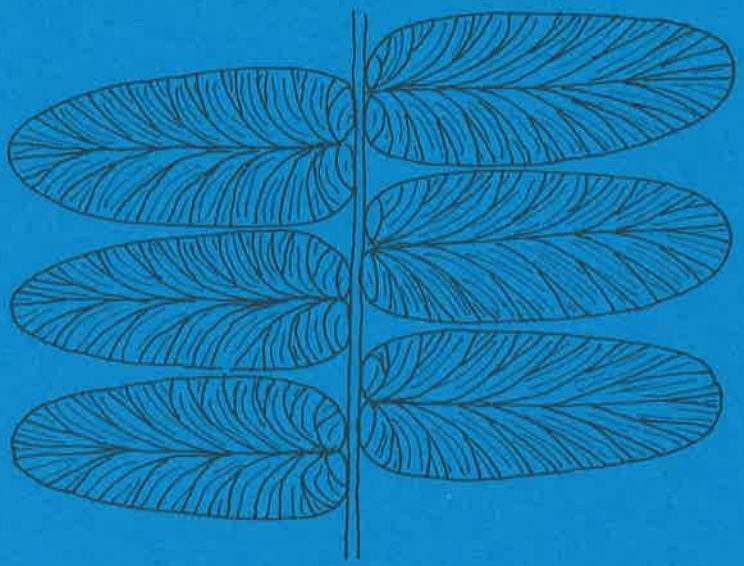
PROCEEDINGS
of the
GEOLOGICAL SOCIETY
of
GLASGOW



Session 118 1976

PUBLICATIONS

During the session publication sales were slightly lower than those of last session, with sales of Arran guides standing at 798 and Glasgow guides at 469. Small numbers of other publications were sold, including *The plain man's guide to Plate Tectonics* by Oxburgh, a popular account provided as a service to members. Total income from all sources stands at £1,126.32 for the session.

Major customers for the Arran guide include the two main booksellers on Arran – Pellegrini's Cafe and Alexander's of Brodick – taking a total of 280 copies, and a number of English and Scottish Universities taking 200 copies for use on student field trips to the island. The Glasgow guides' main purchasers are the students of Glasgow University – a captive audience – society members and other Glaswegians, together accounting for about 200 copies. There are also postal sales to individuals throughout Britain, indicating a thriving amateur geological population, and a small export trade, mainly to the United States and Europe.

Prospects for the coming session appear a little less bright, in that private purchases are dropping, possibly with saturation of the market. However, commercial sales seem likely to remain at high levels, especially on Arran, where the casual tourist may be induced to sample the guide.

MEMBERSHIP

Category	Session 117	Session 118
Honorary	5	5
Life	4	4
Ordinary	361	381
Associate	14	18
Junior	31	22
Total	**415**	**430**

This session has seen a slower growth rate than the previous two years. The total figure for session 118 given above was for the end of September 1976. However, this must now be altered, since a large number of members were in arrears, and had to be removed from the list. The doubling of the subscription to £6 caused a great deal of extra work, and the income from subscriptions was some £500 less than it ought to have been, as many members did not alter their bank standing orders to the new amount. To date, over £400 of this shortfall has been recovered, but unfortunately 35 members had to be deleted because of non-payment, making a total of 50 deletions for the session, and an addition of 30 new members. Some 20 members are still in arrears of £3 or £6, but their *Journal* has now been stopped. During the current session (119), 25 new members have joined, making the total figure 405 at 23rd May 1977. The fall in the number of Junior members from a peak of 40 to 22 is regretted. Rather few Junior members become Ordinary members

on reaching the age of 21. I should like to record my gratitude to Miss M. M Fotheringham and Mr. G. R. Thomson for their invaluable assistance throughout the year, and also to pass on my good wishes to Mr. Thomson, who will be taking over from me as Membership Secretary from the end of the current session. It is hoped that an up to date membership list will be published this session, as a special issue of the Proceedings.

THE SOCIETY LIBRARY

The contents of our shelves in the Mitchell Library have been transferred to the Department Library, the Geology Building, University of Glasgow. It is hoped that members will be better served by this move, especially as we will have access, both for consultation and loan, to the departmental collection as well; and we will be able to use the Library on those evenings when the Society meets in the department. Rules for access and loan are included below and any queries should be addressed to the Society's Librarian, Dr. Hall.

The library is to be found on the fourth floor of the Geology Building, in the first room to the left along the corridor from the main stairs and lift.

The library contains a few thousand text books and Survey publications, and an excellent coverage of the more widely used journals. The way the books are arranged in the library is clearly displayed, as are the means of recording loans out and returns. Suggestions for new books, etc. are always welcomed by the Librarian.

Access for Society Members: Monday to Friday, except Public Holidays, 9.00 a.m. - 5.00 p.m., and 7.00 p.m. - 10.00 p.m. on those evenings when the Society meets in the department; at other times by arrangement with the Society Librarian (Dr. Hall, **041 339.8855 Ex. 7473**).

Loans: Members may have up to and including a total of 10 volumes (books plus periodicals) on loan at one time. Reference sets of books and periodicals and unbound current parts of journals may not be borrowed. Books and periodicals on loan through the period of the annual inspection (usually in June) must pass through the hands of the departmental librarian during that time. Loaned material may be recalled after one month, to be returned before, or at, the completion of two months of loan. Requests for recalls are to be handled only by the departmental librarian, who may negotiate earlier recall.

