PROCEEDINGS OF

THE GEOLOGICAL SOCIETY

OF GLASGOW

Hutton's Garden Edinburgh *(Dr. Colin McFadyen)*

Session 153 **2010-2011**

SESSION 153 (2010-2011)

SESSION 153 (2010-2011)

Members of Council

President	Miss Margaret Donnelly
Vice President	Dr Alan Owen
	Vacancy
	Vacancy
Honorary Secretary	Dr Iain Allison
Treasurer	Mr Michael J. Pell
Membership Secretary	Dr Robin A. Painter
Minutes Secretary	Mrs Margaret L. Greene
Meetings Secretary	Dr J.M. Morrison
Publications	Miss Muriel Alexander
Librarian	Dr Chris J. Burton
Asst. Librarian & Hon Archivist	Mrs Seonaid Leishman
Proceedings Editor	Mrs .Mina Cummings
Publicity	Dr Neil Clark (web)
	Dr R. A. Painter (meetings etc.)
Excursion Secretaries	Mr Jim Martin (Day)
	Ms Katerina Braun (Residential)
Rockwatch Representative	Ms Katerina Braun
Junior Members' rep	Mr Robert Jamieson
Editors of S.J.G.	Dr Colin J.R. Braithwaite
	Dr. Brian Bell
Ordinary Members	Mrs Barbara Balfour
	MS Emma Fairley
	Mr R. McNicol
	Dr. W Gray

President's report

Membership of the Society has remained steady at around 390. The eight evening Meetings of the Society were all well attended, with the exception of the December meeting when snow and ice forced the postponement of our AGM to January. The six Saturday field trips, and the two residential excursions to Arran and to Ardnamurchan were also well supported.

Our newly designed and expanded website was launched in February, providing comprehensive information about the Society. Many thanks are due to all the hard work of the website subcommittee and of the various Members of Council who spent a great deal of time and effort on this project.

The Strathclyde Geoconservation Group (SGG), a subcommittee of the Society's Council, has continued to be very active in promoting geology in the wider community. It has been investigating a number of new sites as well as continuing progress on others. One outcome of this work was the reactivation of the Fossil Grove Trust with seven Trustees who, together with members of the Fossil Grove Steering Group have met on several occasions throughout the year to discuss ways of improving the site. The displays and lighting within the building have been upgraded and a firm of architects appointed by Glasgow City Council to carry out a feasibility study. This led to a workshop held in August to discuss the various options with interested parties. Alternative designs considered were the improvement of the existing building with minimal cost, the upgrade/extension of the existing building or the design of a new building.

The two other subcommittees, Argyll and the Islands Geodiversity Group and Geodiversity Dumfries and Galloway, are also making progress and have investigated a selection of new sites. A representative of each attends one Council Meeting per year (March) and all three provide a report for each Council Meeting.

This year our Society joined with a number of other interested groups including Geoparks, Museums, SNH, BGS, Geoconservation Groups and other Geological Societies in setting up the Scottish Geodiversity Forum with the aim of promoting Scotland's Geodiversity and its value in education, community involvement and health, tourism and the wider economy. Agreement was reached in principle at a meeting in November and the Constitution was adopted at a meeting in March at which there were a selection of presentations. During the course of the year the Forum has been supporting a Petition to the Scottish Parliament Petitions Committee that Scotland's Geodiversity be protected in statute. It is hoped that continuing dialogue with the Scottish Government will take this matter forward.

A 'Volcano Fun Day' was held in Holyrood Park, Edinburgh in October, and a 'Fossil Family Day' at Fossil Grove, Glasgow in April. Both events were organised by our Youth Outreach Officer, assisted by members of the Society. This year the Society allocated grants to the Scottish Diversity Forum and to a BSES expedition to the Himalayas.

Two new guides – to the geology of Southern Kintyre and to the geology of the Island of Gigha – are currently being prepared for publication by the Society.

Margaret Donnelly

.....

Membership Secretary's Report

	At end Session 153 30 Sep 2011	At end Session 152 30-Sep-2010
Honorary Members	5	5
Ordinary Members	287	288
Associate Members	72	71
Junior Members	20	21
TOTAL Members	**384**	**385**
New Members	30	26
Memberships Closed	31	31

Overall membership numbers in Session 153 remained virtually static from the previous Session.nNew members joining rate was almost in balance with the rate of memberships being closed.

