**11.97**
Westward. Rainfall decreasing from Castleton					
Kildale Hall	2.28	2.02	4.55	1.18	10.04
Ingleby Manor	2.05	1.55	4.15	0.82	8.57
Rounton Grange	0.70	2.01	0.57	2.59	5.87
Ampleforth Abbey	0.42	0.92	0.29	0.56	2.19
Northward. Rainfall decreasing from Castleton					
Lockwood Beck	2.70	1.84	4.46	1.11	10.11

Kateridden (11/2 m north of Lockwood Beck	2.64	1.16	3.43	0.50	7.73
Marton-in-Cleveland (Odling)	1.89	0.51	1.55	0.11	4.06
Middlesbrough (Park)	1.22	0.24	1.20	0.25	2.91
Southward, Rainfall decreasing from Castleton					
Pickering					2.14
Helmsley					1.80

Let us seek to realise what a rainfall of 11.97 inches in slightly under three days (3 p.m. 20th to noon 23rd) means. The Writer's garden is practically 2 acres in area. An inch of rainfall equals about 100 tons of water per acre. Thus, practically 2,400 tons of water fell on that garden in these three days. And yet comparatively little damage was done. One or two small trees. uprooted and washed away. The wire netting round the Tennis Court became matted up with hay and brushwood, and four posts were broken down and the wire ripped away.

If we take the Esk Valley as, say 20 miles long and averaging 7 miles broad, we have an area of 140 square miles. This equals in round figures 90,000 acres. Take an average rainfall of say, 9 ins. per acre, and we have approximately 80 milllon tons of water dumped into the valley in less than three days. The quantity is prodigious. No wonder that enormous damage was done in the lower reaches of the valley.

Let us now survey some of the more remarkable effects of the floods along the valley.

All the low-lying fields about Castleton were flooded, the water rising until it was practically 10 feet above normal water level in the river. Castleton was cut off from the Station and Danby Beck was impassable either at Ellerstang, Piper or Ashfield Bridges. The current left the line of the river and took short cuts over its meanders, leaving stones, gravel, sand and debris to mark its temporary channel. Plate VII, Fig. 1 shows the flood from Danby Bridge looking up stream. At Lealholm the entire course of the Esk was changed for six months after the floods. Many hundreds of tons of stones (many very large), with trees, branches, etc., were dumped at the outfall of Crunkly Gill, and this completely blocked up the old channel leaving the course of the river diverted after the subsidence of the flood on to the adjoining field to the north. Here it divided into two streams, one flowing back into the old channel through the hedge in about 200 yards, and the other stream continued down the field almost by the side of the small Primitive Methodist Chapel, washed down the boundary wall and cascaded into the sunken lane which leads from the highway across the stepping stones and by means of this lane, rejoined the course of the river, and so passed seaward under the Lealholm Bridge.

Plate XII, fig. 2 shows the divided and diverted stream more than a month after the flood, with the left branch flowing through the hedge and the right hand branch flowing along the field towards the lane. Plate VIII, fig. 1 shows the water cascading down the destroyed wall into the sunken lane and flowing into the old river course at the "stepping stones." Plate VIII, fig. 2 shows the wall of the Chapel on which the height of the flood in July, 1840 (the previous record), is marked, and the black mark about 10 inches above it shows the height of the flood in July 1930.

It appears that Crunkly Gill, only some 170 yards wide in parts, had become dammed for some time by the stones, trees, branches, brushwood, and hay crops brought down by the river. The weight of water forced the dam and the resulting rush of water swept down an immense load of stones-some perhaps fifty tons in weight-which were dumped at the end of the gill where the water, having emerged from the ravine, could spread and so lose its velocity and consequent carrying power. The height of the water in the gill could be traced to about 18 feet above normal level. The owner of one side of the gill informs the Writer that he well knew many of the large stones along the gill before the flood, but afterwards he could only recognise one of them. Much damage was done to the lower paths, indeed to the whole of the rock garden of the late Sir F. Ley.

Plate IX is a photograph of the Beggar's Bridge, Glaisdale, taken in the afternoon of the 23rd after the flood had begun to subside, and shows a remarkable state of things. The height of the underside of the arch is 18 feet above normal stream level, and the height of the pier, which supports the lattice steel fencing on the side of the new girder road bridge is 7 feet 3 inches above the surface of the road. The flood when at its highest, reached the cap on the square pillar, which is prominent on the right side of the iron bridge.

On examination of the photograph it will be seen that the lattice work has filtered out the trees, brushwood, hay, etc., which the river was bringing down and held them, so probably saving this irreplaceable gem of Cleveland beauty. Part of the abutments and parapets were washed away.

But the railway bridge about half a mile eastward of Beggar's Bridge was not so fortunate. This bridge was a stone two arch bridge, with a massive pier in the middle and built about 70 years ago. The middle pier was uprooted and a large block washed

in one mass some distance down stream, leaving the rails attached to the sleepers suspended in mid-air. Plate X shows two views of the rails suspended with an abutment of the Bridge. It is well-nigh inconceivable that flood water could have had the power to uproot a central pier like this, and carry it down stream as it did.

The road near the whinstone quarry at Egton, and about a mile further on, the Egton Bridge was washed away.

Similarly, Sleights Bridge, another massive stone built bridge of two arches, built in 1764, was carried away. Thus the highway between Whitby and Pickering via Blue Bank, was broken, and by the breaking of the water-main carried by the bridge, Whitby was deprived of its supply water for nearly 48 hours, in the high season.

After leaving Sleights the floodwater spread itself over the flats towards Ruswarp and Whitby, and so scoured out to sea. On its way, walls and fences were levelled, tearooms, outhouses, barns, crops, livestock and the like, were destroyed and washed away. Many householders were marooned, and pleasure boats and even the lifeboat, had to be requisitioned to cruise inland for about two miles over flooded fields to rescue those trapped in the upper rooms of their houses. One poor lady - a Miss Brown - lost her life.

The lines of the Poet Thomson do not inaptly describe the tragedy of these floods :-

" ..... the fields around
Lie sunk and flatted, in the mighty flood
Sudden the ditches swell; the meadows swim.
Still from the hills innumerable streams
Tumultuous roar, and high above its banks
The river lift; before whose rushing tide
Herds, flocks and harvest, cottages and swains
Roll mingled down; all that the wind has spar'd
In one wild moment ruined; the big hopes
And well earned treasures of the painful year."