The Society is grateful to the Department for the opportunity to share these facilities and for the services of the departmental librarian in the day to day running of the Library.

Please use the Library: it is there to serve you.

OBITUARY NOTICES

Professor Walter William (Bill) Bishop, Head of the Department of Geology, Queen Mary College, University of London, died suddenly at his home in Pinner, Middlesex, on 20th February, 1977. A native of the Birmingham area where, at the local University, he graduated first in Geography (B.Sc.), later in Geology (Ph.D.), Bill Bishop took a very active part in the corporate life of the University of Birmingham. He was President of the Students' Union and a devoted participant in Gilbert and Sullivan operas, on which in later years he based numerous geological parodies for the delight of his colleagues and others who shared his company.

After periods of training as a teacher and in employment in museum service in East Africa, Bill Bishop came to Glasgow in the autumn of 1959 as an Assistant in the Hunterian Museum. Short though his sojourn in Glasgow was – a few weeks more than three years – in that time Dr. Bishop made the acquaintance of a very large number of people, both in the University and in the Geological Society of Glasgow, who, for the fifteen years of his life that followed, treasured their friendship with him and the ready ease with which he passed on his knowledge to them. It was he who initiated in Glasgow a phase of Quaternary studies that still continues in the Departments of Geology, Geography and Archaeology of the University, but his enthusiasm went further than the encouragement of his professional colleagues and pupils. On his inspiration a team of amateur members of the Geological Society – many of them busy housewives – carried out the quantitative analysis of glacial deposits and in addition accumulated a valuable record of borehole and excavation data from building sites in the environs of Glasgow.

In the field of University Extra-Mural studies, also, Bill Bishop's enthusiasm and teaching talents were invaluable assets, and it was Lockerbie, in Dumfriesshire, that was fortunate to have him as a tutor during the period of his residence in Scotland. Here again life-long friendships were forged and he found many ready helpers to assist in investigations of the Quaternary deposits in the vicinity of Lockerbie and further afield.

Leaving Glasgow in 1962, to be drawn again by the lure of East Africa – this time to become Curator in the Kampala Museum – Bill Bishop became deeply involved for the remainder of his life in investigations concerned with the tracing of Man's ancestors at Olduvai, Omo and other sites that (partly because of his work) have become bywords in British households in recent years. Curatorship of the Kampala Museum for a few years, combined with teaching duties in Makerere College, was followed by Dr. Bishop's appointment to a Lectureship, later to a Readership, in Bedford College, University of London, posts he held until appointed to the Chair of Geology in Queen Mary College in 1974.

His years in London were very busy times. In the course of them, in addition to his normal duties in Bedford College and annual visits to East Africa, he became Chairman of the Editorial Board of the Geological Society of London. It was largely due to his efforts that the Journal of

the Geological Society was modernised and enlivened from the old Quarterly Journal to a periodical that appears regularly six times per annum. His editorial service was followed by a period when he was Secretary of the Geological Society of London, a task to which he turned his enormous vitality once more. Secretaryship of the Geological Society brought with it service on numerous committees, but in addition Dr. Bishop found time to continue his interest in the ancestry of Man and in the principles of stratigraphy, especially as concerned with the Quaternary sub-Era. For many years he was a member of the Stratigraphy Committee of the Geological Society of London and he served also on the Subcommittee of the British National Committee for Geology that is concerned with the affairs of the International Union for Quaternary Research (the INQUA Subcommittee). In 1976 his contributions to research on the ancestry of Man and on various aspects of the Quaternary were fittingly recognised when he was awarded the Prestwich Medal of the Geological Society of London when still in his mid-forties. Later, but only a few months before his death, he was appointed Director of the Yale Peabody Museum, New Haven, Connecticut, a post he was to hold in conjunction with a Chair in the Department of Geology at the University of Yale. It was one of the highest rewards a geologist could be accorded and few, if any, other than Bill Bishop had the necessary academic and museum training to attain it.

Bill Bishop was a man who gave much to Geology in the fields of research, teaching and administration. He did not spare himself. The last part of a large volume on a Symposium on *Geological Background to Fossil Man - recent research in the Gregory Rift Valley,* of which he had been the organiser, is shortly to be published. A few days before, as Chairman of the Programme and Publications Committee, he had drafted the scientific programme for the forthcoming International Congress of INQUA. He will be remembered for his breadth of knowledge and interests, for his inspired teaching combined with humour, and for his tireless endeavours. In Glasgow, however, he will be remembered most for his friendliness and his interest in people, facets of his personality that found expression ten days before his death when he lectured on the Gregory Rift Valley to the Geological Society of Glasgow.

W. G. Jardine.

Douglas Bailey, who died on the 28th January, 1977, was born in London and educated in Scotland. He then trained as an architect in Glasgow and Cambridge. Son of Sir Edward Bailey, he was an enthusiastic and lively member of the Geological Society for a number of years. While working with the 1st Glasgow Housing Association, of which he was chairman, he used his geological knowledge in a study of various sites. He was a founder member of the New Glasgow Society.

J. A. Lawson.

GEOLOGY IN SCOTTISH SCHOOLS

by Alberto V. Caira.

Until recently, there has been little motivation in teaching Geology in Scottish schools. The land of Miller and Hutton has been slow to recognise the educational and cultural value of the subject to its school pupils. In March, 1971, the Universities Preliminary Examinations were discontinued, leaving Scotland devoid of any examination in Geology below university level.