Of concern is the number of members whose subscription is overdue has roughly doubled from 22 to 52 over the Session 153. If these subscriptions are not received at the start of Session 154 these memberships will be deemed closed in compliance with the Society's rules, resulting in a net loss of membership of 30 over Session 154.

We will continue with our annual practice of reminding by letter those members whose subscriptions are overdue. (The memberships closed category rolls up the numbers resigning and those terminated due to non payment of subscriptions.)

Robin A. Painter

.....

Library report

The Society's Library has thankfully enjoyed a year of 'business as usual', devoid of any large-scale reorganisation, but with a large and very welcome influx of books by donation.

Library use

Library use has continued at normal levels, with a mix of borrowing – ranging from introductory to specialist works, together with the ever-popular field guides. New acquisitions have included a very wide range of up-to-date field guides to many parts of the world, so members should consider the library as their first port of call when they are contemplating excursions at home or abroad. Enquiries to the librarian have risen over the year, and he is always ready to provide information and advice on books to consult.

Out of date books
The rate of acquisition of books has been so great over the past twelve months that a number of out of date books will of necessity have to be removed from the library to make room. These are books which are not of historical interest, but which have been overtaken by new knowledge. Discarded books will be offered to members and thereafter to the Oxfam bookshop.

New acquisitions
Thanks to the generosity of a number of donors we have acquired:
277 books and 5 stratigraphical atlases (Mesozoic/Cenozoic North Sea)
2 geophysical atlases (seismic stratigraphy)
23 maps and charts
The main donors are: Mrs C. Leslie (collection of the late Charles Leslie), Dr W. E. Tremlett, Mrs C. Oakman (collection of the late Colin Oakman). We are very grateful for these key donations.

Map acquisitions
The steady flow of BGS maps, which are given free to the Society, has continued and we have received the usual wide range, including two detailed maps of the rea around the Dounreay nuclear facility – perhaps not the place for a Society excursion!
The maps are:
Scotland
1:50 000 Sheet 8E Loch Doon Superficial Deposits and Simplified Bedrock
1:50 000 Sheet 87W Ellon Solid and Drift geology
1:50 000 Sheet 93E Evanton Bedrock and Superficial Deposits
1:50 000 Sheet 101E Ullapool Bedrock
1:25 000 Dounreay Superficial Deposits
1:25 000 Dounreay Bedrock
England
1:50 000 Sheet 85 Manchester Bedrock
1:50 000 Sheet 247 Swansea Bedrock and Superficial Deposits
1:50 000 Sheet 247 Swansea Bedrock
1:50 000 Sheet 265 Bath Bedrock and Superficial Deposits
The Society's map collection is housed in room 516 of the Gregory Building and is accessible via the Librarian.

Chris J. Burton, Librarian and **Seonaid Leishman**, Assistant Librarian.

.....

Scottish Journal of Geology -Editors' report

The Scottish Journal of Geology continues to publish papers focused on all aspects of the geology and geomorphology of Scotland and adjacent areas. The Scottish Journal of Geology (SJG) is a joint publication of the Geological Society of Glasgow and the Edinburgh Geological Society.

Activity

Two full issues were published during the year. Volume 47 comprised 15 peer-reviewed papers and 6 book reviews. There is the typical eclectic mix of Moine, Dalradian, Lower Palaeozoic and Carboniferous offerings, with two on geomorphology, two on palaeontological topics and two relating to the historical study of geology.

The Journal is now comfortably embedded in the Geological Society Publishing House (GSPH) and in the Lyell Collection. The principle effect of this has been to increase the publicity received by the Journal. Our name appears on all of the widely circulated GSPH leaflets and our exposure istherefore far in excess of anything that we could have managed independently. Of particular importance is the link between the Lyell Collection and GSW (Geoscience World), the leading North American online data collection. Our five-year citation index suggests shows a slight increase that even at this early stage may be attributed to this. Our move to electronic publishing in the Lyell Collection has rapidly borne fruit with a satisfyingly large number of 'hits' and 'downloads ' in the first year. For this year we so far only have data up to September but these indicate download totals of 74,912 abstracts and 10,193 full texts and PDFs that should also have an effect. What they mean is that articles published in the Journal will have been found by a far larger number of 'search engines' and authors will therefore have enjoyed a much wider readership.

In the last year we have also been working to prepare copies of our predecessors, the Transactions of the Edinburgh and Glasgow Societies for online publication. Articles from volume 1 in each of these to the birth of the SJG in 1965 will now also be fully accessible electronically as part of the Lyell Collection and have been advertised in GSPH publicity material for some months.

With all these positive features the Journal still struggles at times to find sufficient copy of the required standard.

Changes to Editorial Board

Alan Stevenson (BGS) has replaced Ken Hitchen (BGS) on the Scientific Editorial Board, with a similar area of scientific responsibility. Robert Morley has taken on the role of Treasurer to the SJG, replacing David Gould, and Alistair McGowan has taken on the duties of Secretary. The Board and

the two societies are grateful for their services to the Journal, from Ken as editor and secretary and David Gould as Treasurer.

Dr. Alistair McGowan, Secretary to the Editorial Board,
Dr. Colin Braithwaite

……..

Publications report

The Bookshop was, as always, a popular attraction on Society lecture nights and sales this session have been good. Visits to Adult Education classes have also boosted our income and the year hasbeen financially successful.

We held a selection of books on geological topics to suit a wide range of interests, from those wishing light reading to those considering more in-depth pursuits. Several new books have been published recently pertaining to the geology of Scotland which we have now added to our stock. These included excursion guides to the Moine (for which the Society is one of the publishers), the Dalradian and most recently the North West Highlands. Geological maps were also available and may be ordered on request.

This session saw the introduction of the new web site which contains a Publications page. We have now listed a selection of titles available from our stock which we hope will encourage sales from a wide range of readers both from within and outwith our membership. We continue to receive requests for the Madeira guide from prospective visitors to the island.
Once again my grateful thanks goes to all those who have helped me throughout the year especially with ordering, selling and advertising the books.

Muriel Alexander

……..

Report on the Geological Society of Glasgow's website http://www.geologyglasgow.org.uk/ 2011

Officers Dr. Neil DL Clark, Jim Martin

Map of towns in the UK where visitors to the website originated in 2011

The website is up and running and has been now for nearly a year. Since January, the numbers of visits to the website has been 5,059 (January 22nd 2011 – November 1st 2011). During
the same period in the previous year we had 1,164 visits and in2009 we had 1,100 visits. This is a substantial increase in traffic to our website which we hope to be able to maintain.
The year did not go without its problems as some pages of the website were unavailable for some time due to server problems.
Overall the website was successful in informing visitors to the site on the activities of the GSG.
The vast majority of the visits came from Glasgow (1,693 visits) and Edinburgh (558 visits), with London coming a distant third (369 visits).
People from over 91 countries visited our site viewing on average over 4 pages per
visit including one person from Stip, Macedonia who viewed 4 pages on their visit. It is comforting that over 800 people have visited the site over 10 times and that there are 38 of us who have visited the site more than 100 times in the last 10 months.

We are encouraged by the figures, and despite a few teething problems, the website has been able to run smoothly over the last year since being set up by RedPaint. Thanks to all the committee members who seem to have taken to editing the web-content relating to their respective offices, to Andrew Watson of RedPaint and the website subcommittee (especially Jim Martin and Seonaid Leishman), the website is running like clockwork.

Comments and suggestions for the web pages are always welcome, but the content is reliant on information being provided by members.

……..

STRATHCLYDE Geoconservation Group

Strathclyde Geoconservation have been involved in a number of strands in the geodiversity field over the past year; site assessments, interpretation, activities for the public, local planning authorities and the Scottish Government.

On the local sites front, we have visited Trearne Quarry with Chris Burton; the managers of the quarry have undertaken to keep part of it free as an interpretative area when the quarrying is finished.

We visited Havoc Hole, Dumbarton with a view to writing a brief description for the website and Dumbarton Rock to trial the leaflet which is being prepared. Later in the same area there was a trip to Lang Craigs to look at the ancient landslip below the Craigs. The land around the Craigs is now owned by the Woodlands Trust and they will be including information on the local geology in their interpretation of the area. In April two of our number went to Kelburn Country Park in response to a request to assess the rocks there which had been exposed by floods over the winter. This resulted in articles and photographs of the local geology appearing in national press and an interview on BBC radio.

In interpretation we are well on the way to producing a leaflet on the geology of Dunbarton Rock and the beach below it, and in the summer Paisley Museum held a display in Gleniffer Braes which had a significant geological input thanks to the help of Dr Simon Cuthbert. The group is still involved in the ongoing work of the Gleniffer Braes Green Network Heritage Action Team. In our dealings with local planning authorities we have been most successful in East

Dunbartonshire; the East Dunbartonshire Local Plan 2, adopted 31 October 2011, lists the 34 Local Geodiversity Sites suggested by Strathclyde Geoconservation and audited by BGS. Policies on the

Natural Environment give some protection to these sites and support their promotion in which SGG will be involved. The Group are also working with the newly formed East Dunbartonshire Tourism

Partnership and coordinated the geodiversity input to the Campsie Fells Strategic Review, still to be published.

Members of the group have also met with personnel from planning department in North Ayrshire, Glasgow and West Dunbartonshire. The next Local Development Plan for Glasgow is out for consultation; geodiversity is included largely due to our approaches over the past couple of years and we will have positive comments to make in regards to this section of the policy document.

Through our part in the Fossil Grove steering group we were involved in the Fossil Fun Day in April which celebrated this year's opening of the Fossil Grove. Members were on hand to explain geology

and help with experiments on that day, and also at the Volcano Day in Edinburgh which was held

recently. As result of our actions the Fossil Grove Trust is now in consultation with a group of architects to design a new building for the Fossil Grove.
On the national front our involvement with the Geodiversity petition has come to an end, as sadly, that petition is now closed with no statutory duty of care for geodiversity; but we have raised the profile to such an extent that through the Scottish Geodiversity Forum, we are now in an ongoing conversation with members of the Scottish Government, BGS and SNH in order to produce a Scottish Geodiversity Charter; a voluntary document which we hope many local authorities and other interested bodies will sign up to.
The Scottish Geodiversity Forum held a one day conference at Battleby, Perth at which the charter and many other issues pertaining to Scottish geodiversity will be discussed, participants came from a wide field of interests so the geodiversity/ geoconservation message is spreading ! To find out more about the Forum, or become a member, go to www.scottishgeodiversityforum.org .
Anyone interested in finding out more about Strathclyde Geoconservation Group, please come along to one of our meetings; you can speak to a member of the group at a lecture night or contact us on
strathgeocon@gmail.com . Information on the group can also be found on the Society's web site.

Margaret Greene, Chair

……

Geodiversity: Argyll & the Islands

The year can be summarised from the reports sent to GSG Council meetings through the year.

January 2011

The sub-committee is studying the GC-UK documentation and investigating access to the GeoConservation database, but this requires Microsoft Access, not usually available on the version of MSOffice usually found on home computers, GAI will need to resolve this problem as the next step.

April 2011

Still awaiting a response from the Planning department of Argyll & Bute Council to our friendly informal approach, and we feel it is unlikely there will be one.

Sept 2011

Our U3A group has run two field excursions to the NW Highlands, with the help of Donald Fisher of the NW Highlands Geopark. We have also been grateful to Jim Blair of Lochaber Geopark running a field trip on Kerrera to which Oban U3A members were invited. In return he joined us for a field excursion to Glensanda Superquarry. To round off the field season, a repeat of last year's trip to S Kintyre is to take place at the end of this week.
On the geosites front, the group has made a formal response to the Argyll and Bute Council Main Issues Report that will lead to the next Local Plan. In this response, we have made clear our desire to have meaningful contact with the Council in the recording of geosites. An earlier letter to the Council Planning Department was never answered, and there has so far been no response to this formal submission. By coincidence, the Bute columnar sandstone site was brought up again by Glyn Collis of Bute Museum, who asked

what progress we were making. In the light of my response to him, he took it up with his Museum trust chairman, an ABC councillor, who then took it up with the Argyll MSP, Mike Russell, also a senior SG minister. As a result a meeting with Mike Russell was set up for late September at which the issue of geodiversity and its official acknowledgement will be discussed, mainly in the context of the Bute site, though this discussion might have more than local significance. Another potential geosite on the Isle of Luing is the disused slate quarries. A meeting occurred last week with Historic Scotland, from which emerged ideas for potential small-scale slate quarrying, mainly for heritage use, and also an appreciation of the historic importance of the site, including its geological value. Matters are unlikely to move fast, but there is immense geodiversity potential in the site.

October 2011

We can report that the meeting with Mike Russell was held as planned, attended by Glyn Collis of Bute Museum as well, and MR promised to send a letter to A&BC if we gave him some points. A specimen letter was drafted, and emailed to his PA, but nothing heard since then. MR did say he thought the best way forward was to identify a few 'star' sites and promote these to the Council, and we are moving to take that approach. This would include the Bute columnar sandstone site; others might be Carsaig Bay on Mull, The Galdrons (aka Galdrings, etc.) on the Mull of Kintyre and the disused Cullipool North slate quarry on Luing. This last has also been the subject of a visit by Historic Scotland to discuss with the island's Community Trust the possibility of small-scale slate working being resumed; the response from HS was very encouraging, and we await written feedback, but it would be a complicated process to put it into effect.

AGM 28 October 2011

At the AGM, the existing committee and officers were re-elected for the coming year. The report above was presented as the Annual Report and accepted by the AGM.

A further meeting is planned in early December to consider the assessment and recording of the ‘Dog Stone’ former sea stack on the raised beach alongside Dunollie Castle, a geosite with important cultural and historical connections.

Alastair Fleming (Chairman) and **Zoë Fleming** (Secretary)

…….

GeoD: Geo-Conservation Dumfries and Galloway

GeoD aims to establish a long-term geological presence in Dumfries & Galloway and will seek to reestablish a core membership and advertise for many more members. The secretary has not had time, due to personal matters, to devote to the group's activities this summer. However, in May she met with Nick Fraser [National Museums Scotland], Maxine Akhurst [BGS], and Andrew McMillan [ex-BGS] regarding her "Doweel Breccia Cores" project which they support. She has started applying for funding for this. She has also been given “permission to register” sites by 25 landowners as Local geodiversity Sites.

Diana Turner Secretary

……..

Proceedings Editors' reports

Regrettably, mainly due to problems with my (MD) computer, the Proceedings for Session 152 have not yet been published. (Margaret Donnelly)

For session 153, the synopses of the winter meetings are in place and I haven now received and put in place most of the day trips reports. All these reports will shortly be made available on the Society's website where, in addition to the text published in the proceedings, addtional photographs can be included.(Mina Cummings)

Margaret Donnelly and Mina Cummings

.....

TREASURER'S REPORT

Income and Expenditure Account for Year Ended 30th September 2011

(Scottish Charity Number SCOO7013)

	2009-2010		2010-2011	
Income				
1. Subscriptions				
Received by Bankers Order	3973		3977	
Received by payment to Memb Sec	2575		1625	
Deduct paid in advance this year	-40		-40	
Add received in advance last year	61		40	
Add back Moine Guide advance last year	- 68	6569	68	5670
2.Investment Income				
Dividends	457		461	
National Savings	301	758	285	746
3. Tax refund (Gift Aid)	900		850	
Under accrual on 2010 gift aid	68		87	
4. ConocoPhillips prize2011(Debtor)	133		133	
5 Publications income used for purchases	491	1592	614	
5a Publications Income			1556	
5b Moine Income(incll accrual of £76)			746	
5c Book Purchases			-1729	
5d Cost of Moine Guides from stock			- 256	922 1922
6. Saturday excursions income	904		1588	
expenditure	-882	22	-1444	144

7. Weekend excursions income	1684		5256	
Debtor	0		72	
expenditure	-1450	234	-5302	26
8. Donations (coffee collections)		298		242
9. Fossil Fun Day income			1404	
expenditure			- 1343	61
Total income		**£9473**		**£8881**

Expenditure

1. Scottish Journal of Geology	2500	0	
2. Meetings incl. speakers', expenses etc.	1210	321	
Meeting Secretary expenses	incl.	627	
Room hire session 152a/153a	966	915	
Room hire session 152b/153b	1455	1526	
3. Publication of Proceedings	346	0	
4. Billets, production incl Hon Sec's expenses	529	481	
5. Sponsorship grants	1000	300	
6. Library and Down To Earth	132	150	
7. Insurance	166	18 0	
8. ConocoPhillips prizes 2011 (accrual)	400	300	
9. RIGS	300	0	
10. Website	746	2517	
11. