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Cover Illustration:

Alexander Rose, F.R.S.A. (Geologist), 1781–1860.

EDITORIAL

'We regard it as one of the essential requisites of our little volume that all its science be considerably diluted with gossip'. This admirable statement in Thomas McCrie's book *The Bass Rock ...*, published in 1847 certainly has some application in this particular issue of our little volume. But we make no apology, for science diluted by idle conversation frequently proves more amusing and instructive than an indigestible concentration of facts.

In order to standardise its distribution we have resolved to circulate the magazine to all Edinburgh Geological Society members residing in Lothian, Fife, Central and Borders Regions. To save on postage the magazine will continue to be distributed at the first lecture meeting following its publication. Thereafter remaining copies will be mailed to individuals. Distribution to other members who request a regular copy will continue as before.

The success of our endeavours to maintain a readable magazine depends greatly upon both amateur and professional geologists to provide the raw material. One of our difficulties in interpreting what the reader wants is that we receive virtually no feedback. We would of course, always be pleased to have your comments as well as articles for publication.

Refreshed in mind and body from a summer full of splendid excursions, members of the Society may look forward to an equally stimulating (mentally at least) programme of lectures for 1981-82. For example, during the first four months of 1982 the list of titles indicates considerable geological and geographical diversity (see below). There is, we suggest, something to interest everybody. We trust the same may be said of this Edition's contributions and we take this opportunity to thank all the contributors.

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LECTURE PROGRAMME, JANUARY to APRIL 1982

The latter half of this Session's lecture programme includes the following:

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| 13th January | Dr N.M.S. Rock—"Aspects of the Sunda Volcanic Arc in Java and Sumatra, Indonesia". |
| 27th January | Presentation of the Clough Memorial Medal for 1980-81 to Dr J. B. Sissons—"The ice-dammed lakes of Glen Roy and vicinity". |
| 17th February | Dr M. Leeder—"Upper Palaeozoic sedimentary basins". |
| 3rd March | Fellows Night. |
| 17th March | Dr D. G. Jenkins—"Evolution of Cenozoic planktonic foraminifera". |
| 29th April | James Wright Memorial Lecture. Professor D. L. Turcotte—"Mantle convection, plate tectonics and geological processes: some recent developments." |

REFLECTIONS ON ALEXANDER ROSE

Stuart K. Monro

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Two hundred years ago Alexander Rose was born. He played a key role in the early development of the Edinburgh Geological Society and has been called its founder; so it is fitting to briefly reflect on this man, his life and influence on the Society.

The forebears of Alexander Rose came from Cromarty where his grandfather was factor to Sir Robert Munro of Foulis; both were killed at the Battle of Falkirk in 1746. Alexander Rose's father, John Rose, married Isabella (Sybilla) Munro, a granddaughter or niece of the then Munro of Foulis and together they moved south. He set up in business as a turner in wood and ivory and in 1781 Alexander Rose was born.

There is no record of his place of birth or of where his father set up in business. But it is known that Alexander's early days were spent in Edinburgh and that he was educated at the Old High School of Edinburgh where Dr Adam was Rector. He developed both mental and manual dexterity, as illustrated by a story told by his grandson, Robert Traill Rose:

During the final years of the 18th century there was excitement in the neighbourhood of Blackfriars or Niddrie Street, caused by the report of a 'Brownie' busy in one of the old houses there. Morning after morning a local turner on entering his workshop was astonished to find that the work he had left unfinished the night before was all beautifully completed. Curiosity got the better of fear and a watch was set. In the grey of an early morning, the 'Brownie' was discovered entering the window of the workshop. The 'Brownie' was a small boy, Alexander Rose.

While the accuracy of this tale may be suspect, it underlines the interest of the young Rose in craftsmanship and he grew up following his father's footsteps as a wood and ivory turner. Examples of his work include the turned bowls now housed in the Royal Scottish Museum and his mineral cabinet and chair which were presented to the Edinburgh Geological Society by Mrs Mary Tweedie Stodart Rose. Rose also made scientific instruments for the University of Edinburgh and is credited with having invented a seismometer.

Old Edinburgh directories list Alexander Rose as a 'wood and ivory turner' up to 1823 but between 1823 and 1834 he was, in addition, credited as 'dealer in minerals'. Between 1834 and 1843 'mineral dealer' was given as his main activity, and the 1860–61 edition describes him as a 'lecturer and mineral surveyor'. It seems that what started as a hobby rapidly became a profession.

Although Rose was associated with many of the noted scientific men of the day, including Faraday, Daguerre, Sir David Brewster, Henry Mackenzie and Hugh Miller, it was not from these that the Edinburgh Geological Society sprang; nor was it from the geological intelligentsia associated with either the Huttonian or the Wernerian schools of thought. Instead the Society owes its origins to a group of enthusiastic amateurs who were stimulated by a series of lectures on mineralogy given by Mr Rose in the early 1830s. On 4 December 1834, eleven members of the class met in Robertson's Tavern, Milne's Close, and resolved to start a society for 'discussion and mutual instruction'. Initially called the Geological Society, it grew into the Edinburgh Geological Society and its members were to meet in Mr Rose's house every Monday evening at half-past eight. The first scientific meeting was held on the 8 December 1834, the subject discussed being whether or not Arthur's Seat was of volcanic origin.

By the 1840s Rose was established as a lecturer in geology and mineralogy at Queen's College, a teaching or lecturing association which also boasted anatomical demonstrations by Dr Knox of Burke and Hare fame.

Alexander Rose was much travelled and frequently visited Iceland and Denmark. He was awarded a Knighthood of the Order of Dannebrog by the King of Denmark and received an inscribed bible, in Danish, from Gista Brynin, doctor and priest at Holm, Iceland. The observations from his travels were the source for many lectures to the Society.

Rose was held in high esteem by his friends who described him as "a man of unassuming disposition, of sterling integrity, and of warm affections, with a rich fund of dry humour, not infrequently directed against his own activities". This characteristic can be seen in many of the songs which he wrote. The following, in broad Scots, gives the 'common man's' view of a Rose geology lecture.

Yestreen I heer'd a lectre on
Geology they ca'd it,
It coost a shillin hale; Ochon!
I sairly was defraudit.
It was pang fu' o' senseless stuff,
An' words as lang's a cable; —
There's nae been spak sae muckle buff
Sin' the days o' ancient Babel.

The respect in which the man was held by those who knew him is reflected in the many presentations made to him, a silver tea service, a silver cup and many books from his students and a silver snuff box and

a gold watch from the Society.

Alexander Rose served as the second president of the Edinburgh Geological Society for twelve years from 1835 to 1846. But from 1856 he appears to have retired from active work and with his death in 1860, enthusiasm and interest in the Society waned almost to the point of extinction.

While Mr Rose cannot be cited as the founder of the Edinburgh Geological Society, his role in providing the stimulus and sustenance in the Society's formative years must undeniably credit him as its father.

Suggested further reading:

- 1 *Transactions of the Edinburgh Geological Society*, Vol.13, 1934, pp.191–271.
- 2 *Alexander Rose, Geologist and his grandson Robert Traill Rose, Artist*, by Mary Tweedie Stodart Rose, Edinburgh: C.J. Cousland & Sons Ltd.

THE EDINBURGH GEOLOGICAL SOCIETY EXCURSION TO SKYE, MAY 1981

We are pleased to print (on page 13) Mrs Davenport's Diary of the Society's field excursion to Skye which was held during May 1981. Details of where the party stayed and what it ate appear in Mr Hogarth's 'Information on the Long Excursions' on page 16. Firstly, to set the geological scene there follows a summary of the geology prepared from Dr Mykura's excellent handout which may enable the reader to plan a similar field trip of his own.

Geology and Itinerary by Dr W. Mykura, Institute of Geological Sciences, Edinburgh

Though Skye is best known for its Tertiary plutonic complex and its extensive Tertiary lava flows, it also contains an extensive suite of older rocks, ranging from Lewisian Gneiss to Cretaceous, including the most complete development of Jurassic rocks in Scotland. Most of the Precambrian and lower Palaeozoic rocks lie in the belt of Caledonian thrust sheets which extends southward from Durness along the west coast of Scotland and traverses south-eastern Skye.

Basement

Undisturbed Lewisian Gneiss and Torridonian Sandstone of the Caledonian foreland may be seen on the Island of Raasay. South of Broadford and in the Sleat peninsula Lewisian, Torridonian and Moine rocks are stacked up into three nappes, separated by thrust planes, which are themselves folded into a north-east trending anticline and syncline. The following structural units can be recognised in the nappe-complex:

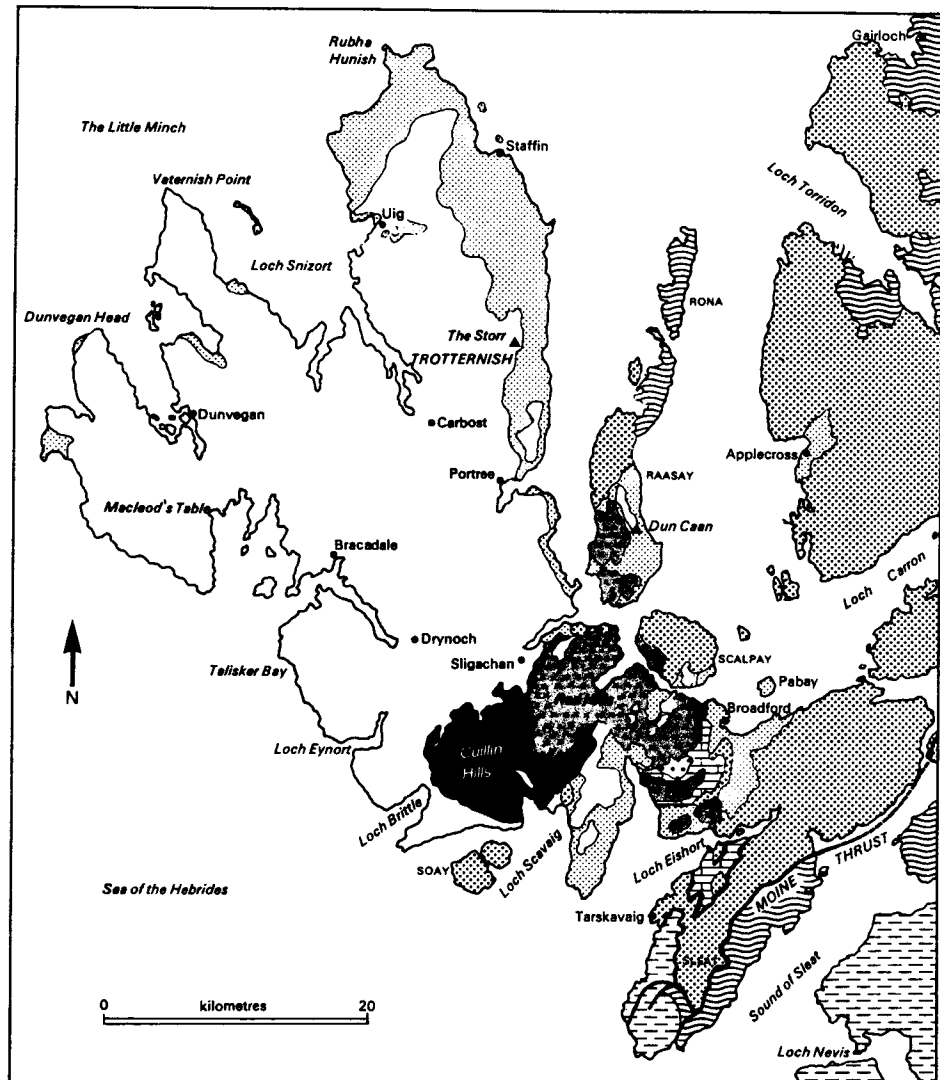
- d) the Moine Nappe, which rests on the Moine Thrust and is exposed in the Sleat peninsula where it is composed mainly of Lewisian Gneiss.
- c) The Tarskavaig Nappe which rests on the Tarskavaig Thrust. It is seen only in Sleat and comprises mylonitised Lewisian gneiss overlain by younger metamorphic rocks which are known as the 'Tarskavaig Moines'.
- b) The Kishorn Nappe which rests on the Kishorn Thrust and is made up mainly of Torridonian sediments.
- a) The Foreland. South-west of Broadford and in the 'Ord Window' of Sleat the rocks of the foreland comprise Cambro-Ordovician limestone and some Cambrian quartzite, but on Raasay they contain only Torridonian and Lewisian rocks.

Permo-Triassic

The oldest post-Caledonian sediments are of Permo-Triassic age. On Skye they are very thin and comprise basal breccio conglomerates (debris-flows formed in alluvial fans) overlain by alternating pebbly sandstones and red mudstones with concretionary deposits (ephemeral river deposits). Geophysical exploration in the seas around Skye has shown that the Triassic beds get progressively thicker westwards, reaching several km along the Minch Fault, close to the east coast of the Long Isle. Triassic breccias are well developed south of Broadford and an excellent fluvial sequence may be seen in Raasay.

Jurassic

The Jurassic succession of Skye and Raasay is the best exposed, thickest and most completely developed in the Hebrides. The succession is summarised in Table 1. The Jurassic rocks were laid down in a shallow marine environment which encroached over the Triassic alluvial plains and eventually covered the projecting hills. The Lower Lias comprises the Broadford Beds and Pabba Shales. The Lower Broadford Beds



Tertiary Igneous rocks

(basic dykes and sills omitted)



Felsite, granophyres and granite



Gabbro



Vent-agglomerate



Lavas (basalt, etc.)

Mesozoic



mainly Jurassic sediments
(Note: extensive dolerite sills in Mesozoic omitted in N and N W Skye)

Cambrian



Durness Limestone etc.

Pre-cambrian



Moine schists and gneisses



Torridonian Sandstone



Lewisian Gneiss



Thrust

Geological Map of Skye
(after *British Regional Geology, Scotland: The Tertiary Volcanic Districts*
3rd Edition, 1961, H.M. Geol. Surv.)

**Table 1 — JURASSIC SUCCESSION IN SKYE,
WESTERN SCOTLAND**

30 m +	Staffin Shales	Dark Shales Grey Shales and Clays Dark Shales and Clays	Kimmeridgian Oxfordian	U P P E R
18 m	Staffin Bay Beds	Belemnite Sands (= Carn Mor Sand- stone) in Strathaird Upper Ostrea Beds	Callovian	
207 m	Great Estuarine Series	Mottled Clays Ostracod Limestones Lower Ostrea Beds Concretionary Sandstones Estheria Shales White Sandstone Basal Oil Shale	Bathonian	M I D D L E J U R A S S I C
210 m	Bearreraig Sandstone (Inferior Oolite)	Garantiana Clay Calcareous Grit Upper Sandstones Massive Sandstones Shaly Sandstones Lower Sandstones Dun Caan Shales	Bajocian Aalenian	
2.5 m	Raasay Ironstone		Toarcian	
20 m	Portree Shales			
124 m	Scalpa Sandstone		Pliensbachian	L I A S
182 m	Pabba Shales			
71 m	Broadford Beds	Upper Broadford Beds Lower Broadford Beds	Sinemurian— Hettangian	

consist of calcareous shales, limestones, some sandstones and include two coral beds and (in Raasay) an oyster reef. They are overlapped by the more uniformly sandy, ferruginous, ammonite-rich Upper Broadford Beds, which were laid down in a delta prograding into a shallow sea. The Pabba Beds are a uniform group of silty shales, becoming sandy towards the top. They are best studied on the north shore of Loch Eishort but are also well seen near Hallaig on Raasay. There is a lithological gradation up into the Middle Liassic Scalpa Sandstone which on Raasay is extremely fossiliferous with abundant large brachiopods and many ammonites. It was formed as shallow marine sand bars. The Upper Lias is thin and consists mainly of black marine micaceous shales (Portree Shales). In Raasay and just north of Portree the shales are overlain by the Raasay Ironstone which was worked for a time during and after the first world war. It is up to 2.5 m thick and is a typical minette ore full of chamosite oolites. Parts of it are richly fossiliferous and a complete section may be seen in the old opencast workings on Raasay. Hallam (1966) has discussed the modes of formation of the Jurassic Ironstones.

Middle Jurassic

There is a considerable non-sequence above the Raasay Ironstone, which is succeeded by the thin, dark grey, micaceous Dun Caan Shales, followed, in turn by the very thick but variable Bearreraig Sandstone (mainly Bajocian), which form extensive outcrops in North Skye, on Raasay and near Elgol. The sandstone occurs in two facies: a lower calcareous and shaly facies full of fossils and an upper strongly cross-bedded facies of calcarenite. The base of the cross-bedded unit is diachronous.

Bathonian (Great Estuarine Group)

All the Jurassic strata described so far were laid down in a marine environment, but the Great Estuarine Group was formed mainly in fresh to brackish-water lagoons which contained a number of deltas. The group contains shales, cementy limestones, and sandstones, and is characterised by having relatively few fossil species, but each species occurs in tremendous numbers. There are many shell beds, including oyster beds, gastropod beds, beds teeming with ostracods, and two algal horizons, one with well-developed stromatolites. At the top of the group, there are red marls with a possible caliche (cornstone) suggesting fossil soil development. The individual formations of the Group have a wide geographical extent and can be traced throughout Skye. Good sections may be seen along the Elgol shore and also north and west of Staffin.

Upper Jurassic

Marine conditions returned to the Hebridean basin just before the end of the Bathonian, but, whereas in Southern Skye the higher beds are largely fossil-rich sandstones, in northern Skye, above the thin basal Upper Ostrea Beds and Belemmite Sands, they are exclusively ammonite-rich, in part bituminous, mudstones and siltstones with thin tuff bands. At Staffin the shaly sequence extends without a major break right up into the Kimmeridgian.

Upper Cretaceous

The Upper Cretaceous beds which rest unconformably on Upper Jurassic strata are much thinner and more patchily developed than in Mull and Morvern, though there are thin residual flinty limestones and sandstones in Scalpay and near Camasunary.

Tertiary

The rocks of the Tertiary Igneous Suite dominate central and north-western Skye. The outpouring of lava on the land surface of eroded Mesozoic and Torridonian rocks generally preceded the emplacement of plutonic rocks at the root of the central volcano. At first volcanic activity was confined to a number of small vents which deposited some thin palagonite tuffs and agglomerates. Later fissure eruptions occurred throughout the area, producing an extensive lava field which extended well beyond the aerial limits of Skye, particularly in a south-westerly direction. The lava field was at least 1200 m thick and consisted of alkali basalts with some mugearites and subsidiary trachytes. It reaches its maximum development and greatest thickness around Bracadale, 12 km WSW of Portree.

The plutonic rocks represent the roots of a great central volcano. The first rocks to be emplaced were the gabbros and the layered peridotites, allivalites and eucrites (cumulates) of the Black Cuillin Centre. These formed an ENE-trending oval mass 9 km by 13 km in diameter, which was developed during four major intrusive phases, with intervening periods of dyke-, cone sheet -and sill-intrusion.

After the emplacement of the Cuillin ring complex the centre of igneous activity moved about 3 km to the east and emplaced, within the Cuillin gabbros, a much smaller, predominantly granitic complex, 4 km across, centred on Strath na Creitheach. This centre contains an agglomerate vent thought to mark the site of a caldera. Later the locus of plutonic activity shifted to the north-east and the available magma was again almost entirely granitic. This third major episode gave rise to the 'epigranites' (fine grained granites emplaced not far below the surface) which now form the Western Red Hills. Its volcanic activity was

centred on the head of Loch Ainort, and there were ten separate intrusions producing granites, granophyres and felsites. There was also an early phase of gabbro intrusion and a late, narrow ring intrusion of hybrid dioritic rocks known as 'marscoites' and ferrodiorites.

Finally, the centre of intrusive activity moved some 10 km to the south-east, and the fourth and last major episode produced the 'epigranites' which now form the Eastern Red Hills. Activity started with the emplacement of the large Kilchrist agglomerate vent, followed by the intrusion of several gabbro sheets and then six phases of granite intrusion. One of these granitic bodies (the Beinn an Dubhaich Granite south of Loch Kilchrist) is completely detached from the complex and there is, even further east, a series of composite and acid sills which sweeps in an arc from Loch Eishort via Heaste to Broadford.

The acid rocks of the two Red Hills centres are cut by far fewer basalt dykes than the Cuillin gabbros and the country rocks, suggesting that most of the dyke emplacement took place fairly early in the history of the complex.

The plutonic rocks have thermally metamorphosed the adjoining sedimentary rocks, particularly where granite has been intruded into the Cambro-Ordovician dolomites. These have been converted into white 'marble' containing many new minerals such as brucite, diopside, forsterite and tremolite. Locally the marble contains small bodies of magnetite and copper ore.

Landslips

In northern Skye the Jurassic sediments are intruded by thick composite picrite-dolerite sills which now form prominent sea cliffs displaying columnar jointing. The sediments are here overlain by thick Tertiary lavas with some palagonite tuffs and pillow lavas at the base. The lavas form the prominent eastward-facing escarpment extending from Portree to near Staffin. For much of this distance they rest directly on soft impervious, Jurassic shales, gently inclined to the west. During late- and post-glacial times slip planes developed close to this surface. These were lubricated by glacial meltwaters and acted as movement planes for large masses of overlying lava, the joints of which had been opened by frost action. The landslips forming the jumbled rock pinnacles of the Storr, the Quirang and Flodigarry are now among the largest and most impressive in Britain. In eastern Raasay the massive Berreraig Sandstone has similarly slipped on the underlying Liassic shales.

References

Maps:

Ordnance Survey 1:50000 topo sheets:

32 (Southern Skye)

23 (Northern Skye)

24 (Raasay and Loch Torridon)

Geological Survey: 1" or 1:50000 sheets:
71W (Broadford)
Special 1" Sheet Northern Skye or Sheets 80 + 90
81W (Raasay)

Open University: *Geological Map of the Central Igneous Complex: Isle of Skye, Scotland.*

Guides, Books and Papers:

British Regional Geology: Scotland: The Tertiary Volcanic Districts, by J. E. Richey (3rd Edn.). (Though now very much out of date this is still a very good introductory account.)

Guide for Western Scotland, in *International Field Symposium on the British Jurassic*, Excursion No.4 by Hudson, J. D., and Morton, N., (1969). (An excellent, detailed excursion guide to the Skye Jurassic; unfortunately very hard to come by.)

Geologists Association Field Guide No. 13: *The Tertiary Igneous Geology of Skye*, by G. M. Brown et al. (This describes many of the localities visited.)

Bell, J. D., 1976. The Tertiary intrusive complex of Skye, *Proc. Geol. Ass.* 87 pp. 247–72. (A comprehensive, up to date summary including reference to most recent researches.)

Layered Igneous Rocks by L. R. Wager and G. M. Brown, 1968, pages 408–24. (An excellent and very readable account of the layered cumulates which form the greater part of the Cuillin centre.)

Open University: Igneous Case Study. The Tertiary igneous rocks of Skye, NW Scotland. (A geochemical approach to the Skye igneous rocks, their age relationships, large scale structure and regional tectonic setting.)

Itinerary

The Excursion was based in Portree. As usual the daily order of excursions depended on the weather (e.g. cloud base in the Cuillins) and the fitness of the party. Three of the excursions were fairly strenuous and for those days alternative itineraries for 'Hard' and 'Sedate' parties were provided.

Sunday 17th May: East shore of Loch Scavaig from Elgol [NGR 518 137] towards Camasunary to examine the fine section in the Great Estuarine Series of the Jurassic. Stops en route at (1) **Loch Kilchrist** to view the Eastern Red Hills Complex, the Kishorn Nappe tectonics and the Skye Marble Quarries. (2) **Torrin** for the Blaven–Garb Bheinn Range on the eastern margin of Cuillin Eucrite Ring Complex. (3) **Coast of Loch Slapin at Kilmarie**—calcareous facies of Bearreraig Sandstone.

Monday 18th May: Trotternish Peninsula. (1) **Bearreraig Power Station**, coast section and Waterfall [518 528] for Storr landslip and Old Man of Storr; type section of the Middle Bajocian Bearreraig Sandstone. (2) Cliffs between Loch Mealt and Valtos [512 645]—Columnar jointing in dolerite sill ('Kilt Rock'); cliff and quarry section in Concretionary Sandstone. (3) **Staffin Bay** between Digg [474 700] and

and **Flodigarry** [468 716]—marine Upper Jurassic shales with Upper Ostrea Beds and Belemnite Sands; also toe of Flodigarry landslip. (4) **Duntulm Castle** [410 740]. Fine section in Lower Ostrea Beds and composite picrite-dolerite sill; Skye Folk Museum. (5) Uig-Staffin road for close look at the Quirang landslip.

Tuesday 19th May

- (A) **Hard Party:— Western Red Hills Complex.** Glen Sligachan, Marsco [508 252]. Marscoite-ferrodiorite dyke, successive phases of epigranite' intrusions, early gabbro, and superb views to study the relationships between the Cuillin Gabbro, Strath na Creitheach and Western Red Hills centres.
- (B) **Sedate Party:—** (1) **Camas Malag** [584 190]—Intrusive relationship of Beinn an Dubhaich Epigranite and Durness Dolomite, and, at mouth of Allt Nan Leac [586 184], basal Lias breccias and baked Upper Broadford Beds. (2) **Broadford**—Type section of Lower and Upper Broadford Beds between Ob Lusa [700 248] and Lower Breakish [668 240].

Wednesday 20th May. Cars to Elgol and hired boat to head of **Loch Scavaig** and **Loch Coruisk**.

- (A) **Hard Party:—Loch Scavaig to An Garbh Choire** [467 200] for banded cumulates belonging to the Sgurr Dubh Peridotite, Eucrite zones I and II, and also outer unlayered gabbro. Then path from Loch Coruisk to Druim Hain to examine rest of Eucrite series, Druim nan Ramh Eucrite Ring Dyke and Druim Hain banded gabbros. Descend to **Loch na Creitheach** (agglomerate vent). Return via Camasunary by track to Kilmarie (lavas and Cretaceous sediments en route).
- (B) **Sedate Party:—Return via 'Bad Step', Camasunary and Kilmarie to Elgol; Spar Cave** [538 127] (at low tide and bring torches) with fine stalagmite formations and good sections of cross-bedded Bearreraig Sandstone.

Thursday 21st May

- (A) **Hard Party:— Glen Brittle—Loch Choire' a Ghrunda—early phases of Cuillin Centre intrusions, cone sheets, tholeiite sills, superb glacial erosion features, gabbro-lava contacts; return via Bracadale** (see Sedate Party).
- (B) **Sedate Party:—Dunvegan** (Castle and seal islands) 'Coral Sands' at **Camas Ban** [226 540], view of 'Macleods Tables' with fine lava terraces. Return via **Bracadale** [368 398] type localities of 'big-feldspar mugearite', trachyte with zeolites and agates, and 'ben-moreite'.

Friday 22nd May: Raasay. Ferry from Sconser to East Suisnish. Brochel Castle [584 463]—Lewisian Gneiss, Torridonian shale and sandstone and ?Permo-Trias gully-breccias. (2) Old Ironstone Workings at Glen Lodge [569 365]—Raasay Ironstone. (3) North Fearn [593 360] to Rubha na Leac and Hallaig. Fine sections of Trias, Broadford Beds, Scalpa Sandstone and Berreraig Sandstone Opportunity for keen walkers to cross the island from Balmeanach via Dun Caan to rejoin the buses at North Fearn.

Skye Diary by Lizzie Davenport, 14 Bank Road, East Linton.

Sunday: Stop for paperweights at the Skye Marble quarry. A very hard party is dropped off to climb Blaven; rest go on to Elgol for the Great Estuarine Series. Some enthusiasts examine the Bearraig Sandstone, though there is no sign of life to suggest the 'open marine' of the composite log handout. There are signs of violent deposition—it makes you seasick just to look at what you are standing on. Lunch on the white sandstone—sunhats and bandanas are brought out, and woollies removed. Afternoon reveals vagaries of estuarine development, and fauna—ostrea, stromatolites ostracods. Undeterred by a dead lamb at the base of the cliff, the very enthusiastic clamber on to the mottled clays and Carn Mor Sandstone (bits of it conveniently litter the shore). On the way back, a stop is made for the Concretionary Sandstone. The improving works of the laird of Elgol (Ian Anderson, mainstay of Jethro Tull) are apparent and approved—some members of the party commit themselves to not switching off when he next appears on the box. Beaches near the laird's house are rich in driftwood which is gathered by those whose neighbours in Portree will not spare them a sod of peat.

Monday: Berreraig. The steps down to the shore take varying lengths of time to negotiate: first arrivals take the slippery path to the Dun Caan Shale. The Berreraig Sandstone does appear to be open marine here; ammonites abound even after years of predation by geologists. We climb up to the Massive Sandstone (site of a waterfall which has almost dried up), up a gully (the flow from the fall seems to have been diverted into this) and under the power station pipe lines. Veterans recall a commando course completed in Fife. On to Staffin, where you don't need a hammer to extract

souvenirs—the belemnites can be pulled from their beds like tent pegs from the soil. Access to the belemnite beds locating a fault which repeats the sequence is treacherous. A young pioneer is sent over to find ‘fossilised carrots’. ‘They’re in the larder at Portree’ is the riposte. ‘No, those are hydrolysed, not fossilised’. The burnished ammonites of Staffin beggar description—you can’t remove them intact either. At Duntulm the very enthusiastic look at the picrite-dolerite sill, altered shale and what remains of the Lower Ostrea Beds as the tide encroaches, and more algal mats. The rest go to a ‘folk’ museum and tearoom.

Tuesday: The hard party get off at Sligachan in driving rain to climb Marsco. The rest proceed to the Broadford beds and tearooms. As ‘hard’ party proceeds, discrepancies between the G.A. Guide and the terrain become evident. The ‘Thick, porphyritic alkali olivine-dolerite dykes’ in the stream take some finding. We do see a holly tree with thick clusters of red berries, and its mate. The back-pack bibliographic services of a committed member of the party don’t help much to locate what we should see—they are simply a blown-up version of the Guide. Lunch at the Shelter Stone in Harker’s Gully. Some of us are already too tired to look for the ‘chilled but bulbous plastic-looking contact’ between marscoite and porphyritic felsite. Those of us without problems so far find them at the Southern Porphyritic Epigranite, which is certainly ‘steep’ but not ‘sound’ as described in the Guide, as those at the back are bombarded by dislodged lumps of rock. The summit does make a good vantage point for the Western Redhills.

When we hear how the day was spent in Broadford, some of us wonder if the ‘sedate’ party is named from its common derivation with sedentary or sedimentary or both. (Libellous! Eds.)

Wednesday: By boat to Loch Coruisk very early; we share the attentions of a very hospitable dog who can’t believe there are thirty odd guests to welcome on board. There are eagles (someone says seagulls) above the Cuillins. Both parties look at the layered eucrites, and then split: the ‘sedate’ (this proves a misnomer) set off via the Bad Step back to Elgol. They will get their reward later. The ‘hard’ party play with compasses on the flank of Meall na Cuilce (where there are blobs of magnetite) and sun themselves on the layered gabbros of Druim Hain. The going in between is fairly strenuous, and there is a long search for the sheer zone on Druim Hain, before we can go down the explosion breccias and paddle in Loch na Creitheach. Track from Camasunary to Kilmarie (created as an act of service or servitude by the army—did they break the

stones for it?) is hard and long.

Thursday: A slow start. The hard party disappear into the cloud cover at Glen Brittle. The rest go to look at the Tertiary lava flows of Bracadale, and the coral sands and potteries of the Dunvegan area (one of these is shut). After some cursory observations on road cuttings and general comments on typical lava flow landforms (Macleod's Tables), we stop at Ros a' Mheallain and examine the big feldspar mugearite (scrofulous where the feldspar has weathered out) and trachyte. Samples are taken of whiskery fibrous zeolites. We share lunch with a large red hen, and go on to the 'coral sands', and lie like silkies on the strand collecting cowries and 'coral' fragments—a plan to look at living specimens in situ is thwarted by the tide. In the evening a small group pays homage at the grave of Louis Necker de Saussure, who drew the first geological map of Scotland, (we look at this by the grave), and whose Voyage en Écosse et aux Îles Hébrides is a classic of Scottish travel literature (with the geological sections tactfully set apart). Midges emerge in hosts from the trees to devour the Neckerophiles.

Friday: Raasay. We drive to the base of the sequence—Lewisian and Torridonian with the boundary where the vans are parked. A long look at what is marked on the map as volcanic breccia at Brochel; it should probably be described as a Permian flash-flood deposit. A very few (enthusiasm seems to be waning) set off to climb Dun Caan and join the rest at North Fearn. The pace is brisk, and we lunch on the summit where James Boswell breakfasted and danced a jig. The hard-rock specialist among us wonders which of the chipped edges was left by the sample he took on his last visit. In spite of mishaps, the other party synchronises its arrival with our descent rather well, and we attack the pectens of the Scalpa Sandstone with gusto. In the evening, there is a faculty party, and certificates of merit are presented to those who completed the Bad Step, including baby Emily, who has survived the week with more composure and dignity than some. Extraordinary canapés au débris are concocted from surplus food from all the houses (at least one goes out the window) and five glasses from one house end up in a coat pocket from another. Of the Firemen's Ball in Portree Community Hall which followed, the less said the better, though a very very few survived to watch sunrise from the Kilt Rock.

INFORMATION ON THE LONG EXCURSIONS

S. Ian Hogarth
Excursion Secretary

Each May since 1977 the Society has organised a full week's excursion so I thought Fellows would like details of the accommodation we used. In the following table, with the exception of Kinloch Castle, Rhum which has changed hands since our visit, the cost of accommodation at the time of each excursion is given.

Year	Location	Address	Booking	Cost
1977	Rhum	Kinloch Castle	The National Trust for Scotland 5 Charlotte Square Edinburgh EH2 4DU	On application
1978	Assynt	Elphin Outdoor Centre	Highland Regional Council, Education Department, Brora Sutherland KW9 6PC	60p per adult per day
1979	Isle of Mull	Scoor House Bunessan Isle of Mull Argyll	J. M. McKeand	Large Flats (up to 8 people) £75.60, Small flats (up to 5 people) £60.88
1980	Isle of Islay	Machrie Hotel, Machrie Isle of Islay Argyll PA 22 7AN	The Manager	Chalet (up to 6 people) £184
1981	Isle of Skye	Dunvegan Road Portree 6 Bayfield Portree 1 Douglas Row Portree	Hugh Murray Ltd. Dunvegan Road Portree Isle of Skye IV51 9HF Iain Jagger 6 Bayfield Portree Isle of Skye IV51 Robert H. Preston Chartered Surveyor Royal Bank Buildings Bank Street Portree, Isle of Skye IV51 9BY	Bungalows (up to 7 people) £69 Bungalow (up to 4 people) £60 Flat (up to 6 people) £50

All prices are per week and include V.A.T., unless otherwise stated. The terms for peak times, e.g. July, are much more expensive.

The Logistics of the 1981 Excursion to Skye

37 Fellows took part and we travelled 940 miles in 3 hired mini-buses which used 120 gallons of petrol.

The 30 Fellows who stayed in the accommodation listed above existed on the following diet:

53 Brown Loaves	1000 Tea Bags
110 kg Potatoes	24 kg Sugar
20 doz Eggs	24 lbs Butter
100 pints of Milk	30 large tins (6 lbs) of Fruit
6 Chickens	18 pkts Dried Soup
6 Steak Pies	12 tins Rice
420 rashers of Bacon	24 Table Jellies
30 each of Pork Steaks,	24 tins Custard
Gigot Chops and	18 pkts Cream
Gammon Steaks	9 Apple Pies
12 lbs Stewing Steak	6 tins Biscuits
12 lbs Mince	3 cases Apples
42 lbs Muesli	3 cases Oranges

and many other items which if all were piled on top of one another would create a new Cuillin. (Would any reader care to calculate the approximate elevation above Ordnance Datum? Eds.)

Next Year

We are going to Arran. Why not come and enjoy the geology and culinary delights!!

Full details will be given in a future Meeting Billet.

JAMES HUTTON : THE INNER MAN

(A digest of Letters! Eds.)

Jean Jones

9 Greenhill Terrace

Edinburgh

In the 'Biographical Account of the late Dr James Hutton' John Playfair described Hutton's mien and his mode of life—his intellectual features, his spare frame, his drab clothes, the even tenor of his days, and his frugality at table.¹This ascetic and unpleasing image has survived

for a couple of centuries. Recent research has dispelled any such notion, and established Hutton as a bon viveur.

Hutton and his friends were evidently fond of fish. He sent some herring to a Scots friend in London, who replied: "The herrings are just arrived ... They shall be dressed with caper sauce and I will learn the English how to live."² Greasy pork did not appeal to him: "They had me at a feast of Baal, where was roasted a sow, an honest sow roasted i' the guts, and I did eat thereof ... but I will go no more into their high places."³ Ham, however, roused his enthusiasm: "How are all friends? did you remember to enquire about the ship's master that got my hams?"⁴ He also had a weakness for black bun, for when he missed a New Year party his hostess felt bound to console him and wrote: "Mrs Cuming with compts. to Dr Hutton will take care to keep a piece of black bun to his hogmany."⁵ Another friend enquired "did you get any early cauliflowers?", showing that vegetables, too, were not beneath his notice.⁶

Even some of Hutton's geological experiments had a culinary flavour. In an attempt to justify his ideas about subterranean heat by demonstrating that fossils could survive high temperatures if sufficiently compressed, he and the chemist Joseph Black put "animal and vegetable substances" into a Papin's digester.^{6a} The digester was an early form of pressure cooker which consisted of two stout copper cylinders enclosing a glass cylinder in a steam jacket, and which could reach temperatures of 400° to 500° F. It was devised by a French scientist called Denis Papin, who was at one time assistant to Robert Boyle at the Royal Society. Papin designed it for glue-making but, good Frenchman that he was, he realised that it might also be useful for cooking. In 1681 he published a recipe book entitled A New Digester or Engine for softening Bones in which he describes how to use it for making jam, or to cook eels, breast of lamb, mackerel with gooseberry sauce, "old rabbits which are usually but a pitiful sort of meat" and a jelly made of vipers' bones. Hutton and Black would surely have tried out his recipes; in fact they probably kept the digester in the kitchen and only shifted it into the laboratory on special occasions.

The influence of French cuisine is also apparent in the well-known story from Kay's Portraits. "Dr Hutton and Dr Black, perfectly satisfied that their countrymen were acting most absurdly in not making snails an ordinary article of food, caused them to be served for dinner. Neither party felt much inclination to partake of the smoking dish; nevertheless if they looked on the snails with disgust, they retained their awe for each other; so that each, conceiving the symptoms of internal revolt peculiar to himself, began with infinite exertion to

to swallow the mess which he loathed. Dr Black at length broke the ice. "Doctor", he said "Doctor do you not think they taste a little—a very little queer?" "D - queer! d - - queer, indeed! tak them awa!" vociferated Dr Hutton, starting up from the table, and giving full vent to his feelings of abhorrence".⁷ Another dinner with the abstemious Dr Black was described by a contemporary wag as "two philosophers rioting over a boiled turnip"—a phrase which shows how successfully Hutton managed to keep a puritanical face to the world and his indulgences to himself.⁸

Playfair reported that Hutton enjoyed alcohol as little as he enjoyed food, saying "he ate sparingly and drank no wine."⁹ Hutton, however, was not averse to spirits and was happy to say "I have just muddled with brandy and water and so to bed."¹⁰ In 1788 he was one of three men appointed by the Royal Society of Edinburgh to examine "A Distillation of Ardent Spirits of Carrots", sent to them by an enterprising scientist in York. Hutton and his colleagues—drawing on their own experience—concluded that "it resembled a corn spirit in flavour, but was equal to a corn spirit of the best kind, and it was a proof spirit."¹¹

Was Hutton, then, a heavy drinker? Fortunately, though few of his papers have survived, there is just enough material left for us to calculate the extent of the problem. Of twelve extant letters, four were composed when he was far from sober. Supposing that he devoted two hours a week to letter writing, then, by simple proportion, he was inebriated not less than $\frac{2}{1} \times \frac{4}{12}$ hours = 40 mins a week; or $\frac{.67}{6 \times 24} \times \frac{24}{8} \times 100 = 1.40\%$ of his waking hours every year, excluding Sundays.

Finally—Hutton's palate was such a dominant influence in his life that, even when other appetites invaded his attention, he described them in gastronomic metaphor. On a lonely and exhausting geological tour he exclaimed: "I begin to be tired of speaking to nothing but stones and long for a fresh piece of mortality to make sauce to them".¹² This *cri de coeur* has lost none of its poignancy in the last two hundred years, and is our best assurance that Hutton was no stranger to human frailty.

Acknowledgement

Sir John Clerk kindly gave me permission to quote from his family papers (and tidied up my arithmetic).

References

- 1 J. Playfair in *Trans. R. Soc. Edin.* 5, pt.iii, 93 (1803).
- 2 Mr Shairp to Hutton, 1777; Fitzwilliam Museum, Cambridge, Perceval Bequest, J. 10.
- 3 Hutton to George Clerk Maxwell, 1755; Scottish Record Office, GD 18/5749/2.
- 4 Hutton to John Bell, 1755; S.R.O. GD 18/5749/2.
- 5 James Cuming to Joseph Black, n.d.; Edinburgh University Library Gen. 874/IV/53.
- 6 William Hall to Hutton, n.d.; British Library, Add. 36297.
- 6a Joseph Black to Henry Menish, 1792, E.U.L. Gen. 873/232.
- 7 John Kay, *Portraits* vol.i, p.57.
- 8 I have lost this reference. Can anybody help?
- 9 Playfair *op.cit.* p.93.
- 10 Hutton to Clerk Maxwell, 1774; S.R.O. GD 18/5937/1.
- 11 "History of the Society", *Trans. R. Soc. Edin.* 2, 28 (1790).
- 12 Hutton to Clerk Maxwell, 1774; S.R.O. GD 18/5937/1.

NOTES ON ANDALUSITE Al_2SiO_5 (after Hamlyn Guide)

Crystal System: Orthorhombic

Habit: Crystals prismatic and pseudo-tetragonal with a square cross-section; also massive.

S.G.: 3.1-3.2 Hardness 6.5-7.5. Cleavage: prismatic, distinct

Fracture: uneven. Colour and transparency: commonly pink or red, also grey, brown or green; transparent to nearly opaque. Lustre: vitreous.

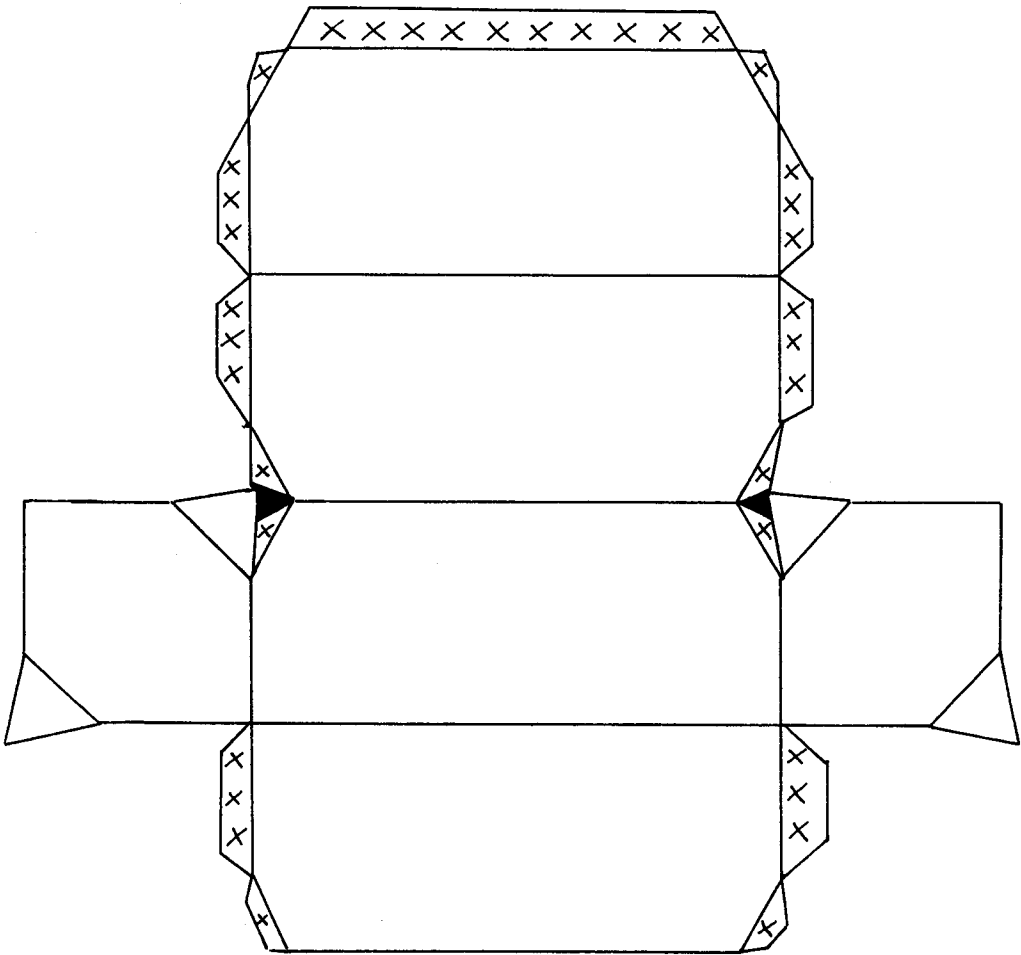
Occurrence: typically in thermally metamorphosed pelitic rocks, and in pelites that have been regionally metamorphosed under low pressure conditions, occurs in some pegmatites.

MODEL ANDALUSITE CRYSTALS


by Margaret W. Sutherland,
Institute of Geological Sciences, Edinburgh.


Here is a pattern from which you can construct your own model Andalusite crystals. Simply transfer the pattern onto thin card, cut around the outer edges, and score the folds.

ANDALUSITE



Key:

Tabs: 

Remove: 

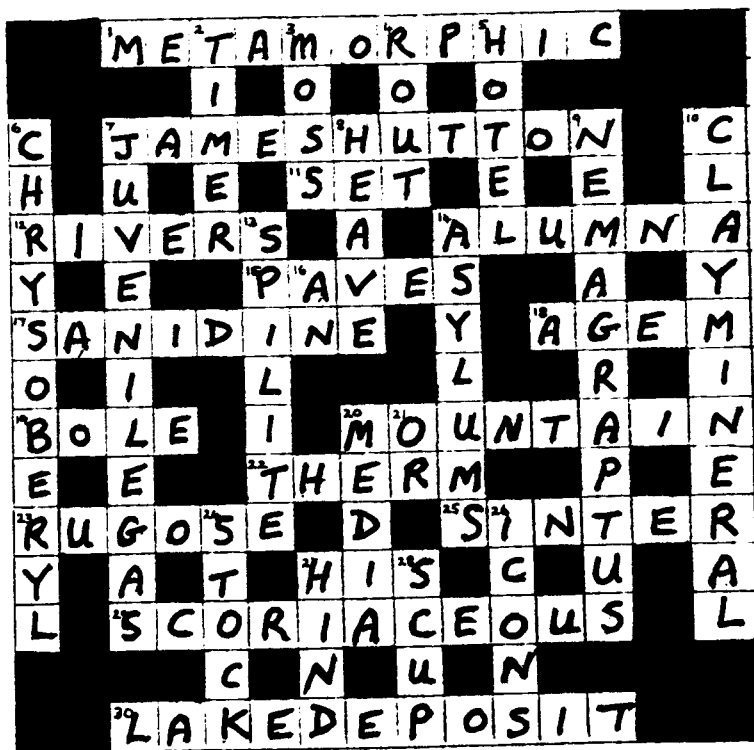
CROSSWORD SOLUTION

The Crossword Competition of the 9th Edition of Edinburgh Geologist was won by Mrs M. C. Hogarth. The correct solution is printed below.

Owing to one of the Editor's bad Latin (he just scraped through 'O' Level) the answer to 14 Across, 'Alumna' is technically incorrect. For those who were put off their stride in solving the puzzle, our apologies. The following may help to clarify:

Alumen, Alumina: Neuter, 3rd Declension, oxide of aluminium.
 Alumnus, Alumni: Masculine, 2nd Declension, pupil.

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4) Jura	.20
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