Whilst school geology was growing with a fair degree of rapidity in England and Wales (always a stronghold), the nurturing of the subject, at this level, north of the border, was left to a handful of enthusiastic teachers who stimulated the interest of some of their pupils within the context of existing Science or Geography courses, or, occasionally introduced Geology in its own right, usually to the chosen few who were able enough to enter for the General Certificate of Education Examinations at 'O' or 'A' level with one of the English Boards.

Partly because of this intermittent but persistent activity by a score or so of Scottish schools, the Consultative Committee on the Curriculum considered the introduction of Geology into Scottish schools. The proposal was not approved.

With the cessation of the Universities Preliminary Examinations, the Scottish Certificate of Education Examinations Board, aware of the geological void which had been created, considered that an appropriate course of action would be the constitution of a Subject Panel in Geology which would determine whether the introduction of an examination at 'O' Grade was desirable and, if so, to construct a syllabus for consideration.

Over a two year period, this panel drew up what was considered by its members to be a syllabus suited to the needs of Scottish pupils and with an appropriate bias on Scottish Geology. The aims of each section were discussed and clearly stated in the draft proposals. Presenting authorities and other interested bodies were then invited to consider and comment on these proposals in the Autumn of 1975 as part of the Board's normal consultative procedures.

The response to this proposed syllabus was most encouraging, although the majority of respondants tempered their enthusiasm with a measure of constructive criticism.

In the light of comment received, the panel amended the original proposals mainly by : (a) reducing the content in some of the sections, and (b) emphasising the importance of the proposed fieldwork log by increasing the percentage of marks allocated to it from 10 to 15.

This amended syllabus was considered by the Examinations Committee and the introduction of an examination based on the syllabus and

specimen paper approved by the Examinations Committee was agreed by the Board in February 1976.

Geology was thus added to the list of subjects examined by the Scottish Certificate of Education Examinations Board and the first examination has been scheduled for 1978.

It should be noted that the Geology panel members have been most anxious to express their cumulative opinion that the scientific nature of Geology be recognised and that the subject should be taught using the scientific method of observation, hypothesising and testing.

If the subject is to make a contribution to education in our schools, it must do so by training pupils to use the faculties which have been used by geologists since the inception of the subject as a discipline in its own right. To this end, it has been strongly recommended that pupils become familiar with the handling and identification of mineral, rock and fossil specimens, that the subject be taught in laboratory conditions and that field work be considered an essential ingredient of the course.

The problem of assessing individual candidate's practical and observational skills was considered at some length by the panel. The difficulties are severe and must be resolved taking into account the need for overall assessment on a national scale and the diversity of geological phenomena, over the country as a whole. It was considered that an assessment based on the scrutiny of a field work log prepared and submitted by each candidate by a pre-determined date in April of the year of the examination would be both realistic and valid.

The major part of the assessment, totalling 85% will take the form of a written paper structured as follows:

Section A: (50% of marks) is semi-objective in type and consists of a number of short questions which may refer to any section or sections of the syllabus.
All questions in this section are compulsory.

Section B: This will consist of one compulsory question carrying 15% of the marks and dealing with some aspect of geological maps, diagrams, photographs or other data. **It will be designed to test candidates ability to observe and judge a geological situation based entirely on the information given.**

Section C: This section will consist of a number of essay type questions of a semi-structured nature. **Only one question will be attempted and will carry a value of 20%.**

The full syllabus with its aims can be found on pp 62-70 of *Scottish Certificate of Education Examination – Conditions and Arrangements*

1978 (obtainable from Robert Gibson & Sons, Ltd, 17 Fitzroy Place, Glasgow G3 7SF, Price 60p).

With a little less than a year before the first Scottish 'O' Grade examination is unveiled, there are still many problems to be resolved. How will the subject find its way into Scottish schools and colleges bearing in mind such questions as :

(a) How many qualified teachers of Geology are in post at the present time and what priority can be expected for those so qualified in the coming years?

(b) What will be the effects of the current financial constraints imposed on education in general and to barely established subjects such as Geology in particular?

(c) Where lies the place of Geology within the curriculum bearing in mind that, wherever the subject is already established, it has usually been at the instigation of zealous and far sighted teachers of Geography rather than of Science? (It must be conceded that the introduction of Geology as a national school subject should be credited in large measure to the diligence and enthusiasm of such teachers).

(d) The implications arising from the curricular deliberations of the Munn and Dunning Committees which are expected to be revealed in the near future.

(e) The national debate gathering pace at the present time on the desirability of narrowing school curricula.

(f) The uncertainty of the, as yet, unestablished infrastructure necessary to guide the subject through its conception and early development.

(g) The understandable reluctance of University departments to accept school geology if it is studied at the expense of Mathematics, Physics or Chemistry in the timetable. The subject has, however, been recognised as an entrance qualification by the Scottish University Council on Entrance.

Many of these questions will be resolved but it must be said that the success or failure of the subject in schools will fall mainly on the shoulders of staff already in service and faced with severe restrictions without the addition of a further burden.

Doubtless there are many ancillary ways in which the status of Geology can be enhanced in the eyes of pupils, parents and industry. The propagation of the educational, cultural and vocational values of the subject by the geological fraternity at large, the changing demands of industry (especially the oil industry), the encouraging of the natural collecting instinct in young people and the gregarious habit of geologists in general to form themselves into concentrated units (already there is a

teachers working party in the Glasgow area) will all help to advance the cause of Geology as a school subject.

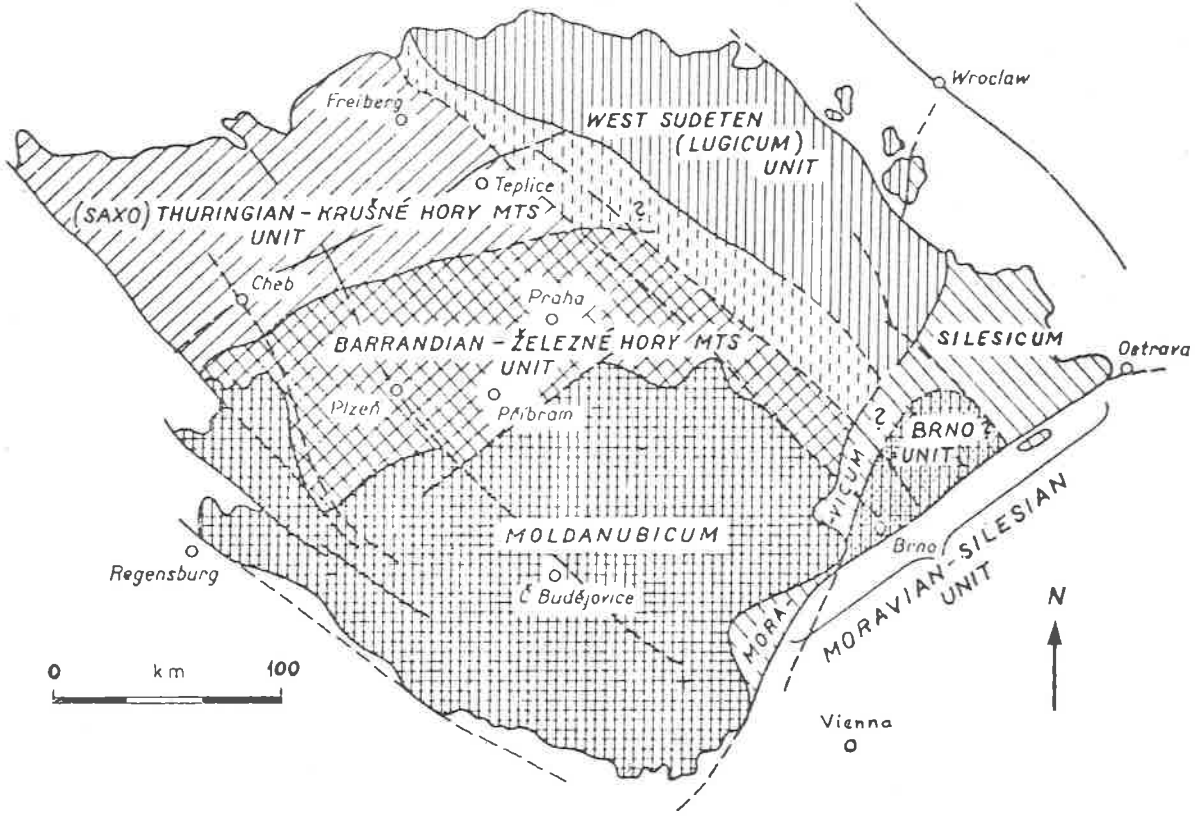
There can be no doubt that the introduction of a Higher Grade syllabus and examination will go a long way towards making Geology 'respectable' in the eyes of the public at large. The feasibility of a Higher Grade has been considered by the Geology Panel. They felt that it was too early to determine the demand and need for such an examination, especially in these difficult times. It must be said that, in the light of the still to be resolved uncertainties referred to above, such a recommendation is not only honest but constructive. There will, however, be an increasing demand for a Higher Grade examination as these problems are resolved and the subject gains momentum.

It might well be that the greatest service that can be done for Geology at the present time is that all those involved might gather themselves into an organisation under the aegis of, or similar to, the Association of Teachers of Geology (A.T.G.) which has made such an impact on Geology teaching in England and Wales since its inaugural meeting at Keele University in the Autumn of 1967.

Before such an organisation can be formed it will be necessary for those of us who find ourselves in appropriate positions of influence to persuade sympathetic institutions or authorities to grant us the facilities required for an inaugural meeting.

It is difficult at this time, not to temper feelings of elation with those of frustration and uncertainty. Let us not fail in the task ahead by putting off until more favourable times what can be achieved today by using the natural interest and stimulation which our subject offers.

I am indebted to Dr. H. A. Long, Examination Officer, for his invaluable assistance and advice to me during the preparation of this paper and on many occasions in the past.



TECTONIC UNITS OF THE BOHEMIAN MASSIF

Figure 1

BOHEMIAN TRAVELS

by **Cornelius Gillen.**

Introduction

In 1975 a party of young geologists from this country went to the Krkonoše natural park in northern Czechoslovakia, to carry out some detailed mapping in a block of folded and metamorphosed rocks. Friendly relations were soon established with Czech geologists, resulting in the formulation of an exchange agreement between Scottish and Czech geologists. As a consequence, ten members of staff of the Geology Department at Charles University, Prague, visited the Northwest Highlands of Scotland during May, 1976, followed by our return visit to the Bohemian Massif in September, 1976. Further excursions are planned for 1978, and during 1977 a start will be made on exchanges at an individual level, for the purpose of carrying out research projects in the two countries.

Krkonose Expedition 1975

During July, 1975, a party of ten undergraduates, research students and members of staff in geology at Glasgow University and Paisley College took part in an expedition to north Czechoslovakia, under the auspices of the Glasgow University Exploration Society, and led by J. Addison of the Hunterian Museum, assisted by the author. During the planning of the expedition, contact was made, at the suggestion of Professor D. R. Bowes, with Dr. M. Suk and Dr. A. Dudek of the Czechoslovak Geological Survey, who gave us an idea of suitable projects, and advised us to approach Dr. F. Fediuk of Charles University. The Krkonoše (Giant Mountains) area of northern Bohemia was chosen for our research expedition, on the advice of Dr. Fediuk, who had worked in the area, and his help, together with that of Dr. J. Chaloupský of the Survey, made the expedition a success.

Topographically, the Krkonoše reservation (Figs. 1,2) resembles the Cairngorms, but is quite thickly forested up to about 1200 m, is criss-crossed by numerous nature trails, and dotted with chalets and mountain huts. Our group stayed at Lesní bouda ('forest chalet') above Pec pod Sněžkou (Sněžka, or Snowy Top, at 1602 m is the highest mountain in the area, on the border with Poland; 'pec' is Czech for a blast furnace, and is a reference to the earlier days of mining in the area). Lesní bouda is situated at a height of 1100 m, in one of the many forest clearings. Geological and topographic maps at a scale of 1:50000 were provided, which we enlarged as more detailed maps are not available to the public. Full board was provided at Lesní bouda, except for lunch, but since most of the chalets have a cafeteria, there was no problem. We were perfectly free to move and work wherever we chose, and a special permit from the Ministry of Education allowed us access to some of the

restricted nature trails.

The purpose of the expedition was to find evidence of distinctive structural sequences in two adjacent groups of rocks that had been affected by two orogenic episodes and intruded by a large granite. The Krkonoše Mountains form part of the Krkonoše-Jizerské hory crystalline complex, one of the geological blocks of the Bohemian Massif, consisting in the main of phyllites, garnet mica schists, quartzites, amphibolites, metagreywackes, marbles and coarse, porphyroblastic feldspar schists and augen gneisses ('orthogneiss'). Lower Palaeozoic low grade metasediments unconformably overlie Upper Proterozoic (600 - 1000 Ma) crystalline rocks, and the two complexes together were deformed into a large anticlinorium, or dome structure, the core of which was intruded by the Krkonoše-Jizerské hory granite during Upper Carboniferous times, in the Variscan orogeny. The crystalline rocks disappear southwards beneath an undeformed cover of Permo-Carboniferous and Cretaceous sediments, resulting in a striking unconformity.

The oldest rocks of Proterozoic age (600 - 1000 Ma estimate) are adjacent to the granite (Fig. 2), and are composed of phyllites and mica schists, the metamorphic equivalents of shales, silts and greywackes. Interleaved with the schists are thin units of quartzite, limestone, calc-silicate rock, amphibolite and chlorite schist. The schistose rocks all show a well-developed planar fabric, and display polyphase deformation. The Krkonoše orthogneiss, on the other hand, is so coarse grained, with an augen structure, that little else apart from a rough foliation can be observed. Folding and associated regional metamorphism of these rocks occurred during the late Precambrian Assyntian orogeny.

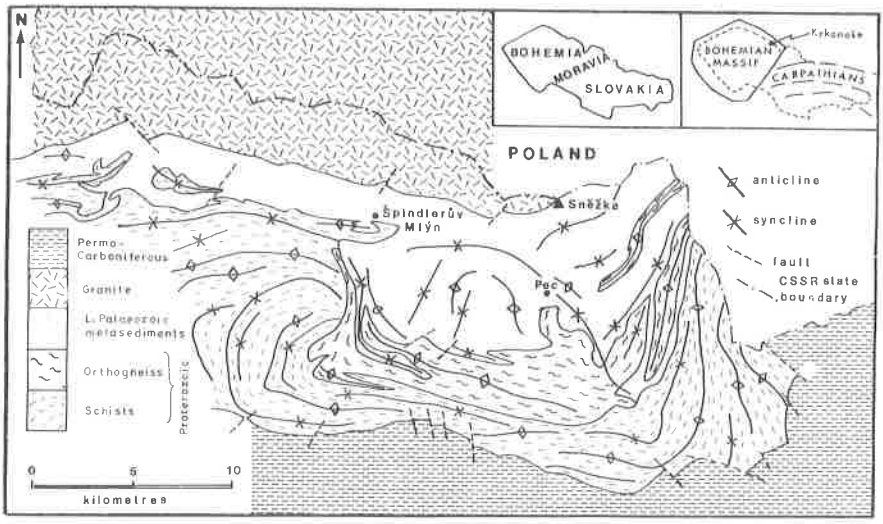
Lower Palaeozoic rocks supposedly lie unconformably on the older Proterozoic schists, but an unconformable relationship was difficult to discern. The younger rocks are rather less intensely metamorphosed, and fossils, such as graptolites in graphitic shales, have allowed the rocks to be dated with some accuracy, as Upper Ordovician to Upper Silurian, and were originally conglomerates, sandstones, limestones, tuffs and lavas. These rocks were deformed and metamorphosed during the Caledonian orogeny, and are now phyllites of various types, such as graphite-sericite phyllite and chlorite-sericite phyllite, sericitic quartzite, meta-conglomerates, crystalline limestones, and green schists.

Detailed mapping of the Proterozoic and Palaeozoic areas around Pec pod Sněžkou and Špindlerův Mlýn did not allow us to demonstrate indisputably that two distinct structural sequences could be identified, with the products of the Caledonian orogeny being superimposed on an earlier metamorphic and structural pattern developed in the rocks of Proterozoic age. This was mainly due to the relatively barren 'orthogneiss' being so wide-spread, as well as the outcrop being patchy and discon-

tinuous, and also the effects of the granite in places, which tended to recrystallize some of the rocks and obliterate structures.

Metasomatic processes, associated with the intrusion of the Krkonoše granite have resulted in ore mineralization of the Proterozoic rocks mantling the granite. Ore deposits are quite numerous, but small in size and although the area has been known as a mining district since the Middle Ages, difficulties of access and extraction have prevented mining from reaching any great extent. The most important ores worked in the past were iron ores (magnetite, with haematite and limonite) and polymetallic ores bearing copper, arsenic, lead, zinc, gold, silver, tungsten, tin, molybdenum, antimony, and bismuth, and fluorite-barite ores. We were able to examine several old mine dumps, and a collection of minerals from the area has been lodged in the Hunterian Museum. The Hunterian Museum also houses a fine collection of Czech minerals that were donated by the National Museum in Prague.

Following a visit to this country in May, 1976 by ten Czech geologists, a group of us returned to Czechoslovakia in September, 1976 for our part of the exchange agreement. Our excursion was a comprehensive tour of the Bohemian Massif (Fig.2), which is described more fully elsewhere (Gillen, 1977).



GEOLOGICAL SKETCH MAP OF KRKONOŠE

Figure 2

Acknowledgements

Financial support for the 1975 and 1976 trips from the University of Glasgow, the Carnegie Trust for the Universities of Scotland, the Geological Society of Glasgow, the British Council and Paisley College of Technology is gratefully acknowledged.

F. Fediuk and J. Chaloupský assisted the 1975 expedition, and J. Souček was responsible for organising the 1976 excursion. Enthusiastic support for the exchanges by Profs. B. E. Leake, D. R. Bowes (Glasgow) and I. M. MacLeod (Paisley), and Prof. F. Čech (Prague) ensures the success of future visits. A. Dudek and M. Suk of the Czechoslovak Geological Survey have been our constant friends. To these and to all our Czech friends who helped, I extend warmest appreciation.

Reference

Gillen, C. 1977. *Geological exchanges with Czechoslovakia. Outcrop, 6* 83-90. University of Glasgow.

SOCIETY MEETINGS (Session 118)

Held in the Geology Department, The University, Glasgow.

9th October, 1975.

The following were enrolled as members of the Society :

Mr. David S. R. Campbell, B.Sc., Mr. Noel N. Lunt, F.C.A., Mrs. Anthea K. Lunt, Mrs. Evelyn M. O'Neill, B.Sc., Mr. A. E. Stevens, B.Sc., (Eng.), M.I.C.E.

Professor J. L. Knill of Imperial College, London, delivered a lecture on **Geology in Dam Construction.**

The success of a dam as an engineering structure was largely determined by geology. The fundamental rock and engineering soil properties, of strength, deformability and permeability, relate directly to more geological characteristics. The lecture drew on a series of case histories which illustrated such influences on foundation geology on the design and construction of dams.

13th November, 1975.

The following were enrolled as members of the Society :

Dr. J. K. Grant, B.Sc., Ph.D., F.R.I.C., Mr. Roger McDonald, B.Sc., Mr. Peter C. D. Whiteside, B.Sc., Mr. Michael G. Arnott.

A lecture entitled **Volcanism and Plutonism – some problems of acid magmas** was delivered by **Dr. G. P. L. Walker, F.R.S.**, of Imperial College, London.

The speaker dealt with anomalies in the distribution of rhyolitic volcanism, and the anomalous nature of the topographic forms and long repose period of rhyolitic volcanoes. There was discussion of the mechanical handicaps restricting the rise of acid magma to high crustal levels and granitic plutons were looked at to see how these handicaps might have been overcome. An attempt was made to synthesise the mechanical aspects of the rise of acid magma towards the surface, taking examples from the Thulean Province and elsewhere.

11th December, 1975 (Annual General Meeting)

The following were enrolled as members of the Society :

Mr. Alberto V. Caira, B.Sc., Mr. Donald McM. Sharples, Mr. James D. Wilson.

The following office-bearers were elected :

Councillors : Mr. K. Smith and Mr. R. J. M. Young

Librarian : Dr. J. Hall
Assistant Librarian : Mr. I. R. Vann
} existing officers re-elected

Auditors : As no nominations had been received the election of two Honorary Auditors was postponed.

Written reports of Council for Session 117, previously circulated to members, were unanimously approved by the Society.

Dr. C. D. Waterston, official curator and keeper of geological records at the Royal Scottish Museum, Edinburgh, delivered a lecture on **Hugh Miller – his life and significance.**

Hugh Miller was born at Cromarty on 2nd October 1802, the son of a ship-master and descended from a long line of sea-faring people. Dr. Waterston gave a very full account of his life and discussed the significant contribution he had made to our Scottish heritage.

In the church politics of his time Hugh Miller became an outstanding figure, and the speaker outlined the leading part he had played in the religious controversy prior to the Disruption of the Church of Scotland in 1843.

His literary output was considerable. One of his early works, *Scenes and Legends of the North of Scotland* was published by Adam Black in 1835, and was an immediate success. The material for the book had been collected during the 15 years of Miller's early life as a stonemason in Cromarty when, during his travels, he had the opportunity of collecting and recording folk tales. He had been aware of the vanishing heritage which was his, and realised if he did not write it down, it would be lost for ever. Not only did Miller enjoy the tales and the tellers, he also realised the ethnological significance of legend. Two of his most famous books were, *The Old Red Sandstone* and *My Schools and Schoolmasters.* The former first appeared as a series of articles in *The Witness,* the newspaper of which he had become the distinguished editor. In *Chamber's Journal,* in 1840, the articles were collected and expanded as *The Old Red Sandstone* and published in 1841. *My Schools and Schoolmasters,* a biographical work of great charm, was published in 1852, and describes the life and people of Cromarty and Edinburgh.

His great·st contribution was, of course, to geology. The speaker described Miller's researches in their historical background, when the rocks of *The Old Red Sandstone* were much in dispute, and at a time when many, including Hugh Miller, still attributed observed geological structures to cataclysms and catastrophes. Although the evidence supporting the principle of uniformity of process formulated by James Hutton of Edinburgh was being recognised by an increasing number of people, it caused strong reaction in ecclesiastical circles and was unacceptable to many as working against true religion. Hugh Miller was a deeply religious man and his later work was greatly concerned with the reconciliation of his faith and of his science. He was violently criticised by progressive geologists and reactionary members of his own church. In 1856, when working on *The Testimony of the Rocks,* a book intended to grapple with the problem, he took his own life.

Despite his conservatism Miller's presentation of geology had a permanent influence on the future of that science. His geological books appealed to a wider public than to geologists. The popularity of *The Old Red Sandstone* which went through twenty-one editions in thirty-six years, was due not only to its literary merit, but to the interest in the implications of geological thought on popular themes of the day, of which one of the most important was religion. Since Miller wrote *The Old Red Sandstone* geological knowledge has made spectacular advances, yet his discovery and description of the fossils of *The Old Red Sandstone* have stood the test of time and illustrate the genius of the man.

8th January 1976

A lecture entitled **The Dalradian rocks of Connemara and Donegal, Ireland,** was given by **Professor B. E. Leake.**

The lecture linked the Dalradian succession and structures from Scotland

through Donegal to Connemara with some indication of the major vergences of the principal recumbent folds. Important successions and structures were illustrated including the Portaskaig Boulder Bed in Ireland, the key stratigraphical horizon.

12th February, 1976 (Members' Night)

The following were enrolled as members of the Society :
Mr. Saad S. J. Al-Sheikhly, B.Sc., Mr. James A. Gilbert, Miss Rosalind Gourgey.

The following talks were given by members :

Mr. Joe Davies:	A Foraminifera-rich dune in Eigg
Mr. C. Gillen:	The University Exploration Society Expedition to Czechoslovakia.
Dr. J. G. MacDonald: and Mr. W. B. Bradford:	A new boring through the picritic sill at Saltcoats
Dr. P. R. Thomas:	Geology of Ben Alder.
Mr. Andrew Scott:	The Sanquhar Coalfield - Sedimentological Palaeogeographical and Palaeobotanical problems.
Dr. G. E. Farrow:	*Living Sediments* (a 16mm colour/sound film).

Exhibits were displayed by the following members :

Mr. Joe Davies:	Samples from Foraminifera-rich dune, Eigg.
Dr. W. D. I. Rolfe:	*Beaconites* from the Lower Old Red Sandstone of Cardross: holothurian, polychaete or lungfish burrow.
Dr. J. G. MacDonald:	A new boring through the picritic sill at Saltcoats.
Mr. R. F. Offord:	Specimens of Scottish agate, onyx and amethyst.
Mr. J. Jocelyn:	(1) Sample of Marble from quarry at Ardmaddy, Nether Lorn (2) Haematite (Kidney Iron Ore) old furnace at Bonawe (3) Report on ancient and historical monuments of Lorn and contemporary literature relevant to the above.
Mr. B. J. Brown and Dr. G. E. Farrow:	Early diagenetic concretions of crustacean burrow origin (from Loch Sunart and the Firth of Clyde.
Mr. Tom Naismith:	Mr. Murray Tavendale's collection of Cabouchoned gemstones.

The following recent accessions to the Hunterian Museum were also displayed :

Fossil bat, freshwater fish, garpike and bowfin, from the Eocene of Darmstadt, Germany.
Ammonites from the Lias of Holzmaden, Germany.
Natural History Museum replicas of Wm. Smith's 1819, 1820 maps of Gloucs., Bucks., and Oxon.
Rocks from the Skaergaard Intrusion, E. Greenland.
Rocks from Hawaii, including tholeiites, oceanites and trachytes.

Rocks from New Zealand, including greenschists etc.
Blueschist rocks from Cazadero, California.
Minerals from Italy, Germany, S. Africa etc.
Sillimanite gneiss from S. W. Africa.

There were also demonstrations by :

W. Lindsay:	Disease and lesions in Oxford Clay plesiosaurs.
J. Brannon and M. McGinnes:	The arthrodiran fish *Coccosteus cuspidatus* from Edderton, Ross.
T. Sharpe:	Tooth insertion and replacement in ichthyosaurs

3rd March, 1976

The joint Celebrity lecture with the Geological Society of Edinburgh took place in the William Robertson Building, George Square, Edinburgh. **Dr. G. Richter-Bernburg** of the Technical University of Hanover delivered a lecture on **Saline Deposits.**

11th March, 1976

The following were enrolled as members of the Society :
Mr. Hew R. Curran, Miss Kirsten L. Dixon, Mr. Ian W. Gentle (Jnr), Mr. Ian C. Moore, Mr. Graham S. Picken.

Alteration to the Constitution (Senior Membership)

Notice was given of a proposal to introduce a new category of membership under a new clause, 3(e) in the Constitution of the Society as follows :

Senior Members: At the beginning of any Session following that in which Ordinary members attain their 65th birthday, members may opt to pay half the Ordinary membership subscription, and retain full benefits of such membership, except that they will no longer receive the Scottish Journal of Geology. The receipt by the Membership Secretary of such a half-subscription will be taken as an indication that an Ordinary Member wishes, and is eligible, to take up Senior Membership.

It was decided to put this proposal to the Society at a Special Meeting on 13th May in the City Museum, Kelvingrove.

A lecture was delivered by **Dr. Harold G. Reading** (Department of Geology and Mineralogy, Oxford) and the topic was : **The Cantabrian Mountains — A Strike Slip Orogenic Belt?**

In contrast to the gently accumulating Cambrian to mid-Carboniferous shallow water succession, the Upper Carboniferous of the Cantabrian Mountains of northern Spain was deposited in a time of intense tectonic activity. Sedimentary facies include alluvial fans, lacustrine, deltaic, shoreline and offshore carbonates and clastics, and deep marine slides, slumps and turbidites. Facies changes are very rapid both vertically and laterally and the succession is punctuated by four major unconformities.

The great variability of facies, locally very thick successions, structural styles and lack of igneous and metamorphic activity suggest a Hercynian strike-slip fault system. Modern strike-slip fault systems form orogenic belts where fault patterns and curving of strike-slip faults lead to very great vertical displacements and zones of both extension and compression.

13th May, 1976.

At this Special Meeting the proposal announced earlier (11th March) was put to the meeting and was carried unanimously.

A Joint Meeting of the Society with the Art Galleries and Museum's Association followed the Special Meeting. This meeting had been arranged to mark the opening of an exhibition on **Early days of geology in Britain.**

Mr. Thackray delivered an address entitled — **A New Look at Charles Lyell, one of the founders of geology.**

In his *Principles of Geology* (1830-1833) Lyell interprets the history of geology in terms of the struggle between the scientific principle of uniformitarianism, and the speculative beliefs of catastrophism. He implicitly gives himself a substantial share of the credit for the ultimate triumph of the scientific approach. This interpretation has been largely accepted over the years. A new look at the whole picture of geology in the 1830's shows that Lyell's opponents had a set of principles every bit as scientific as his own and, at first glance, even more attractive. Lyell's view of the scientific worth of his contemporaries and of figures from the early days of geology in Britain is contrasted with the outlook of the historian and geologist today. These reassessments bring Lyell down off his pedestal, but do nothing to lessen our respect for a man who was indeed one of the founders of geology.

SOCIETY EXCURSIONS (Summer 1976)

24th April	**Auchensail Quarry, Cardross. Leader Dr. W. D. I. Rolfe** Plants of the Lower Old Red Sandstone including *Sawdonia,* a simple early land plant of the same group as those found at Rhynie.
8th May	**Galloway Mudflats. Leader Dr. G. Farrow.** Groups of two or three people made studies of the different parts of the shore and later met to discuss their palaeoecological significance.
22nd 24th May	**Bute Weekend.** **Leaders Dr. B. J. Bluck and Dr. J. G. MacDonald.** A wide variety of rocks were studied including Dalradian schists and grits. Old Red Sandstone and some belonging to the Carboniferous.
5th June	**Joint Excursion with the Edinburgh Geological Society. The Moffat Area. Leader Dr. E. N. K. Clarkson.** The Lower Palaeozoic sediments and fossils, particularly the graptolite succession at Dobb's Linn, of the Southern Uplands were studied. Geomorphological features of the area were noted.
19th June	**Leadhills. Leader Mr. J. Addison** Several mine dumps were visited and a wide range of minerals were found — both the main ores, galena and blende and various secondary minerals.

3rd	July	**Dockra and Trearne. Leader Mr. S. Brown.** The limestones and shales and their associated faunas were studied in the Hessilhead and Trearne Quarries, Ayrshire.
4th	September	**Comrie and Lednock. Leader Dr. A. R. MacGregor.** Many different igneous and metamorphic rocks of this complex area were studied during the day.

RECENT PUBLICATIONS OF INTEREST TO MEMBERS.

Ardnamurchan – a guide to geological excursions
by C. D. Gribble, E. M. Durrance and J. N. Walsh.
Edinburgh Geological Society £2.00.

The Geology of the Lothians and S. E. Scotland – an excursion guide
edited by G. Y. Craig and P. McL. D. Duff.
Edinburgh Geological Society £2.00.

Geology Explained around Glasgow and S. W. Scotland including Arran.
by J. D. Lawson and J. A. Lawson.
David and Charles £4.95.

Edited by J. A. Lawson, published by the Geological Society of Glasgow, Geology Department, The University, Glasgow G12 8QQ
Printed by Heatherbank Press, 163 Mugdock Road, Milngavie, Scotland.