GEOLOGISTS' ASSOCIATION

SOUTH WALES GROUP

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EDITORIAL

The Quarterly was designed to fulfill two purposes: to provide an agent for disseminating news to members of the Group; to provide a link between the professional geologist, the teacher, the student and the amateur.

It is clear from the comments of subscribers that it is fulfilling these aims. The number of requests for copies and the unsolicited comments from teachers in schools outside Wales, suggest that the W.G.Q. is of use to teachers and pupils throughout the country. In this context it is a happy coincidence that the first number of Volume 1 should contain an article on the Association of geology teachers in the U.S.A., and that the last number in the volume should contain a questionnaire concerned with the possible formation of a British equivalent.

As with previous issues, the format is again experimental and the editors would welcome any constructive criticisms. Please send them to D.A. Bassett, Department of Geology, National Museum of Wales, Cardiff.

Acknowledgements: The cover was designed and printed by Vivian S. James, Barry; and the text prepared and cyclostyled by Mrs. Jean Parsons.

DISTRIBUTION OF STUDENT FIELD INSTRUCTION IN GEOLOGY IN BRITAIN

G.P. Black

Since 1945 the numbers of geology students have been steadily increasing and are currently about ten times those of twenty years ago. Over the same period there has been a significant increase in the teaching of geology in schools and a less marked, but still significant, increase in the membership of geological societies. There is thus now a much wider dissemination of interest in geology among school children, undergraduates and the lay public and, since geology is a field science, this has led to a greatly increased amount of geological field work and excursions.

Although probably no part of the country has escaped from the attention of geologists, professional and amateur, there has been a marked and natural tendency for the rising amount of field work to become concentrated on the "classical" localities, both because they are known to a large number of geologists, who therefore tend to direct parties thither, and also because they are well documented, as for example in the excellent series of guides published by the Geologists' Association.

The steeply rising incidence of visitors to such localities has created a wide range of problems. The accumulation of waste rock chippings tends to spoil the interest by burying exposures under man-made scree, an effect particularly marked in small localities of especial interest. Land owners and their tenants, faced with the rising tide of geological visitors, have become less willing to allow parties to cross their land and have in several instances forbidden access to all geologists. Further, geologists are easily recognised in the field and are becoming familiar features of the British countryside. Damage to crops, breaking of walls and fences and similar breaches of the Countryside Code are frequently blamed on geologists since they form a

recognisable group on which local inhabitants to their own satisfaction can pin the responsibility for such damage even though it has been more probably caused by other, casual, non-geological, visitors.

The Nature Conservancy are responsible for the maintenance of features of geological interest and, although this does not necessitate the Conservancy taking an active part in settling problems of access, their officers do the best they can to smooth relations between the owners and occupiers of approximately 1,000 geological localities and the countless visiting geologists. In addition the Conservancy has commenced a programme of cleaning up those geological sites most encumbered by man-made scree. These duties are of course in addition to the Conservancy's work under the National Parks and Access to the Countryside Act 1949 in striving to prevent distruction of geological localities by "development".

In tackling the problems created by the ever increasing use of the countryside for geological education it was found essential to estimate as accurately as possible the number of man-days involved and to find how this was distributed over the country. Consequently, a questionnaire was circulated to universities and technical colleges with geological departments asking for details of all field trips of more than two days duration held in the years 1963, 1964 and 1965.

With one exception replies were received fromall University and Technical College Geological Departments. The total number of student-days spent in the field in the past three years was determined for each district and is quoted in the table below. No significant variation from year to year was found.

		Total Student-days, 1963-5.	
ENGLAND:	Cornwall	2646	
	Devon	3429	
	Dorset	5996	
	Isle of Wight	2228	
	Bristol District	606	
	Gloucester District	2317	
	Shropshire	4217	
	South Midlands	381	
	Peak District	949	
	Ingleborough	2354	
	Northern Pennines	1713	
	Lake District	2132	
	Norfolk	60	
	Yorkshire Coast	808	
	Northumberland and Durham Coast	245	30081
WALES:	Pembroke	4860	
	Gower and South Wales Coalfield	2204	
	Mid-Wales	333	
	North Wales	3430	
	Anglesey	1178	12005
SCOTLAND:	Southern Uplands	110	
	Ayrshire	899	
	Midland Valley	1016	
	Southern Highlands	170	
	Central Highlands	245	
	Glencoe and Loch Leven	925	
	Arran	4521	
	Mull	573	
	Ardnamurchan	271	
	Rhum	170	
	Skye	2444	
	Banff Coast	196	
	North-West Highlands	1162	
	Northern Highlands	215	
	Shetland	100	13017
NORTHERN IRELAND			2380
TOTAL FOR GREAT BRITAIN			57483

The questionnaire was also sent to non-academic bodies (e.g. the Field Studies Council and Adult Education Colleges) in an attempt to locate the areas they used for formal geological instruction in the field. Owing to the difficulties in contacting all such bodies this part of the survey can only be considered incomplete. The figures obtained showed a further 12,000 student days for England, largely concentrated in Dorset (4,000), the Lake District (3,000), Shropshire (2,000) and the Peak District (1,000) and a further 2,000 for Wales, almost all in Pembroke. Scotland appears, as yet, to attract little interest from field study courses of this type.

Owing to the incomplete cover the figures quoted above are underestimates and the true total might well be double, i.e. 24,000 student days in England and 4,000 in Wales for the period 1963/1965. Of this estimated total for non-academic bodies approximately 12% was spent under the aegis of the Field Studies Council.

The questionnaire took no account of the vast amount of field work done by undergraduates in geological mapping; geological societies' excursions and half-day and day excursions by undergraduates, Workers' Educational Association students, and school children, as it was felt that it would be excessively difficult to obtain accurate figures relating to these types of geological field instruction.

This implies that the true total of man-days spent in all forms of geological field instruction in the period 1963-1965 cannot be precisely estimated, but it would appear probable that the total must be of the order of 200,000 man-days. In the light of this figure the need for all geologists to observe the Countryside Code with meticulous care and the need for some service, preferably organised locally, to clean up the more heavily used exposures is seen to be of the greatest urgency.

Welsh Geological Quarterly, v.1, no.4, pp.3-6.

NAMING FOSSIL SPECIMENS

John Challinor

The best way to get to know fossils is to name specimens from 'monographs' which deal, by description and picture, with the groups to which the specimens belong. This applies both to the beginner and to the advanced worker.

Palaeontologists are embarrassed - though of course very pleased - with the immense wealth and variety of the material at their disposal in the British rocks alone, and the result is that few biological groups of British fossils have modern comprehensive monographs to themselves in which the collector can be sure of finding the species to which his specimen belongs. Thus, unfortunately, the naming of fossils in this way often requires a good deal of preliminary research amongst the palaeontological literature. The Monograph of British Graptolites, by Gertrude Elles and Ethel Wood, one of the splendid series of Palaeontographical Society monographs, is, however, one of these comprehensive works; though it is not very modern, having been published in parts during the period 1901-1918 (and incidentally this is some indication of the work involved in this kind of research and compilation). Naturally, new species and varieties of British graptolites have been brought to light during the last fifty years, but for practical purposes this work is still the standard. Wales is famous for its graptolites, so that Welsh geologists are fortunate in this particular matter (as in many other particular matters).

When you have been skilful and lucky enough to find well-preserved graptolites resist the temptation to hand them straightaway to an expert for naming and then, when you have numbered and listed them, store them away or incorporate the names in a thesis without more ado. Identify the specimens yourself, and the more puzzling they are the more you will learn about graptolites.

In this connexion a point arises in the naming of fossils, which may be illustrated by one of the many graptolites collected by the writer from the Silurian (Llandoverian) rocks of the Rheidol Gorge in Cardiganshire. As this is of some importance, perhaps, in a general way, and as he does not know of any previous discussion of it, it is set out below.

In giving specific names of fossils precision is supposed to be assured when the name of the author of the species is added. On the whole this is no doubt a useful practice because an occasional ambiguity may thereby be avoided. But wholesale addition of authors' names is not enough to ensure that every name mentioned or listed denotes exactly the form it is meant to; indeed for some items it may be misleading if given without qualification. It is here suggested that a safer procedure would be to cite the work used in naming each specimen, with a reference, perhaps, to a particular figure; a procedure which would have the double

merit of requiring the closest examination and comparison of the specimen and being essentially simple.

Using 'Elles and Wood' a certain specimen was named Monograptus fimbriatus. From the monograph it was seen that the author (founder) of the species was Nicholson. If we turn up Nicholson's original paper we find a short description and some very poor figures of a particular graptolite, named Graptolites fimbriatus, which is included in Elles and Wood's greatly extended and much more precise diagnosis of the species. The writer's specimen was hardly comparable with any of the forms shown by Nicholson,yet, following the usual custom, he might have been expected to name it 'Monograptus fimbriatus (Nicholson)' whether or not he had happened to look up Nicholson's figures. To secure precision he should, it is suggested, have named it 'Monograptus fimbriatus (Elles and Wood, pl.XLVlll, fig.4b)'; 'Monograptus fimbriatus (sensu Elles and Wood)' would be better than 'Monograptus fimbriatus (Nicholson)'. Someone in the future, revising the species of Monograptus, might decide that this particular form should be excluded from the connotation of 'Monograptus fimbriatus (Nicholson)', so that if that name alone had been given to the writers' specimen - a name that current practice would deem correct and sufficient - that name would henceforward be wrong, and the error would not be detectible without a re-examination of the specimen itself. But it could never be wrong if the procedure of identification and naming here suggested had been efficiently carried out (always provided that the specimen was sufficiently complete and well-preserved to allow such an identification to be made).

References

ELLES, G.L. and E.M.R. WOOD. 1901-18. A monograph of British graptolites. Palaeontogr.Soc.

NICHOLSON, H.A. 1868. Coniston Flag graptolites. Quart.J.geol.Soc. Lond., 24, 521-545.

Welsh Geological Quarterly, v.1, no.4, pp.7-8.

DEFINITIONS OF GEOLOGY (4)

"The science of Geology deals with all matters concerning the earth. It provides descriptions of the materials - the rocks - of which the earth is made and discusses their origins. It traces the effects of various forces upon these rocks, forces deriving their energy from the earth itself or from the sun. It studies the way in which the rocks are arranged in the accessible part of the earth. It is very much concerned with the types of former life found in the rocks and with the evolution and habitats of this life. It endeavours to determine the limits of land and sea during past ages and so to trace an unending succession of lost geographies. All branches of this broad science are interconnected and interdependent: further, they draw copiously upon the physical, chemical and biological sciences."

"The fundamental aim of geology is thus to furnish a detailed history of the earth; geology is earth-history. The documents from which this history is to be read are the rocks themselves which, by the way they were made and their relations to one another, provide a record of thousands of millions of years of astonishingly varied events."

H.H. Read and J. Watson - Introduction to geology. Vol.1: Principles, 1962, p.1.

"The science which treats of the origin, history, and structure of the earth, as recorded in the rocks; together with the forces and processes now operating to modify rocks. (Cox-Dake-Muilenburg) The science which treats of the history of the earth and its life, especially as recorded in the rocks. Three principal branches or phases are usually distinguished: 1. Structural or geotectonic geology, treating of the form, arrangement, and internal structure of the rocks. 2. Dynamic geology, dealing with the causes and processes of geological change. 3. Historical geology, which aided by other branches, aims to give a chronological account of the events in the earth's history. Other subdivisions are: Economic geology, that branch of geology which deals with the applications of the science in industrial relations and operations. Legal geology, the application in litigation of the facts and principles of geology, particularly its subdivisions, mineralogy, economic geology, and mining geology. Mining geology, a subdivision of economic geology concerned with the application of geologic facts and principles to mining. Stratigraphic geology, a study of the succession of the beds of rock laid down during the progress of geologic ages. (Fay)"

C.M.Rice - Dictionary of geological terms, 1960, pp.150-151.

"'The mediaeval Latin word Geologia covered the study of anything, such as law, which was earthy rather than divine' (Edwards, Early History of Palaeontology, 1931). It eventually came to be used approximately in its present sense of 'geology'. 'So far as is known at the present time, Lovell's work Pammineralogicon or an Universal History of Minerals, published in 1661, is the first work in the English language in which the word geologia appears. The work of Escholt [Geologia Norvegica], written in the Danish language but published at Christiania in 1657, is the first printed work in which the word occurs. But Aldrovandus employed the word, in some manuscript notes and in his will, essentially in the modern sense, at least as early as 1605, the year in which he died' (Adams, Development of the Geological Sciences, 1938. See also BGSA, 1932/3). The term then begins to appear in non-classical form. 'To De Saussure, so far as I have been able to discover, we owe the first adoption of the terms "geology" and "geologist". This science had formed a part of mineralogy, and subsequently of physical geography. The earliest writer who dignified it with the name it now bears was the first great explorer of the Alps. In the year 1778 there appeared at the Hague the first imperfect edition of De Luc's Lettres Physiques et Morales sur les Montagnes, in the introduction to which the author states that for the science that treats of the knowledge of the earth he employs the designation of Cosmology. The proper word, he admits, should have been Geology, but he "could not venture to adopt it because it was not a word in use". In the completed edition of his work, published the next year, he repeats his statement as to the use of the term Cosmology, yet he uses Geology in his text notwithstanding. In the same year (1779), De Saussure employs the term Geology in his first volume without any explanation or apology, and alludes to the geologist as if he were a well-known species of natural philosopher' (Geikie, Founders of Geology, 1905). The term seems to have been firmly in use in Britain in 1795: 'I hope fully to refute the geological, as well as mineralogical notions with regard to that body granite' and '... a person who has formed his notions of geology from the vague opinion of others and not from what he has seen' (Hutton, Theory of the Earth, 1795). 'The observations of the same excellent geologist [Hutton]' (Playfair, Illustrations, 1802). 'Without calling it "Geology", Steno gives in the little treatise of 1667 the first outline of a scientific history of the earth arrived at through exact studies of Nature and through inductive reasoning. Geology as a science was born. Two years later he gave in De Solido (1669) a more detailed "geology" (Garboe, The Earliest Geological Treatise (1667), 1958)."