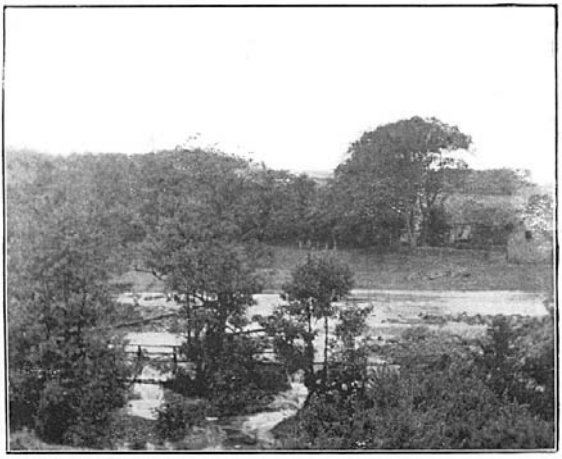
The flooding of the Esk Valley was by far the heaviest, as is shown by the table of rainfall on page 159. But there was heavy flooding in the Leven Valley at Kildale, Great Ayton, Stokesley, Hutton Rudby, Leven Bridge, on the flats about Nunthorpe, and further westward, and much damage was done.

The Meteorological conditions prevailing were a low depression which persisted off the coast of south east Yorkshire and Lincolnshire from the 20th to the 24th July, with strong northerly winds over the Yorkshire

PLATE VII.

Photo by H. Clemmit, Danby

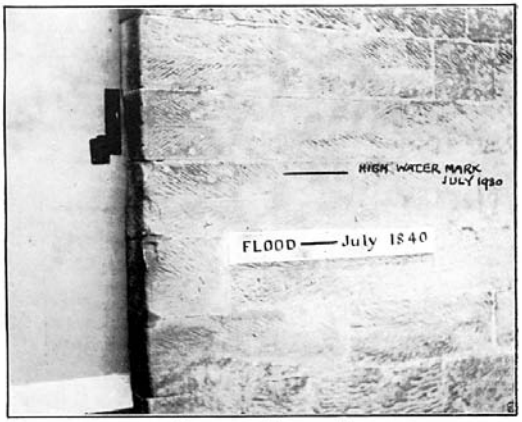
ESK AT DANBY MILL (UPSTREAM). 23rd JULY, 1930.



LEALHOLM. DIVERSION OF ESK INTO TWO COURSES.

PLATE VIII.

LEALHOLM. SHEWING ONE BRANCH OF DIVERTED ESK JOINING OLD CHANNEL NEAR "STEPPING STONES."

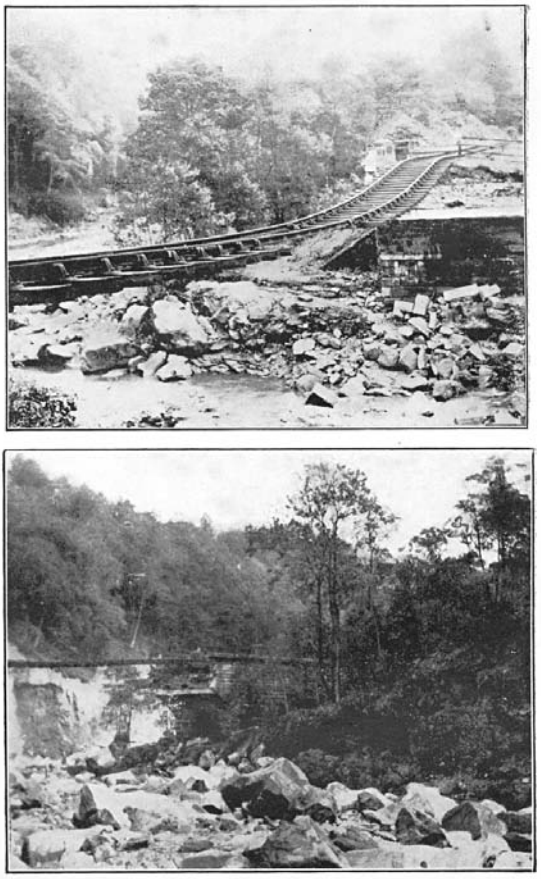


PRIMITIVE METHODIST CHAPEL, LEALHOLM.

PLATE IX.

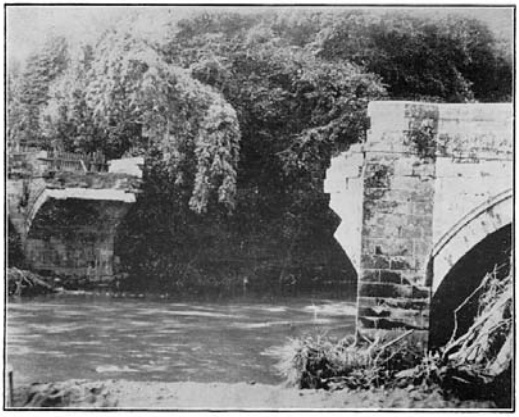
BEGGARS BRIDGE, GLAISDALE, ON AFTERNOON 23rd JULY, 1930. *Photo by J. Broadbent, Glaisdale.*

PLATE X.

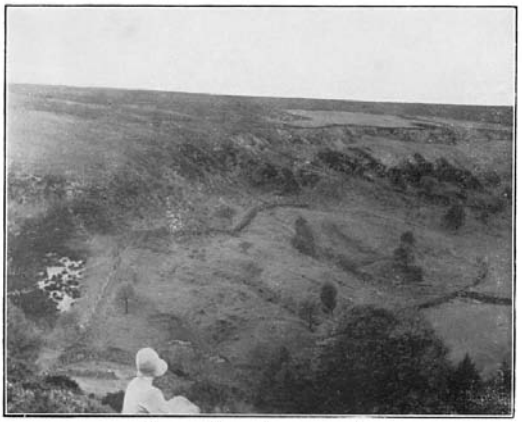


RAILWAY BRIDGE IN ARNCLIFFE WOODS AFTER FLOOD IN JULY, 1930.

PLATE XI.



EGTON BRIDGE AFTER FLOOD.



DANBY HEAD (UNDERCLIFF).

PLATE XII.

COUMS. SHEWING LANDSLIP.

COUMS. ILLUSTRATING SINKING OF ROAD.

COUMS. SINKING OF ROAD AFTER FLOODS OF SEPT., 1931.

NEW RAILWAY BRIDGE IN ARNCLIFFE WOODS, AS DESTROYED BY THE FLOODS IN SEPT., 1931.

SOME GEOLOGICAL ASPECTS.

There were many features of these floods, which are of interest to the Geologist and the student of the evolution of scenery.

The floodwater was of course, turbid with stones, gravel, soil, sand and silt, all of which were carried seawards. The sea was turbid as far as could be seen, and for a wide area around the outfall of Whitby Harbour. This resulted from the breaking down of banks, uprooting of trees, ploughing out of new channels, and carrying away of the disintegrations of rocks which had accumulated during years past.

So these floods must have laid down extensive beds of material on the sea bottom in a vast semi-circular area for miles around the mouth of Whitby Harbour - first gravel, then grit, sand, and lastly, mud and silt as the velocity of the flow fell and the carrying capacity was reduced. These beds will be full of the remains of cattle, sheep, pigs, small land animals and birds, tree trunks, branches and vegetable matter, much of which will eventually become fossilized, and so the ever prying Geologist of distant ages, will find "estuarine beds" of great interest, the examination of which will enable him to unerringly read the broad story of this flood.

The eroding power of the flood would no doubt have been greater if it had occurred in prehistoric times. Since, then, there would have been no channels kept open and drains to facilitate the flow off of the water. On the contrary, the valley bottoms would be more or less choked with trees, brushwood, and undergrowth, which would impede the rapid flow-off of the water and so increase the tendency of the flow to rive up the trees, loosen the river banks and rocks, dam up the water into lakelets which, by bursting their dams, would cause great flushes of water thereby increasing their power to disintegrate the substance of their basins many fold.

There are many examples of landslips or undercliffs in these Cleveland dales. Remarkable ones are at the heads of Great Fryup, Danby Dale, on Hasty Bank, and so on. Plate XI, fig. 2 shows that at the head of Danby Dale. These slips are mostly on the western cheek of the valleys owing to the dip of the rocks towards the East.

The sequence of events leading towards these landslips is the development of a line of fissures in the soil. This gives access to water and eventually to intenser sub-aerial action. When this has led to an instability of the rock, an excess of water comes along,

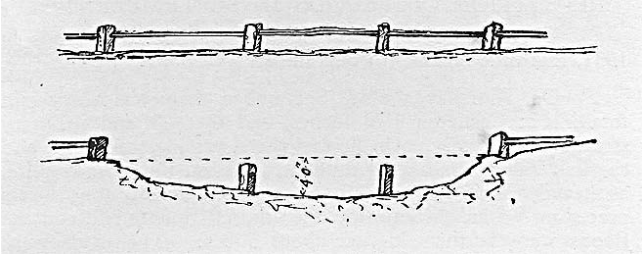
lubricates the base often on clayey shale, and the whole water logged mass slides downward, either by slow degrees or even, though more seldom, rapidly.

An interesting example of rather an unusual type of landslip occurred in July, 1930, in "The Coums," a half basin shaped valley scooped out of the end of Danby Rigg, where it abuts on the high road leading from Ainthorpe past Danby Castle into Fryup.

On the West side of this incipient dale, there is clearly a semi-circular landslip similar to that at Danby Head. It is as usual, on the West cheek of the valley. Plate XII, fig. 1 shows the landslip, and also the road leading towards the Castle. Where the line of the slip, if prolonged, would traverse the metalled road, and for about 35 yards along, the highway sank 4 feet, practically vertically, during and immediately following the flood. The road on the outerside, was protected from a deepish depression by a series of stone posts and square rails as diagrammatically shown on page 165. The road sank, carrying with it the stone posts still in position as shown in the lower figure. It thus became impassable. The road-repairers built a retaining wall along the outer edge of the road, and filled up the depression without disturbing the stone posts, which can now be seen in situ below the surface of the road as is seen in the lower illustration of Plate XII. The road has, since repair, sunk further by probably about another foot. This was a vertical sink, but an examination of the ground and fields on the low side of the road reveals fissures, bulging, wrinkling and slipping, indicating a somewhat deep seated, what may almost be called "floe" of earthly material, shale and the like, laterally towards the valley bottom along some surface of harder shale no doubt rendered slippery by excessive water. The field walls along the side of the road have moved out of alignment to the extent that in some places they are almost in festoons. In this way, is produced part of that general warp and pressure of material towards the river banks which results, at frequent intervals, in large masses of earth falling into the river and which are carried away by freshes and completely removed by floods. Those who watch this destruction of the land over a period of years have little difficulty in realising the efficiency of these processes of denudation in making "the high places low" and ultimately in the formation of a peneplane.

Canon Atkinson describes a similar occurrence to this at the same place in "Forty Years in a Moorland Parish", but that subsidence was apparently not nearly so great nor the

accompanying phenomena so marked as this one, or his acute observation would not have left him in doubt as to the nature of the phenomenon he described.



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Other happenings may be observed at the East end of the semi-circular landslide. A wellmarked and still developing fracture can be seen along the fields in alignment with the main landslip prolonging it in the same semi-circular direction, and others more or less parallel are developing. Below these again there are bulgings and wrinklings in the surface of the fields – walls are affected, and there is every appearance of general instability, which may lead to a landslide of major dimensions. It is probably largely in this way that our dales have been formed.

Excessive rain and a fortiori, floods cause many minor land slides in various parts of the dales bringing down huge "streams" of earth, stones (often of great size) and slurry. The road beyond Danby church towards the dale head was blocked a few years ago for several days by just such a slide. This flood was no exception, and many of these minor landslides could be enumerated.

By a review of the effects of this flood of July 1930, floods are revealed as one of the more potent – though perhaps spasmodic – agents in the formation of our Cleveland Dales, and of more general interest in the evolution of land surfaces. Possibly their greatest contribution is in the transportation of the detritus which the less noticeable, though perhaps more persistent agents, have accumulated and made available.

But, lest we take a too dismal view of the future, we must ever remind ourselves that this destruction equally means creation. That all this material which is being rolled seaward is nevertheless "sowing the seeds of continents to be ", and so the people of an older earth may glory in the thriving of corn on

fertile fields composed of the rocks formed of part of the Dales of Cleveland.

REPETITION OF FLOODS IN SEPTEMBER, 1931

There was a repetition of these phenomenal floods in 1931, this time on the 4th September.

On Thursday, the 3rd September, there was a heavy rain totalling at Castleton 1.78 inches, and the Esk and tributary streams rose rapidly. On Friday, there was incessant rain, and the Esk Valley was heavily inundated almost, though not quite, as heavily as in July 1930. During the twenty-four hours preceding 9am on Saturday, the 5th, 5.01 inches fell, and the floods were at their highest about 5pm. The roads were impassable. A cart was requisitioned to convey passengers from the station to the village at Castleton. The conditions shown in Plates VII and IX were repeated, and the floodwater at Lealholm reached the level of July, 1840, but not that of 1930.

Again, much damage was done; crops were ruined, sheep drowned and bridges washed away. Again the Whitby lifeboat was launched over the Ruswarp-Sleights road, and many were rescued by it from their homes, some twice within eighteen months.

The fine single span iron lattice girder railway bridge of 150 feet span, between Glaisdale and Egton Bridge, which had been erected in place of the stone bridge destroyed in 1930 (Plate X), and only opened at Whitsuntide, 1931, was let down on to the river bed. The river worked in behind the Eastern abutment of the Bridge, washed it down, and so let the Bridge down (see Plate XIV). The river channel has been widened at this point by about 64 feet.

A similar phenomenon took place to that described previously at the Coums. The road again sunk vertically. The fall at the West end was about 16 inches, and at the East end about 11 inches, and the other corresponding phenomena noted in 1930 were accentuated. Plate XIII shows this sink clearly.

Generally speaking, the effect on the topography of the country in the Esk Valley was not nearly so marked as in July 1930.

ORNITHOLOGICAL NOTES IN NORTH YORKSHIRE AND SOUTH DURHAM, 1930-1.

C. E. MILBURN.

It is satisfactory to be able to state that with perhaps one exception, the Teesmouth birds referred to in the last Proceedings, Vol. IV, Part 1, pp. 61-63, are numerically holding their own in this area, and the remarks pertaining to them in what follows, will give some idea of their present status with us.

Stonechat (Pratincola rubicola). A pair with young on the wing were met with on the furze covered slopes of Eston Hills in June, 1930, but a search in the following season drew blank. In 1929 I came across three pairs of these very local birds breeding among the thick gorse, which thrives on the top of the banks near Blackhall Rocks. The birds did not give their nesting secret away however, and were not in evidence in later seasons.

White Wagtail (Motacilla alba). As a visitor on the spring migration the White Wagtail can be met with almost every year about the first week in May. The pearl grey black contrasting with the black head is very distinguishable at this time from our breeding *pied* form.

Meadow Pipit (Anthus pratensis). One out of a brood of five, which was ringed in a nest at Graythorpe Shipyard on June 7th, 1930, was "recovered" at Alange Estremadura, Spain, on January 11th, 1931. The cine picture of the "Titlarks" nest under a log of wood taken by Mr. C. Hood on the 1930 Teesmouth Excursion will have an added interest through this later incident.

Tree Sparrow (Passer montanus). There is one thing about the nesting habits of this scarcer relative of our town bird that appeals to me - it is so thorough. Even if its nest is placed well down in a knothole of a high tree, the entrance being just enough for the bird to squeeze through, it makes a fully domed nest at the bottom, not, as one would expect, the ordinary cup shaped structure like other hole breeders. When built in the cavity of a snapped-off limb, you can be almost sure that the entrance hole will be at the most inaccessible side, and other

than dragging away the dome of grass and feathers from above, it is usually a difficult matter to inspect the contents of the "Click" sparrows' home. A nice little colony exists near Stokesley, while odd pairs are fairly evenly distributed where there are suitable trees. A pair reared young close to N. Ormesby in 1930, and in S.E. Durham, the base of a Magpie's nest has been utilised.

Corn Bunting (Emberiza miliaria). A gradual diminution of its numbers has taken place during the last few years, especially on the outskirts of Middlesbrough and the Haverton Hill district. The same applies to the Marske area a former stronghold of this bird, where the sea banks always held a few accessible pairs.

Sheld-Duck (Tadorna cornuta). Still the ornamental bird of the river mouth. Its breeding numbers being about the same - half a dozen pairs on the Durham side and one for the Yorkshire part. These coupled with the flocks of migratory "Skells" up to thirty to forty in number, which are present in April and May, are one of the most dazzling sights the river holds. Whether on the wing, settled on the green marsh or lined up on the top of the sea-wall like soldiers in full dress they cannot help but attract attention to their striking plumage.

The young are most active creatures, and the speed which they can run, is astonishing, as some of us are well aware, while in the water they are almost as adept as a Grebe in diving and travelling under the surface. Curiously enough the parent birds do not submerge when the young are in danger, usually coming up and flying round the intruder while the brood are either sprinting or diving away from the intruder.

Shoveller (Spatula clypeata). Breeding numbers maintained and odd pairs are to be found well away from the main station, Saltholme and Cowpen Marsh.

Teal (Nettion crecca). One pair have nested regularly on Cowpen since my 1928 note, and reared young each season.

Pochard (Fuligula ferina). A pair successfully hatched young on the disused backpond at Belasis, Billingham. Two unmated drakes spent the summer of 1931 here also.

Tufted Duck (Fuligula cristata). Along with the above, a pair of these ducks reared young in 1931 at the same place.

Avocet (Recurvirostra avocetta). On May 22nd, 1931 three of these rare visitors were noticed by my friend, Mr. Bishop, feeding in the pools at the foot of the sea-wall near Graythorpe Shipyard. My son spent the afternoon of the 24th watching them, but only one bird was there when I was able to visit the place. However, I was amply repaid by the good view of the

remarkable plumage, method of feeding, call and flight, all of which are most distinctive. There are few, if any, previous records for the Durham side of Tees-mouth.

Common Sandpiper (Totanus hypoleucis) A pair of these birds have successfully reared young for the last five years on the Durham side of the Teesmouth, and are an addition to our marsh breeders.

Redshank (Totanus calidris). As a rule the nest of the Redshank on our marshes is most cunningly hidden in the centre of a tussock of grass; in most cases the eggs being almost invisible even when the bird has just hurriedly left the place. How the departing owner manages to leave without showing any signs of an exit is somewhat of a mystery to more than one of us. One would at first think that the covering blades of grass spring back when the bird leaves, but the simple test of inserting a couple of fingers, or better still, trying to abstract an egg, soon upsets this idea entirely. The grasses do not spring back, and an obvious hole is made by the interference, one having to smooth the displaced grasses together in order to give the nest its original appearance. The only suggestion I can offer is that the Redshank when leaving gives the grasses a flick with its wings or feet, which effectually removes any trace of its departure. However, the manner in which the sitting bird “flips” away from her eggs is so abrupt that the eye cannot notice anything definite try as one may. A moving picture of the incident would perhaps throw some light on this feature of the Redshank’s nesting economy. A nest found on the Club's joint excursion on May 16th, 1931 was so unusual as to be worth mention. It was entirely open like that of a Lapwing, but was partly screened on one side by a grass tussock. In scores of Redshanks nests that I have come across, this is the only one I can remember where the eggs were plainly visible and not hidden by any grass screen.

Black Tailed Godwit (Limosa aegocephala). One seen in summer plumage along with a dun coloured Bar Tailed Godwit on May 24th, 1930, which is a very scarce visitor to us in the spring migration, although it breeds no further away from us than Holland. The Bar Tailed species is common enough in April and May on migration, usually joining the large packs of Curlews which regularly visit the mud flats as the tide uncovers the feeding ground.

Sandwich Tern (Sterna cantiaca). For a few years now about four or five pairs of these large handsome Terns have frequented the river-mouth during the whole of the summer, and a look-out in the "book" kind of places for a nesting site has

been fruitless. Such a thing as the birds breeding within sound of a busy steelworks a couple of miles distant from the Middlesbrough Town Hall was too absurd. Nevertheless, Mr. G. Phillips has watched the "Sandback" Terns carrying food to their young on an island on what was called the “big lake" close to Clarence Steelworks, and the youths employed there used to swim across to get bird eggs, some of which are described as being "like bantams with black spots on them." This place is now drained, but the birds have not as yet abandoned the Tees, for on June 11th, 1931, Mr J. Bishop found three "nests" with single eggs at another place at Teesmouth. The Gulls prevented the Terns from going further by sucking the eggs, and a damaged egg in my possession is perhaps the only proof remaining of the Sandwich Terns attempt to breed in 1931. The birds remained in the estuary all the summer, but no further attempt to breed came under our notice.

Common Tern (Sterna hirundo). After one or two successful years in which the birds prospered exceedingly well, nests being commonly found right out on the flat grass land, as well as on the usual small islands, egg lifting became prevalent in 1930, and I was informed of cases where between fifty and a hundred eggs were lifted in one morning, mostly for eating purposes. The main island was mercilessly raided while the birds continued laying, and it was only the outlying nests that managed to escape this persecution. Consequently one could see Terns feeding young in August, and perhaps ten pairs out of fifty managed to rear young in 1930. The birds, in spite of this, return in about the same numbers as before, and seeing that my friend Mr. J. Bishop has been appointed watcher by the R.S.P.B. for the Teesmouth area, one hopes his efforts, coupled with our Club's, in getting the Terns eggs on the protected list, will give the birds more encouragement to stay with us than they have latterly received.

Lesser Tern (Sterna minuta). Although this bird, through its habit of laying its eggs among the pebbles and shingle close to the high water mark, suffers regularly through the very high tides swamping the whole breeding area, still it persists and manages to get a brood off eventually. In 1930 about fifteen pairs nested on the old Yorks ground, while two other places were the home of a few pairs. The Summer of 1931 saw no less than five distinct parts of the Teesmouth chosen as breeding places, the most unusual being a small colony of a dozen pairs, which laid their eggs among the fine slag which forms the base of one of the jetties near the mouth of the river. Railway lines intersect the whole place, while the view from the weigh cabin must vie with that of the Graythorpe Shipyard in its novelty. As this slag haunting colony is clear of any tidal menace, there seems no

reason why it should not prosper, but "sea swallows" are so erratic in their choices in different years, that prophecy is useless. The Shipyard colony has gradually dwindled down to a couple of pairs only, the main reason being the rapid spread of marram grass, which does not seem to agree with this Tern's nesting habits. Taken all round, 1931 was a record year for this species with us. At the Tees I am fairly convinced that the young of the Lesser Tern take to the water after they are about a week old and are brought up there until they can fly. One can find young up to a week old regularly, but not a sign of half grown or more matured nestlings on the nesting ground.

Black Headed Gull (Larus ridibundus). One or two abortive attempts to breed have been made at the river mouth during the last few years, and one can hardly encourage this species at the expense of others more interesting and less destructive.

Fulmar (Fulmarus glacialis). The rapid extension of the breeding range of the Fulmar Petrel in the British Isles has been the most striking ornithological event of latter years. Instead of being only a casual visitor in Autumn and Winter, it now breeds on most of the sea cliffs of Yorkshire, and locally, one has only to visit Huntcliffe, Saltburn, to see the bird at home in the breeding season. Here it shares the ledges with the Herring Gulls and the flat paper knife shaped wings, wonderful gliding flight accomplished with hardly a beat of the pinions, readily distinguish it from its cliff neighbours. There will be nearly a dozen pairs frequenting the Saltburn Cliffs, most of which are breeding birds.

Nightingale (Luscinia megarhynca). On May 15th, 1932. Mr. R. Watson, while following his employment at the Normanby Magnesite Brick Works, heard a bird's song in Flatts Lane, which on a closer acquaintance he correctly identified as being that of the Nightingale. The news soon got into the press, and in a few days it took a small force of woodmen and police on night duty to control the crowds of people visiting the place between 10 p.m. and 4-30 the following morning during which time the male sang almost continuously every night, rain or fine, during its stay. Special Motor Buses, and a long line of motorcars and motorcycles parked in Normanby lane each night, paid eloquent tribute to the bird's popularity as a songster. A low sycamore surrounded by dense hawthorn and other cover about five yards from the lane road, was inevitably the male's station when in full song, but during the day he could he heard higher up in the taller part of the wood. Both male and female were seen in the daytime by myself and my friend J Bishop on a few occasions, but they did not seem to have settled down in any particular place, such as would suggest breeding. After treating us to

nearly a fortnight's regular nocturnal song, it ceased abruptly on May 28th, and no more has been noticed of our scarce visitors since that date.

METEOROLOGICAL OBSERVATIONS AT MARTON-IN-CLEVELAND.

Year 1928. Month ...	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Max. in Screen ... {Highest ...	55°	62½°	61½°	76°	74°	80°	83°	76°	73½°	68°	61°	60½°
{Lowest ...	40°	37°	35°	42°	46°	55°	62°	60°	53°	51°	44°	37°
Min. in Screen ... {Highest ...	40°	47°	43½°	51°	51°	53°	58°	62°	58½°	54°	49°	40°
{Lowest ...	25°	25°	20°	21°	29°	35°	41½°	43°	31°	28½°	29°	24°
Min. on Ground... {Highest ...	39°	42°	46°	42°	50°	56°	54°	58°	56°	50°	43°	36°
{Lowest ...	24°	20°	14°	21°	25°	31°	36°	40°	25°	21°	23°	17½°
Number of days below Freezing ... {Screen ...	11	8	7	6	1	0	0	0	2	3	2	15
{Ground ...	17	17	15	10	6	1	0	0	5	8	10	20
Max. Temp. difference in 24 hrs., Screen reading	20½°	37°	26°	36°	38½°	37°	31°	27°	33½°	33½°	28°	23½°
Max. Wind in M.P.H. ...	55	52½	49	42	37	40	35	30	25	43	47	48
Max. Rain in inches ...	.431	.325	1.000	.362	.263	2.950	.593	1.860	.453	.828	.377	.262
Rainfall for month in ins.	2.625	1.466	3.091	1.042	1.466	5.970	1.216	3.275	.906	2.156	2.191	1.707
Rainless Days	7	10	8	11	14	13	22	15	13	12	9	14

METEOROLOGICAL OBSERVATIONS AT MARTON IN CLEVELAND.

YEAR, 1929. MONTH...		JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Max. in Screen ...	Highest ...	52½°	55⅓°	81⅓°	63½°	79½°	76½°	85°	77°	86½°	66°	57°	56°
	Lowest ...	36°	27°	41°	43⅓°	35°	54°	53°	59°	58½°	49°	42°	35°
Min. in Screen ...	Highest ...	44½°	41°	46°	48°	57°	56°	59°	62°	50°	52°	50°	49°
	Lowest ...	17°	11½°	23°	21°	24°	38°	37°	43°	39°	28°	22°	26°
Min. on Ground...	Highest ...	34°	40°	46°	52°	56°	55°	57°	60°	54°	49°	48°	45°
	Lowest ...	10°	8°	20°	20°	22°	34°	32°	37°	36°	23°	18°	21°
Number of days below Freezing ...	Screen ...	19	17	13	6	3	0	0	0	0	4	6	6
	Ground ...	25	21	18	11	3	0	0	0	0	7	12	13
Max. Temp. difference in 24 hrs., Screen ...		21°	25°	48°	33°	38½°	27°	34°	26°	35°	25°	29°	22½°
Max. Wind in M.P.H. ...		39	39	24	30	32	26	25	32	27	38	57	55
Max. Rain in inches ...		.543	.275	.045	.350	.202	.474	.572	.600	.681	.625	.416	.566
Rainfall for month in ins.		2.443	.877	.099	1.618	.855	1.367	1.569	2.631	.907	2.703	2.347	2.738
Rainless Days		10	13	27	15	17	17	21	11	23	13	11	5

METEOROLOGICAL OBSERVATIONS AT MARTON-IN-CLEVELAND.

YEAR 1930	MONTH ...	JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Max. in Screen ...	Highest ...	52°	56°	65°	72°	73°	83½°	78½°	90½°	72°	65°	61½°	53°
	Lowest ...	40°	36½°	36½°	43½°	49°	53°	51½°	60°	54°	53°	31½°	37½°
Min. in Screen ...	Highest ...	44°	39°	45°	49°	52°	57°	60°	63°	56°	56°	46°	45°
	Lowest ...	23°	23°	15°	31°	28°	39°	44°	44°	38°	30°	22°	21°
Min. on Ground...	Highest ...	47°	39°	42°	48°	48°	55°	58°	60°	55°	55°	46°	41½°
	Lowest ...	20°	19°	10°	27°	26½°	37°	41°	40°	34½°	26°	19°	18½°
Number of days below Freezing ...	Screen ...	9	13	10	1	1	0	0	0	0	1	9	11
	Ground ...	10	18	15	3	3	0	0	0	0	4	12	18
Max. Temp. difference in 24 hrs., Screen	...	27°	32°	26°	28°	29°	32½°	23½°	30°	27°	27°	33°	23½°
Max. Rain in inches	...	.725	.428	.747	.805	.266	.769	1.879	1.018	.531	.609	.965	.340
Rainfall for month in ins.		2.375	1.766	3.060	2.479	1.422	1.678	6.136	3.212	2.257	2.105	3.949	1.945
Max Wind in M.P.H.	...	70	40	35	47	35	21	24	38	40	41	45	50
Rainless Days	...	9	13	12	9	15	18	12	9	10	16	12	12

METEOROLOGICAL OBSERVATIONS AT MARTON-IN-CLEVELAND.

YEAR 1931. MONTH ...		JAN.	FEB.	MAR.	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Max. in Screen ...	Highest ...	55°	56°	73°	68°	75½°	78°	74°	74°	75°	76°	61°	59°
	Lowest ...	33°	35½°	41°	42°	51½°	54°	59½°	57°	53°	49°	43°	41°
Min. in Screen ...	Highest ...	45°	44°	44°	49°	53°	58°	59°	57°	56°	59°	53½°	46°
	Lowest ...	22°	27°	21°	28°	29½°	38°	44°	37°	34°	23°	29°	19°
Min. on Ground	Highest ...	42°	43°	41°	47°	51½°	56°	57½°	56°	55°	54½°	52°	43½°
	Lowest ...	19½°	23½°	19°	26°	26°	34°	39°	33½°	30½°	19°	26°	15°
Number of days below Freezing ...	Screen ...	15	10	19	2	1	0	0	0	0	7	1	11
	Ground ...	21	17	24	7	4	0	0	0	2	10	3	16
Max. Temp. difference in 24 hrs., Screen		23°	22°	37°	32°	33°	29°	23½°	30½°	26°	39°	26°	24°
Max. Wind in M.P.H. ...		51	50	37	38	35	41	27	30	33	37	48	51
Max. Rain in inches ...		.484	.330	.248	.868	.786	.760	.831	.480	2.593	.553	.544	.550
Rainfall for month in ins.		1.991	1.651	1.074	2.643	1.700	3.915	4.127	2.260	5.293	1.201	2.775	1.339
Rainless Days		9	10	19	11	14	10	4	13	8	20	10	15

SUMMARY OF OBSERVATIONS—MARTON-IN-CLEVELAND.

	1928.		1929.		1930.		1931.	
	24 hrs. ending.		24 hrs. ending.		24 hrs. ending.		24 hrs. ending.	
Maximum in Screen — Highest	83°	July 16th.	85°	July 21st.	90½°	Aug. 28th.	76°	Oct. 16th.
Maximum in Screen — Lowest	35°	Mar. 12th.	27°	Feb. 15th.	31½°	Nov. 23rd.	33°	Jan. 8th.
Minimum in Screen — Highest	62°	Aug. 12th.	59°	July 22nd.	63°	Aug. 28th.	59°	July 4th.
Minimum in Screen — Lowest	24°	Dec. 21st.	11½°	Feb. 16th.	15°	Mar. 20th.	19°	Dec. 31st.
Minimum on ground — Highest	58°	Aug. 12th.	60°	Aug. 24th.	60°	Aug. 28th.	57½°	July 4th.
Minimum on ground — Lowest	14°	Mar. 13th.	8°	Feb. 16th.	10°	Mar. 20th.	15°	Dec. 31st.
Maximum Wind M.P.H.	55	Jan. 11th.	57	Nov. 26th.	70	Jan. 11th.	51	Jan. 17th. / Dec. 4th.
Maximum Rain in inches	2.950	June 14th.	.681	Sept. 29th.	1.879	July 21st.	2.593	Sept. 5th.
Total Rainfall for the year in inches	27.211		20.153		32.382		29.969	
Rainless Days	148		183		147		143	
Days when Frost was registered on the ground	109		113		83		104	

Notes on Meteorological observations and records for 1925-6-7 occur in Vol. IV., Part I, Pages 36-43.

NOTES ON THE ALUM INDUSTRY

H.N. WILSON F.I.C.

1. HISTORY.

Alum was known to the Greeks, from whom the knowledge passed to the Saracens, and it was not until the fifteenth century that the Italian industry was started, the famous works at Civita Vecchia, which passed into the possession of the Pope, commencing in 1470. By 1500 about 800 workmen were employed. After the Reformation, various attempts were made to break the papal monopoly, particularly at La Rochelle, and under Elizabeth, several efforts were made, at Alum Bay in the Isle of Wight, and near Dublin. Sir Thomas Chaloner was Irish, and gained his first ideas on the subject at the latter place. The first successful manufacture was started near Guisborough at Belman Bank; some prospector having drawn Chaloner's attention to the possibilities there, the latter and three others "floated a company" (to use modern parlance) to exploit the industry. Most of the early legends are demonstrably false, but it is true that three foreign workmen were procured, and "Fuller's Worthies" supports the idea that one at least was brought out of Italy in a hogshead. The industry was never free from state interference until the Commonwealth, but the King never made any money by it. In 1609 the Crown bought out the original Patentees, who had spent about £30,000 on plant, etc., and were very glad to receive Crown annuities instead of doubtful dividends. The Crown expected to make about 1500 tons of alum per year at a profit of £12 per ton, but though several persons did make money thereby - probably Sir Arthur Ingram made the most - the King always lost; Two enquiries and a Star Chamber trial were held, and reveal the Stuart finances as a mass of incompetence and corruption. They also show some interesting statistics. In 1613 there were four alum works, employing about 800 men; the paymaster was already (since 1609) £1,659/11/5$^{1}/_{2}$ short in his accounts. Coal, which was imported from Durham, was the chief expense in addition to labour. By the time of James' death, it was estimated that his interest in the heavy chemical industry had cost the state close on £100,000 (all money is given in £ sterling of the period, not translated to modern values). During the Commonwealth - foe of all monopolies - the works were handed to their original owners, and in the reign of Charles II, the Duke of Buckingham was at one time owner of the Sandsend works. This is noteworthy because he invited the Royal Society to enquire into the industry

and suggest alterations and improvements, and about this time the process became substantially what it was to the end,

(though it is probable that changes were always being slowly made, as in all" rule of the thumb" procedures). In 1736 the price was £10 per ton and the four works surviving agreed on a limitation of output, which was to be 1,500 tons per annum. This succeeded so well that in 1746 the price was £14, and the output nearly doubled. In 1764 the make was 3,200 t.p.a. at £22, but in 1770 it was £16, so a new limitation of output was agreed. With such fluctuations the industry continued; in 1822 six works produced in all 2,840 tons, but the industry was declining owing to competition from Scotland and a too conservative outlook. In 1860 Spence's process was patented in Lancashire. This was the last straw. Kettleness and Boulby closed in 1861 (despite the combination of smuggling with honest trade at the latter place), Loftus in 1863, and finally Sandsend soon after 1870.

2. THE PROCESS USED IN CLEVEl.AND.

Alum does not exist as such, in Alum shale, but it is made from raw materials thus existing. The shale consists of clay, which is partly *Alumina,* and contains abundant *Pyrites* FeS_2, which is the source of the necessary sulphuric anhydride; there is also bituminous matter, which assists in the combustion. Roughly, the FeS_2 burns and forms some SO_3, which combines with the Al_2O_3 of the clay to form aluminium sulphate. The shale was first of all piled on a large area of brushwood to a depth of two or three feet. The kindling was ignited and more shale piled on until the heap was about 200 feet square and 90 feet high. Combustion was controlled by covering the heap with clay. It was desirable to obtain a slow combustion so that the ferrous sulphate formed was decomposed and the aluminium sulphate (which is more stable) remained. The heap burned for a year or more and then slowly cooled. The burnt shale was then lixiviated to dissolve all soluble salts and the solution evaporated in lead-lined pans. The spent shale was thrown into the sea. The "liquor" was concentrated until most of the ferrous sulphate, calcium sulphate and magnesium sulphate had crystallised out, when the strong solution containing-amongst other things-aluminium and ferric sulphates and free sulphuric acids was decanted from the less soluble impurities. (Filters were unknown). The "alum-maker's secret" was when it was most advantageous to stop the concentrating and separate from impurities. This was done by determining the specific gravity by means of crude hydrometers or a primitive specific gravity bottle. A species of "assay" was also conducted on the liquors at

this point in the earlier days. The next point was the precipitation of the "alum:" The double salt did not yet exist, and the

necessary alkali was now introduced. If potash alum were being made, kelp was used. This was made by burning sea-weed and extracting the ashes. Staithes was the centre of this industry. The kelp contained potassium chloride, which was useful because the chlorine prevented the iron salts from crystallising due to the formation of ferric chloride, a very soluble salt. Usually ammonium alum was made; as it is less soluble larger yields were obtained and the product was easier to purify. The source of the ammonia was fermented urine (ammonium carbonate from urea), and the material was collected in all the ports from Bridlington to Sunderland, and shipped in coastal "tankers" to the various works. The ammonia alum or potash alum, after addition of the alkali, was allowed to crystallise, and finally purified by recrystallisation.

The theoretical yield from 100 ton of average shale was about 25 tons of potash alum, but the actual yield was only about sixteen hundredweight. That is not good, but it is a wonder to the writer, when he considers the complexity of the process, which was quite incomprehensible to those working on it, that they ever made any at all.

POTTERY FOUND AT THORNTON-IN-CLEVELAND. In August, 1930, Mr. O. C. Hill found several fragments in the side of a stream, which fitted together, these suggest that they are part of a vessel measuring about 11 inches at the neck and 18 inches at the wide part of the body. The height of the vessel is estimated as being from 18-24 inches, and the average thickness appears to be about 5/16 inch. Mr. Hill describes the design as consisting of "a zig zag line enclosed within two plain lines which encircle the body on its widest part," and that the pottery agrees with that described by Mr. G. R. Collingwood as "Huntcliffe Ware:' Mr. F. Elgee has examined the specimens and the site from which they were obtained, and is of the opinion that there may have been a Roman signalling station in the vicinity.

INCISED CROSS AT GREAT AYTON OLD CHURCH. On May 2nd, 1931, Mr. Chas. Postgate drew attention to an incised cross on the interior of the North Wall of the Nave, at a height of about 7-8 ft. above the present floor level; this, he believes to be a Consecration Cross, and it does not appear to have been recorded before.

NOTES ON RED AND GREY SQUIRRELS.

The Grey Squirrel *Sciurus Caroloniensis*; as recorded in Vol. IV, part 1, p. 59, are regularly seen at Marton-in-Cleveland especially during the Autumn, Winter and Spring months. They do not, however, appear to be on the increase numerically, though they are definitely spreading further north, having now been recorded from Longlands Corner, slightly under a mile S.E. of Middlesbrough Town Hall. Curiously enough they do not appear to have been seen in the Albert Park, which is only about 3 furlongs to the West of this, and which would appear to afford them more congenial conditions. Mr. Lord reports seeing a Red Squirrel attack a blackbird's nest in a high bush when it seized a half-grown young bird, which it subsequently dropped and afterwards searched for. This is of interest in connection with the following note by Mr. T. Johnson. On October 11th, 1931, he witnessed a fight between a red and a grey Squirrel at Rounton, near Northallerton, when they were apparently fighting over the body of a dead blackbird, the conflict extending for about seven minutes; finally the red squirrel overpowered the grey squirrel, which made off, leaving the red squirrel in possession.

From work carried out by Dr. A. H. Middleton and published by the Zoological Society of London (Part 3, 1930), it would appear that the idea that the grey squirrel destroys the red squirrel is not substantiated by observation; the red squirrel, like several other rodents, appears to suffer from periodic epidemics of disease to which the grey squirrel appears to be immune. During such periods, where the two live together in the same wood, virtually only the grey is seen and its presence is all the more noticeable from the fact that it does not hibernate as does our British native. It should also be noted that apart from this, there is a considerable difference in the habitats of the two squirrels, as Mr. Middleton points out. The red squirrel, feeding largely on the cones of coniferous trees, is chiefly restricted to areas where these abound, whereas the grey is much more prone to eating the buds of deciduous trees. This is borne out by the fact that the red is by no means uncommon around Grey towers and is frequently seen in the neighbourhood of Ayton, where Conifers abound. During the autumn acorns and horse-chestnuts are collected and stored up by the grey squirrel for Winter use, when it can, be seen going to its cache on any sunny winter's day. It certainly does not appear to be as shy of human beings as our native squirrel, as the writer has often watched it from a distance of not more than 10 yards, at Marton-

FINANCIAL STATEMENT AT 31st DECEMBER, 1931.

RECEIPTS :—	£ s. d.	£ s. d.	EXPENDITURE :	£ s. d.	£ s. d.
Subscriptions :—Arrears	5 0 0		Printing and Stationery ...	8 10 6	
Current	22 5 0		Postages	5 8 2	
In advance	3 10 0		Lanternist's fee	5 0	
Associate Members	1 12 6		Payment to Cleveland Technical Institute ...	1 1 0	
	32 7 6		Subscription to Northern Naturalists' Union ...	1 7 7	
Dividend on £50 of 4½% Conversion Stock ...	2 5 0		Subscription to Yorkshire Naturalists' Union ...	1 5 10	
Sale of Proceedings ...	2 0				
		34 14 6			17 18 1
BALANCE IN HAND OF SECRETARIES, 31st DECEMBER, 1930 :—			BALANCE DUE TO TREASURER AT 31st DECEMBER, 1930 ...		2 11 2
Mr. Odling	3 16 5		BALANCE IN HAND AT MARTINS BANK, MIDDLESBROUGH		18 9 8
Mr. Wilson	8 0		£50 OF 4½% CONVERSION LOAN TAKEN AT PAR ...		50 0 0
		4 4 5			
£50 OF 4½% CONVERSION STOCK TAKEN AT PAR		50 0 0			£88 18 11
		£88 18 11			

I hereby certify that I have audited the above Statement with the Books and Vouchers of the Club, and have obtained all the information and explanations I have required thereon, and I find same to be correct.

W. CHARLTON,
Hon. Treasurer.

12th March, 1932.

W. W. SILLS,
CERTIFIED ACCOUNTANT,
Hon. Auditor.

in-Cleveland; it does not appear to have done any material damage.

CLASSIFIED INDEX TO VOL IV.
(Articles prefixed by an asterisk are illustrated)

LIST OF ILLUSTRATIONS

(Plates VII-XIV occur between pages 162 and 163).

PORTRAITS

Those marked with an asterisk were Founder Members

ADVANTAGES OF MEMBERSHIP

MEMBERS PRIVILAGES – Members receive the Proceedings, copies of Syllabus of Summer and Winter Meetings, Associate Card of Membership of such other Societies to which the club is affiliated and have access to the Societies small Library.

WINTER MEETINGS – Meetings are held during the winter months, particulars of which are sent out before each Meeting. The Secretary will be glad to hear from Members willing to give Papers or show Exhibits.

SUMMER MEETINGS – During the summer numerous expeditions are conducted to places of Natural History and Archaeological interest in the immediate district and further a-field.

THE LIBRARY – Which consists of works on Science, Natural History and Archaeology, is placed (on loan) in a case in the Dorman Museum and is accessible to Members on application to the Curator. Donation of works on the above subjects, especially those relating to Cleveland are at all times acceptable.

HAWELL BEQUEST – Under the will of the late Rev. J Hawell, M.A., F.G.S. Members have the special use of the Library of geological, conchological and other works, as well as access to the large and valuable collections of Mollusca and Fossils bequeathed by him for the benefit of the Cleveland Naturalists' Field Club and the Dorman Museum. These may be inspected at any time by Members at the Museum, on application to the Curator or his Assistant.

MICROSCOPIC SLIDES (BOTANICAL) – The Botanical Slides made by Mr R Barnes and purchased by the Club, may also be seen at the Museum.

MEMBERS OBSERVATIONS – Members are asked to notify the Secretary of any new localities for any particular Fauna or Flora, or new excavations of Geological interest, in order that they may be visited and recorded. Members having specimens requiring identification should apply to the Curator of the Dorman Museum, or to the Sectional Officers mentioned on the current Syllabus Card.