J. Challinor - A Dictionary of Geology. 2nd edition, 1964, pp.106-107.

"Geology stands to [civil] engineering in the same relation as faith to works ....."

"The success or failure of an undertaking depends largely upon the physical conditions which fall within the province of geology, and the 'works' of the engineer should be based on the 'faith' of the geologist. The how and the why fall with the province of the latter, and the practical application of this knowledge is the special function of the former."

Boyd Dawkins - "On the relation of geology to civil engineering" (James Forest Lecture 1898). Inst.Civil Eng.Min.Proc. (London), 134, 1898, 254-255.

[The science of geology] "is (or ought to be), in popular parlance, the people's science - the science by studying which, the man ignorant of Latin, Greek .... can yet become .... a truly scientific man .... Be sure, that wherever there is a river, even a drain; and a stone quarry, or even a roadside bank; much more where there is a sea, or a tidal estuary, there is geology enough to be learnt, to explain the greater part of the making of all the continents on the globe."

Charles Kingsley - Town Geology, 1877, pp. 4,35.

"Geology offers almost unique opportunity to observe the results of processes that not only involve interplay of more variables and larger masses than can be handled in the laboratory, but that also extend over much greater periods of time and hence reveal the effects of reactions too slow to observe under ordinary conditions."

V.E. McKelvey - Geology as the study of complex natural experiments. The fabric of geology, 1963, p.69.

"This is one of many reasons for the interest of astronomical facts and of geological ages. By making long excursions in space or in time, we may find our ordinary rules completely upset, and these great upsettings will give us a clearer view and better comprehension of such small changes as may occur nearer us, in the small corner of the world in which we are called to live and move. We shall know this corner better for the journey we have taken into distant lands where we had no concern."

Henri Poincaré - Science and Method, p.21.

"It is because simplicity and vastness are both beautiful that we seek by preference simple facts and vast facts; that we take delight, now in following the giant courses of the stars, now in scrutinizing with a microscope that prodigious smallness which is also a vastness, and now in seeking in geological ages the traces of a past that attracts us because of its remoteness."

Henri Poincaré - Science and Method, p.23.

"Geology is par excellence the science which deals with the repetition of the same events in widely separated epochs."

Archie Lamont - Geology in literature. Quarry Mgrs.' J., 28, 1945, p.440.

"Geology, in the magnitude and sublimity of the objects of which it treats, undoubtedly ranks in the scale of the sciences next to Astronomy."

Herschel - Discourse on Study of Natural Philosophy.

"GEOLOGY, though it has become a popular science, may be difficult to define. If we ask what is Geology? We are told it is the 'Doctrine of the Earth'. No one can venture upon such a science as this, in its most comprehensive sense, nor was it ever undertaken but by speculators in theory; it has remained for this age to apply the principles of experimental Philosophy to a knowledge of the earth's surface."

"The principles of Geology, like those of Geometry must begin at a point, through two or more of which the Geometrician draws a line, and by thus proceeding from point to point, and from line to line, he constructs a map, and so proceeding from local to general maps, and finally to a map of the world: Geometricians founded the science of Geography, on which is based that of Geology. But it may be asked, what gives it such general interest? We answer, the interest which every man naturally feels in the soil on which he treads, and from which he derives his food.

William Smith - Views of Geology. Quoted in L.R. Cox: New light on William Smith and his work. Proc.Yorks.geol.Soc., 25, 1942-45, p.67.

CURRENT RESEARCH IN GEOLOGY AND ALLIED SCIENCES IN WELSH COLLEGES, LABORATORIES, ETC.

SUPPLEMENT AND ERRATA

Mr. M.G. Bassett (Dept. of Geology, University College, Swansea).

Articulate Wenlockian brachiopods from the Welsh Borderland and S.Wales.

Large collections of brachiopods have been made from Wenlockian rocks throughout the Welsh Borderland, S.Central Wales and Pembrokeshire. Very little systematic work has been done on these brachiopods, which constitute the dominant element of the Wenlock faunas, since Davidson's classic monographic studies were completed in the middle of the last century.

The fauna is being described in detail and the vertical and horizontal distribution of new and existing genera and species is being plotted. A large number of species have been re-assigned to correct genera, while a number of genera and species are recognised for the first time in the British area. It is intended that the study will lead to finer correlations and a more refined Wenlockian stratigraphy in the shelf area.

Dr. S.B. McCann (Dept. of Geography, U.C.W., Aberystwyth).

Work of long standing on the raised shorelines and associated glacial deposits of Western Scotland is being continued on a more restricted basis, which involves precise height determinations of both present and raised shoreline features at certain key sites throughout the area. Related studies of cliff form and evolution in the Tertiary volcanic rocks of the Western Isles are being carried out by A. Richards (research student). In the Aberystwyth area detailed mapping and measurement of shore platforms (McCann, Richards and Phillips) is yielding interesting results which provide a basis of comparison for similar work being carried out in the Isle of Man by B.A.M. Phillips (research student).

Mr. C. Parry (Coal Survey Laboratory, N.C.B., Cardiff).

The principal coal seams of the Lower and Middle Coal Measures in the S.Wales Coalfield east of the Vale of Neath (excluding the South Crop west of Wern Tarw Colliery).

The structure of each of the eight coal seam groups between the base of the Gellideg and the top of the Two Feet Nine Seam is being studied, and the presence of at least twenty-four horizons of seam splitting demonstrated. Isopachyte maps showing the interval between the diverging beds have been prepared. The effects of differential subsidence are shown, and the location, nature and duration of the controls upon sedimentation elucidated.

During this part of Ammanian times, four major factors influenced sedimentation:- the Usk-Cardiff anticlinal belt; the Caledonoid axes which underlie the main body of the coalfield basin; the Caledonoid Neath Disturbance; and an area of maximum subsidence located at times around Maesteg-Pontypridd. The predominantly caledonoid trend of the lines of

seam splitting and other isopachytes at many of the horizons mapped is related to the sedimentary control exerted by these deep seated structures in the sub-Devonian foundation.

Mr. T.M. Thomas (M.H.L.G., Research Section, Welsh Office, Cardiff).

(i) Landforms of the Colorado Plateau, U.S.A., with particular reference to the formation of natural arches and collapse features associated with salt intrusions, etc. Lengthy traverses have been made of this 300,000 square mile physiographic province for a possible major work on its geology and geomorphology.

(ii) The gash breccias (Triassic?) of the Glamorgan and S.Pembs. coasts - some of these are considered to be "fossil" wadis; others as collapse features.

(iii) Solution rates and processes on the limestone pavement of the North Crop of the S. Wales Coalfield - Planes of weakness within the rock rather than the more obvious joints appear to be the major control of the varying rates of post-Glacial solution.

(iv) Structural control of the micro-relief of the Welsh Uplands - Structural lineations have been mapped on a 1/25000 scale for the whole of the Welsh uplands. With the aid of this mapping a chromorphological map is being produced. This will provide a measure of the country's scenic qualities as well as the land-use potential of the uplands.

(v) Exploration and prospects for oil and natural gas in British continental shelf areas.

(vi) Derelict land in industrial S. Wales - The extent and form of excavation for coal, ironstone, limestone, etc., and their associated spoil heaps have been mapped on a 1/25000 scale and an assessment made of the reclamation potential.

(vii) Water conservation in the Upper Colorado Basin.

ERRATA

Dr. J.W. Baker (Dept. of Geology, University College, Cardiff).

For 2nd and 3rd lines, 2nd paragraph of note in Welsh Geological Quarterly, no.3, p.17, read: "the Rosslare Series and its metamorphism is Pre-Cambrian not Cambrian (as previously supposed)."

NEWS AND NOTES

THE INSTITUTE OF GEOLOGICAL SCIENCES

One of the first tasks awaiting the Natural Environment Research Council when it was formed in 1965 was to give effect to the recommendation of the Brundrett Committee that the Home and Overseas Geological Surveys shall be combined. Preliminary administrative action was taken at the inaugural meeting of Council on June 30th, 1965, when Sir James Stubblefield, F.R.S., the Director of the Geological Survey of Great Britain, was appointed Director of the combined surveys. Within the new organization Dr. S.H. Shaw, C.M.G., O.B.E., is responsible to the Director for overseas activities and retains his position of Geological Adviser to the Ministry of Overseas Development.

The Council has now decided that the name of the new organization shall be the INSTITUTE OF GEOLOGICAL SCIENCES. To give an assurance of continuity, the "sub-title" explains that the new institute incorporates the Geological Survey of Great Britain, the Museum of Practical Geology and the Overseas Geological Surveys.

The change of title reflects the intention of the Natural Environment Research Council to extend the field of activity of the existing organizations and recognises the wide range of scientific disciplines which are employed in modern techniques of geological survey and in geological research generally.

The basic programme of the new Institute is being formulated by the Geology and Geophysics Committee of the Council, which is also considering how to give effect to the governmental decision that the headquarters of the new organization (but not the Museum) shall be removed from London.

Commonwealth Geological Liaison Office
Newsletter for April, 1966, p.1.

CHARLES DARWIN EXHIBITION

On Thursday, July 14th, the President of the Royal College of Surgeons, Lord Brock, opened a permanent exhibition on Evolution at Down House, Downe, Kent, the home of Charles Darwin for 40 years.

The exhibition illustrates by murals the story of the development of animal and plant life throughout the ages. There are also short histories with photographs of those philosophers and scientists who have contributed to the theory of evolution. The murals are pictures by Dr. J. Augusta of Prague.

MINERAL SURVEY OF ENGLAND AND WALES

Field work on the first phase of a major new survey of the economic mineral resources of England and Wales has begun in South East England. Priority is being given to the survey of sand and gravel resources in the south east because of the effect which the exploitation of sand and gravel resources has on land use and the need for further economic deposits, especially in an area where demand for land for development and of raw construction materials is heavy.

The field work is being carried out by the Institute of Geological Sciences and drilling is expected to start in the next week or two by the Ministry of Public Buildings and Works. Subsequent analysis of samples to determine the size and quality of the deposits will be undertaken by the Building Research Station.

The survey is giving priority to "bulk" minerals, since these usually cover the largest areas of land and therefore have the greatest impact on physical planning and land use. Among the bulk minerals, sand and gravel are of major importance; demand has risen rapidly over the last 30 years. On present estimates, the annual demand may well exceed 200 m. tons a year by the late 1970's, and probably exceed that of any other mineral, including coal.

Commonwealth Geological Liaison Office
Newsletter for June, 1966, pp.2-3.

"THE AMATEUR GEOLOGIST"

The first number of a new mimeographed journal has just appeared under the title "The Amateur Geologist". It is published under the auspices of the Liverpool Geological Society and the Manchester Geological Association. It is designed to "cater for the many who are interested in geology, but find the existing professional geological journals too advanced".

The contents of the first number are:- A Beginners' Geological Field Trip to the Welsh Borderlands, by K.H.C. Isherwood; The Rocks of Merseyside, by Professor W.S. Pitcher; The Wren's Nest National Nature Reserve, by A. Stubbs; What's on in the Local Geological Societies?; Temporary Exposures at Oversleyford Brickworks, Ringway, Cheshire, by by I.M. Simpson.

Copies are available (at half a crown per copy) from: The Editors, c/o Anfield Comprehensive School, Breckside Park, Liverpool 6.

MAMMOTH TUSK AT LLAY, NEAR WREXHAM

Fossil remains recently found at Llay near Wrexham in gravels dating from the closing years of the Pleistocene period, provide interesting new evidence of some of the animals inhabiting Wales in Ice Age times. The gravel was being excavated with a mechanical shovel when the driver noticed what appeared to be a large piece of bone lying on top of the bucket. This proved to be a 15-inch fragment of the tusk of a Mammoth - the long-haired "Woolly Elephant" of the late Pleistocene period. A close watch was kept on this section of the quarry face, part of which was excavated by hand, but nothing more was found here. Instead a number of bone fragments and teeth, identified as fossil Ox remains, were later unearthed in another part of the quarry.

The gravels containing these fossils were formed as the thick ice-sheets which covered Wales and Northern England in Pleistocene times began their final retreat about 9,000 B.C. The melting ice released great floods of water which carried with them the boulders and rock debris that had been frozen into the ice or had fallen onto its surface. Any loose bones lying on the surface of the frozen ground skirting the ice-sheets would also be picked up and carried along by the rush of water. All this material, some transported for hundreds of miles by the ice, some picked up close at hand by the melt waters, would be laid down in a jumbled mass as the flood slackened, forming thick deposits of ill-sorted gravels. In consequence the fossil remains in these deposits are scattered and fragmentary so that any attempt to collect them systematically is a prolonged and often fruitless undertaking.

The co-operation of the quarry workers, or of local villagers who can keep an eye on the workings over long periods, can be of immense value in such cases. They are often able to save much valuable fossil material which would otherwise be carried unrecognised to the crushing plant and so lost forever.

Geoffrey R. Tresise.

'POPULAR' RELIEF MODELS

Until recently, practically all relief models were made of plaster, but use is now being made of a new material - expanded polystyrene - which is available in a variety of thicknesses and sizes.

The main method by which relief models are made in the Department of Geology at the National Museum of Wales is still the contour layer method, but whereas in the past the contour layers were cut by fret-saw from sheets of plywood, the new material allows for easier and quicker cutting. A plaster filler is then applied to the contoured terraces and the topography simulated.

Two relief models have recently been completed in the Department: the first, a model of Wales (based on an unpublished generalized contour map prepared by Dr. Eric Brown), with a horizontal scale of 5 miles to the inch; the second, of the Cardiff district, including Caerphilly and Barry, with a horizontal scale of $2\frac{1}{2}$ inches to the mile. Both models have a fivefold vertical exaggeration.

Whilst negotiations were proceeding in connection with the making of plaster casts by a local firm, it was realized that the plasterers were prepared to charge as little as 36/- per cast for a bulk order of 50 or more of the model of Wales, and 55/- each (inclusive of delivery charges in this case) for the model of the Cardiff district. In conjunction with our Schools Service Officer, therefore, this information was made known to geology and geography teachers in Welsh schools. The outcome has been most gratifying. Orders have been received for the model of Wales from all the authorities participating in the Schools Service, making a total of 181 casts, and 111 models of the Cardiff district have been ordered.

Experiments are now being carried out in the making of plastic vacuum casts of these models with a view to producing geological models which can be dismantled along selected bedding planes.

D. Emlyn Evans.

MUSEUM SCHOOLS SERVICE COURSE FOR TEACHERS: EASTER 1966

The annual Easter field-course for teachers in North Wales schools, organized by the Museum Schools Service Officer in Geology and held at Dolgellau on April 16th-18th, was led by Professor C. Kidson and Dr. John Phillips of the University College of Wales, Aberystwyth.

Professor Kidson lectured on "British Beaches" and led an excursion to the coast between Fairbourne and Harlech. Dr. Phillips lectured on "The movement and consolidation of magmas", drawing attention to the succession of Ordovician strata and igneous rocks represented on a geological map of the Arthog-Dolgellau district, and led an excursion to a number of the critical exposures in the area around Crogenen Lakes. A reasonably full summary of Dr. Phillips' lecture and a description of the itinerary will appear in the next volume of the Quarterly.

The first of what is hoped will become an annual series of field-courses for teachers in South-west Wales was held at St. David's on April 29th-May 1st. It was led by Mr. T.R. Owen, University College, Swansea and Dr. Clifford Embleton, King's College, London.

Mr. Owen lectured on "The stratigraphy and structure of St. Bride's Bay"and led an excursion to the localities mentioned in the lecture, including St. Non's Bay, Caerfai, Porth-y-rhaw and Broadhaven. Dr. Embleton lectured on "The Geomorphology of North Pembrokeshire" and conducted an excursion to Whitesands Bay, Penbiri, Abereiddy Bay and the lower Gwaun valley district. A full summary of Dr. Embleton's lecture will appear in the next volume of the Quarterly.

Alun J. Thomas.

GEOLOGICAL SPECIMEN EXCHANGE SCHEME

R.H. Roberts

Many teachers attending courses on "Geology in School" recently held at Queen Mary College, and in the Universities of Exeter and Sheffield have expressed an interest in exchanging specimens of rocks, fossils and minerals.

The accompanying list should enable interested parties to know of each others existence and additional participants will always be welcome. Details should be sent to R.H. Roberts, Geological Survey and Museum, Exhibition Road, South Kensington, or to the Editor, Welsh Geological Quarterly, National Museum of Wales, Cardiff.

All exchanges should be arranged directly between the particular teachers concerned.

Course at University of Exeter

ARMSTRONG, Mr. A.	Saltash County Secondary School
BOOTHROYD, Mr. H.	Barnsbury School, Caledonian Rd., Camden Rd., London.
COUSINS, Mr. P.J.	Callington County Secondary School
DENT, Mr. A.	Holloway School, Hilldrop Road, London, N.7.
ELWOOD, Mr. E.W.	Lescudjack County Secondary School, Penzance
FREEMAN, Mr. E.D.H.	Falmouth County High School
GILSON, Mr. P.S.	Falmouth Boys' Grammar School
HILL, Mr. P.S.	St. Bede's Grammar School, Heaton, Bradford 9
IRELAND, Mr. P.J.	George Abbot Boys' School, Guildford
JARRATT, Mr. C.W.	St. Auston Grammar School
KAY, Mr. H.F.	Helston County Secondary School
MASON, Mr. R.H.	Axminster County Secondary School
MASSAM, Mr. W.J.	Colyton Grammar School
MELLOR, Mr. J.F.P.	Tamar Secondary School, Stoke, Plymouth
OWEN, Mr. M.D.	Scarborough Boys' High School
PENNA, Mr. L.J.	Truro School
PERKINS, Mr. J.W.	Sutton High School, Plymouth
PHILPOTT, Mr. D.R.E.	Harwich High School, Dovercourt, Essex
POWELL, Mr. G.S.	Hautlieu School, Jersey
SCOBIE, Mr. W.A.D.	Stanbridge School, Romsey
SCOTT, Mr. D.S.	Devonport Boys' School, Plymouth
SHILSON, Mr. E.P.	Saltash County Secondary School
SMART, Mr. J.C.	Rugeley Grammar School, Staffordshire
SMITH, Mr. G.H.	Barnstaple Boys' Grammar School
TATTERSALL, Mr. P.J.	King Edward VI Grammar School, Totnes
TAYLOR, Mr. R.J.	County Technical School, Romford, Essex
THORNTON, Mr. T.M.	Cranbrook School, Kent
TONKIN, Mr. S.D.	Heamoor County Secondary School, Penzance
WRIGHT, Mr. W.G.	Bude Grammar School

BERRYMAN, Miss J.	Camborne Girls' Grammar School
COBLEY, Miss K.M.	Truro County Grammar School
GARLAND, Miss M.	Devonport Girls' High School, Plymouth
HARDY, Miss M.R.	School of St. Clare, Penzance
HARVEY, Mrs. C.M.	St. Ives County Secondary School
LLOYD-JONES, Miss G.	Ducie High School for Boys, Manchester
NEWPORT, Mrs. J.	West Cornwall School, Penzance
RICHTER, Mrs. M.	Notre Dame High School, Plymouth
SMITH, Miss M.A.	Monks Park School, Bristol
SQUIRE, Miss M.A.	Stoke Damerel High School, Plymouth
SUMNER, Miss E.	Rouge Bouillon School, Jersey
SQUIRE, Mr. G.J.	Frome Grammar School, Somerset
HAYWOOD-HICKS, Mr. G.R.	Wednesfield Grammar School, Wolverhampton
CLISH, Mr. D.V.	St. Luke's College, Exeter
COX, Mr. E.G.J.	Queen Elizabeth's School, Crediton
LARKINS, Mr. O.S.	Hele's School, Exeter
PARKER, Mr. G.W.	Blundell's School, Tiverton
TOWNSHEND, Mr. R.J.	Teignmouth Grammar School
WHITE, Mr. K.	-
WALLACE, Mr. G.	Callington Grammar School

Course at Queen Mary College, London University

BARRON, Mr. R.S.	Dauntsey's School, West Lavington, Wilts.
BELSON, Mr. B.C.	Science Department, Cambridgeshire College of Arts and Technology, Collier Road, Cambridge
DREGHORN, Mr. W.	St. Paul's College, Cheltenham, Gloucestershire
DUNK, Mr. A.J.	Queen Mary's Grammar School, Walsall, Staffs.
ELLIMAN, Mr. M.J.	The Grammar School for Boys, Queen Edith's Way, Cambridge
ELLIS, Mr. J.B.	Ilford County High School, Barkingside, Ilford, Essex
FREED, Miss M.G.	Grammar School for Girls, Shepherds Lane, Dartford, Kent
FRENCH, Mr. D.P.	North-East Essex Technical College & School of Art, Sheepen Road, Colchester, Essex
GOSKAR, Miss K.	Grammar School for Girls, Neath, Glam.
GRAY, Miss C.M.	Honor Oak School, Peckham Rye, London, S.E.22
HAPPS, Mr. R.D.	The Grammar School, Maltby, Nr. Rotherham, Yorks.
HART, Mr. D.	Archbishop Tenison's Grammar School, London, S.E.11
HOBBS, Mr. L.J.	Heversham Grammar School, Milnthorpe, Westmerland
IVIMEY, Mr. G.	Mary Hare Grammar School, Newbury, Berks.
LEIGHTON, Mr. W.K.	Brighton College, Brighton 7, Sussex
MAYLOTT, Mrs. N.	High School for Girls, Townsend Road, St.Albans, Herts.
MORRIS, Mr. L.	City of Worcester Technical College
PARRACK, Mr. J.C.	Boys' High School, Leek, Staffs.
PERKINS, Mr. P.J.	Great Barr Comprehensive School, Aldridge Road, Birmingham, 22a
PURVIS, Miss J.	Stratford Grammar School, London, E.7.

SALMOND, Mr. K.D.	Sir George Monoux Grammar School, London, E.17
TOBIN, Rev. D.J.	Ratcliffe College, Leicester
WALSH, Dr. P.T.	Enfield College of Technology, Queensway, Enfield, Middx.
WATSON, Mr. E.B.	St. Lawrence College, Ramsgate, Kent
WILLIAMS, Mr. S.L.	The Elliott School, Hayward Gardens, Putney, London, S.W.15

Course at University of Sheffield

AMBROSE, Miss B.M.	Notre Dame High, Sheffield, 10
BATES, Mr.D.	Mexborough Grammar School, Mexbro', Rotherham
BIRCH, Mr. J.B.	Mountside Secondary Boys', Leek
BOOTH, Mr. J.R.	King Edward VII School, Glossop Road, Sheffield 10
BURRELL, Mrs. M.E.	Newport County High, Shrops.
DE FRECE, Mr. J.	Manor School, Old Road, Chesterfield
ELLIS, Mr. B.	Keighley School, Oakbank, Keighley, Yorks.
ELLIS, Mr. K.G.	Aston Woodhouse High, Woodhouse, Sheffield
FIELDING, Mr. D.H.	Radley College, Abingdon, Berks.
FISHER, Mr.J.A.	Henry Hartland Grammar, Sparken Hill, Worksop
FULLER, Mrs. J.	Manchester Museum Schools' Service Dept., Manchester
GOMEZ, Mr. G.	Our Lady of Lourdes, Borkdale, Southport
GOSDEN, Mr. J.D.	Technical Grammar for Boys, Doncaster
HOGGART, Mr. W.B.	Maltby Grammar School, Maltby, Rotherham
HUTCHINSON, Mr. D.	Hinde House Comprehensive, Sheffield, 5
LANDLESS, Mr. R.	Cowley School, St. Helens, Lancs.
LAWSON, Mr. A.J.	Bilston Grammar, Bilston, Staffs.
LAWTON, Mr. J.	The Grammar School, Wath-upon-Dearne, Rotherham
MASTERTON, Mr. I.	Swinton Comprehensive School, Swinton, Mexbro'
PALING, Mr. V.R.	Tupton Hall Grammar, Nr. Chesterfield
PICKERING, Mr. J.G.A.	Hurlfield Secondary Girls, Hurlfield Road, Sheffield
RANSON, Mr. C.E.	Boys' Grammar School, Hitchin, Herts.
SCHOFIELD, Mr. A.E.	South Grove Secondary, Rotherham
TAYLOR, Mr. G.F.	Central Technical School, Gleadless Road, Sheffield 2
TAYLOR, Mr. J.S.	Oakwood School for Boys, Moorgate, Rotherham
THOMSON, Mr. I.H.	Jordanthorpe Sec. for Boys, Dyche Lane, Sheffield, 8
TOWNSEND, Mr. K.	Bolton County Grammar, Gt. Moor St., Bolton
WEST, Mr. G.A.	Thistley Hough School for Girls, Penkhull, Stoke-on-Trent
WILDE, Mr. G.R.	Yew Lane County Secondary, Creswick Lane, Sheffield
WOODCOCK, Mr. R.G.	Rossall School, Fleetwood, Lancashire
YOUKIM, Mr. B.R.	Department of Education, The University, Sheffield
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BOOKS : NOTICES AND REVIEWS

University choice. Pelican original. Edited and introduced by Klaus Boehm (Director: Careers Research and Advisory Centre, Cambridge). 1966, 7/6d.

An attempt is made to unravel the problem of choosing a career by publishing a series of thirty essays by experts on their own subjects, explaining in each case what the studies consist of, how they are taught, and where they lead. The one on geology, by Dr. Nicholas Rast of Liverpool University, contains sections on: Geology in the Twentieth Century; Teaching of geology in Universities; Geological research in British Universities in 1964; The future. It also contains a diagrammatic representation of the connexions between the principal geological and non-geological sciences.

There is an Appendix giving details of First Degree Courses at the Universities and Colleges of Advanced Technology of the United Kingdom.

North Sea Oil - The Great Gamble. By Bryan Cooper and Tom F. Gaskell. Heinemann, 1966. 35/-.

The authors - a journalist and a geophysicist - provide an all-round guide in non-technical language.

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WELSH GEOLOGICAL ABSTRACTS : 1965

Containing abstracts of papers dealing with geology and its allied subjects for Wales and the three border counties, published during 1965; with subject and locality indexes.

Douglas A. Bassett
(National Museum of Wales)

Welsh Geological Abstracts is a successor to the bi-annual bibliographies of the geology of Wales and the Borders* which were superseded in 1964 by British Geological Literature, issued by the Coridon Press and compiled by E.L. Martin of the Geological Survey and A.P. Harvey of the British Museum (Natural History).

The present work is based on a systematic survey of the journals listed in the Bibliography and index of allied sciences for Wales and the Welsh Borders 1897-1958 (Cardiff: National Museum of Wales, 1961) and the new serials which have appeared since 1961. Wherever possible the abbreviations suggested in the World List of scientific publications have been adopted.

Where the authors' abstracts have been quoted additional comments are inserted in square brackets.

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* List of papers, books, theses, etc., on the geology of Wales and the Welsh Borders, 1959-1960. Lpool Manchr.geol.J., 3, 1962, 33-40.
List of papers, books, theses, etc., on the geology of Wales and the Welsh Borders, 1961-62. Geol.J., 4, 1964, 35-42.
List of papers, books, theses, etc., on the geology of Wales and the Welsh Borders, 1963-1964. Geol.J., 5, 1966, 7-14.

ADAMS, T.D. and J. HAYNES. Foraminifera in Holocene marsh cycles at Borth, Cardiganshire (Wales). Contribution - Cardigan Bay Research Project. Palaeontology, 8, 27-38, 1 fig.(sk.map of superficial geol.)

The exposed Holocene deposits at Borth include two well-marked marsh cycles. The dominant foraminifera in these sediments are marsh and estuarine forms such as Jadammina macrescens, Protelphidium depressulum, Elphidium orbiculare, Elphidium excavatum, and Ammonia beccarii var. batavus. The distribution of these species reflects the different stages of the cycles and thus the late post-glacial history of Borth Bog. (Authors.)

ADAMS, T.D., HAYNES, J.R. and C.T. WALKER. Boron in Holocene illites of the Dovey Estuary, Wales, and its relationship to palaeosalinity in cyclothems. Sedimentology, 4, 189-195, 3 tables.

Results from modern and ancient sediments suggest that a boron-illite equilibrium, reflecting salinity, is established at the time of deposition. This condition is not appreciably changed by subsequent processes of diagenesis and lithification. Equivalent boron in thirteen samples, from two augerholes through Dovey Estuary sediments, ranges between 260 p.p.m. and 370 p.p.m. and averages 336 ± 29 p.p.m. (95% confidence limits).

Salinity conditions in the present estuary vary greatly. A very significant direct correlation exists between equivalent boron and inferred depositional salinity of Dovey Estuary sediments. (Authors.)

ALLEN, J.R.L. 1. Fining-upwards cycles in alluvial successions. Geol.J., 4, pt.2, 229-246, 2 figs.(vert.sections), 1 table.

Fining-upwards cycles on a scale of thickness from a few metres to a few tens of metres, and consisting of a coarse grade member (erosive base) overlain by a fine grade member, are the hall-mark of a distinct non-marine sedimentary facies widely distributed in space and time. [Examples from the Lower O.R.S. of Pembs. and Clee Hill, the Upper O.R.S. of the Welsh Borders, etc.] Using data on modern alluvial sediments, it is shown that the interpretation of the cycles in terms of an alluvial environment is probably correct. The cyclicity itself cannot yet be accounted for, although three principal factors are likely to have been involved. (Author.)

ALLEN, J.R.L. 2. The sedimentation and palaeogeography of the Old Red Sandstone of Anglesey, North Wales. Proc.Yorks.geol.Soc., 35, 139-185, 7 figs., 6 pls.(vert.sections, photos.and photomicrographs (sst., congl.m., and lst.), 4 tables.

Work on the O.R.S. in eastern Anglesey is described, a succession radically different from Edward Greenly's is presented, new data concerning the petrology and sedimentary structures given and the problems of age, environments of deposition and palaeogeography discussed. The succession is not less than 1,645 ft. thick and comprises four lithological formations. Each formation is recognized as a major sedimentary facies, is interpreted from a knowledge of modern sediments and sedimentary processes, and given a new stratigraphical name. The

lowest facies, the Bodafon Beds, of conglomerates and pebbly sandstones, lies diachronously above the gently sloping base of the O.R.S. The next, the Traeth Bach Beds, comprises siltstones and caliche-like carbonate mineral beds. Overlapping earlier beds, the third facies, or Porth y Mor Beds, which dominates the succession comprises numerous cycles of conglomerate, sandstone and siltstone. Rapidly alternating sandstones and siltstones make up the highest facies or Traeth Lligwy Beds. These facies are considered to represent piedmont, playa, stream and lacustrine deposits respectively, which accumulated in a valley whose axis sloped south-eastward. Palaeontological evidence is lacking, but indirect evidence is consistent with an early Lower O.R.S. age. The beds probably belong to the southern British development of the O.R.S., rather than to the Midland Valley (Scotland) province as was formerly believed.

ALLEN, J.R.L. 3. Upper Old Red Sandstone (Farlovian) paleogeography in South Wales and the Welsh Borderland. J.sediment.Petrol., 35, 167-195, 12 figs.(incl.isopach, sub-crop, palaeocurrent, facies and palaeogeog.maps, plus photomicrographs), 1 table (numerical summary of palaeocurrent and petrographic data).

The results of a comprehensive study of the stratigraphy, sandstone petrography, palaeocurrent indices and sedimentary facies of the Upper O.R.S. are outlined in the author's abstract as follows:- "The Upper Old Red Sandstone, reaching a maximum thickness of about 1200 feet, rests with a marked depositional break on gently folded Lower Old Red Sandstone and Silurian rocks. Two major sedimentary cycles are represented in the sequence of the Upper Old Red Sandstone through to the Tournasian (Carboniferous) Lower Limestone Shales. In each cycle alluvial deposits graduate up into marginal-marine strata. The alluvial deposits, arranged locally in fining-upwards cycles, are chiefly cross-stratified or flat-bedded sandstones and conglomerates, and subordinate siltstones with proofs of exposure. Compared with modern sediments these lithologies appear to represent stream channel and floodplain sedimentary environments. The marine strata following in each major cycle are fossiliferous sandstones, siltstones, and shales comparing with the deposits of modern coastal barrier complexes.

Post-dating the Middle Devonian phase of the Caledonian Orogeny, the Upper Old Red Sandstone accumulated on a coastal plain bearing comparison with that of the Gulf of Mexico, which lay between uplands (St. George's Land) in the north and a newly created deep-water marine trough in the south. Cross-stratification and regional sandstone petrology suggest that several rivers, each with a distinctive drainage basin geology, constructed the plain and that these rivers flowed from north to south, off the uplands. The plain experienced two marine transgressions from the south during Upper Devonian and early Carboniferous times, each relative rise of the sea leading first to alluviation." Sandstone hand-specimens and thin-sections used in the study are housed in the Archive Collection, Geology Department, University, Reading.

ALLEN, R. See MOHR, P.A.

ANDERSON, J.G.C. The Precambrian of the British Isles. In: The Geological Systems. The Precambrian, 2, 25-111, 20 figs.(incl.struct.map of British Isles showing Precambrian outcrops; g.sk.maps of Irish Sea geanticline and margins, and Precambrian rocks of S.E.Kratogen of Caledonian mountain chain and border; sections of fold belt, etc.), 6 tables (incl. chem.anal.of Mona, Pebidian and Uriconian rocks, and correl.chart), bibliogr. Interscience Pubs., New York: John Wiley and Sons.

The review includes sections on Anglesey, Lleyn, Caernarvonshire, Pembrokeshire, The Welsh Borderland, Malvern Hills, etc.

ARCHER, A.A. 1. Notes on the Millstone Grit of the North Crop of the Pembrokeshire coalfield. Proc.Geol.Ass.,Lond., 76, 137-150, 2 figs.(g. sk.map of Carb.rocks and correl.chart - Pembs. and E.Carms.).

The two cliff sections, one at Marros and the other between Settling Nose and Druidston Haven .. are described in detail. Several undescribed marine horizons, including goniatite bands, are reported. The strata are correlated with the Millstone Grit of the north crop of the South Wales Coalfield, and the sub-Namurian unconformity is discussed. (Author.)

ARCHER, A.A. 2. Red beds in the Upper Coal Measures of the western part of the South Wales Coalfield. Bull.Geol.Surv.Grt.Brit., no.23, 2 figs. (g.sk.map and partial logs of boreholes).

Details are given of red beds proved in boreholes drilled in the Swansea and Grovesend beds north-west of Swansea. From the details of the red beds, and from their position in the sequence, it is concluded that they were formed by the penecontemporaneous oxidation of grey sediments. (Author.)

ARCHER, A.A. and R.W. ELLIOT. The occurrence of olivine-dolerite dykes near Llanrwst, North Wales. Bull.Geol.Surv.Grt.Brit., no.23, 145-152, 2 figs.(sk.maps of lodes and dykes).

Olivine-dolerite dykes have been proved cutting a mineral lode in the Crafnant Volcanic Series in Parc Mine, Llanrwst. The rocks are contrasted with the Lower Palaeozoic albite-diabase intrusions, and compared with other olivine-dolerite dykes described from North Wales, the Isle of Man and the Midlands. Like these, the Llanrwst dykes are believed to be of Tertiary age. (Authors.)

ASKEY, G. 1. Geology in the C.S.E. examination. Welsh Geology Quarterly, 1, no.1, 9-20, 1 fig.

A brief introduction to the C.S.E. examinations; an outline of the work of the geology panel; a copy of the draft syllabus issued by the Welsh Joint Education Committee; and a specimen examination paper.

ASKEY, G. 2. Geography in the C.S.E. examination. In: Report of Third Conference, Geography/Geology Section, University of Wales Guild of Graduates, 22-34, 1 fig.

A brief introduction to the C.S.E. examinations; an outline of the work of the geography panel; and copies of the draft syllabus issued by the Welsh Joint Education Committee, and a specimen examination paper.

BAILEY, R.B. Mid Eltonian tectonism. Bull.Ludlow Res.Grp., no.12, 7.

Brief summary (8 lines) of paper read at the Sedburgh Meeting (1964) of the Ludlow Research Group describing work on possible slide-conglomerates in the Ludlovian succession of the Kerry and S.W. Clun Forest areas described by the author in 1964 (Geol.J.).

BAKER, M.J. See CALLOW, W.J.

BANNERJEE, A. See BATHURST, R.G.C.

[BASSETT, D.A.] A list of provisional titles of theses which are at present being prepared on aspects of the geology, geomorphology, etc., of Wales and the Welsh Borders. Welsh Geological Quarterly, 1, no.1, 7-8.

The list is based on information provided by the heads of departments of geology and geography in the U.K.

BATES, D.E.B. A new Ordovician crinoid from Dolgellau, North Wales. Palaeontology, 8, 355-357, 1 pl.(5 photos.of holotype, one of paratype).

Iocrinus brithdirensis sp.nov. from the Llanvirnian (Ogyginus corndensis beds) near Brithdir, Dolgellau is described. The holotype has been deposited at the British Museum (Natural History).

BATHURST, R.G.C., HARPER, J.C., EAGAR, R.M.C., NEAVERSON, E., BANNERJEE, A., BRENCHLEY, P.J., OLDERSHAW, A.E., SHANKLIN, J.K. and J. STARKEY. Geologists' Association Guide. No.6: Geology around the University Towns: Liverpool. Edited by S.W. Hester.

Contents: I. The Permo-Trias of Skellow Clough. II. The Upholland Area. III. The Parbold Area and Harrock Hill. IV. The Eastern Side of Halkyn Mountain. VII. The Lower Carboniferous Succession between Prestatyn and Dyserth. VIII. The Mynydd Farm Slump, Colwyn Bay. IX. The Avonian D_2 Limestones of Great Orme's Head, Llandudno. The Llangollen Area. X. Trefor Rocks and Bron Heulog Quarry. XI. Ty-canol and Trevor Hall Area. XII. The Ludlow Siltstones of Dinas Bran. XIII. The Caradoc Rocks of the Llansantffraid-Glyn Ceiriog Area.

BLUCK, B.J. The sedimentary history of some Triassic conglomerates in the Vale of Glamorgan, South Wales. Sedimentology, 4, 225-245, 14 figs.(incl. strat.sections, isopleth maps, etc.), 1 table.

From a study of maximum particle size-distribution and sedimentary structures it is concluded that the .. conglomerates .. are alluvial fan deposits. A number of alluvial fans are sufficiently well preserved to be mapped, differences in the shapes of the maximum particle size isopleths, lithology and sedimentary structures leading to the interpretation that both stream flood and stream deposits are present. From details of succession an alternation of stream flood and stream deposits is demonstrated, and this is probably the result of the alternation of wet and dry periods.

Variations in sphericity and in particle shape through the parameters of size and distance show that an original population of roughly 50%

round, 30% disc, 15% rod and 5% blade shaped particles in the size range 5-125 mm median diameter was subjected to stream and stream flood transport which carried disc shaped particles further (or more swiftly) than others of the same sizes. The postulated means of transport was suspension for discs of 5-95 mm in diameter and traction for round and rod shaped particles of equal and larger sizes. (Author.)

BOULTON, G.S. and P. WORSLEY. Late Weichselian glaciation in the Cheshire-Shropshire Basin. Nature,Lond., 207, 704-706, 1 fig.(the Bar Hill-Whitchurch -Wrexham moraine, etc.)

Molluscs in a Cheshire drift which underlies a till/sand complex equated with the sequence north of the Bar Hill-Whitchurch-Wrexham moraine have been dated as 28,000 B.P. (+1800, -1500). Zone II organic deposits were found on the till sheet north of the moraine. It is suggested that this belongs to the Late Weichselian glaciation.

BOWEN, D.Q. and K.J. GREGORY. A glacial drainage system near Fishguard, Pembrokeshire. Proc.Geol.Ass.,Lond., 76, 275-281, 1 fig.(sk.map indicating glacial drainage channels, subglacial chutes, tors and benchs).

A system of glacial drainage channels immediately south of Fishguard, and mapped in part by J.K. Charlesworth (Quart.J.geol.Soc., 1929) and discussed by O.T. Jones (Quart.J.geol.Soc., 1965), have been remapped and reinterpreted. The features have (in the words of the authors' abstract) "previously been regarded as ice-marginal in origin. The presence of tributary and distributary channels, humps on the long profiles of some of them, their high longitudinal gradients and the presence of subglacial chutes suggests, however, that most were developed by subglacial stream erosion. Some may have developed after the superimposition of englacial streams. Minor stages in channel development indicate stages in the process of ice thinning."

BRENCHLEY, P.J. See BATHURST, R.G.C.

BRIDGES, E.M. Soil erosion on the lower Swansea valley. In a symposium on: Rates of erosion and weathering in the British Isles. British Geomorphological Research Group, Occasional Pubn. 2 See also SMITH, D.I.

BROMLEY, A.V. Intrusive quartz latites in the Blaenau Ffestiniog area, Merioneth. Geol.J., 4, 247-256, 4 figs.(g.sk.maps and vert.sections).

Certain flow-banded and fragmental rocks of the Moelwyn Volcanic Series, previously believed to be extrusive lavas, ashes and agglomerates are shown to be of intrusive origin. The rocks of Manod, originally interpreted as as a thick lava, are considered as part of a boss; and the rocks of Moelwyn demonstrated to include a number of sills and sill-like bodies. The thickness and extent of the volcanic rocks is accordingly greatly reduced - e.g. the total thickness of igneous rocks at Ceseiliau Moelwyn is in excess of 1350 ft., of which only 750 ft. is of volcanic origin.

A shelly fauna obtained from ashy sediments at the top of this volcanic series at Ceseiliau Duon (identified by D.E.B. Bates) suggests a position at or near the base of the Caradocian, and thus supports R.M. Shackleton's suggestion [1959: Lpool Manchr.geol.J.] that the Moelwyn Volcanic Series are the lateral equivalents of the Y Glog Volcanic Series.

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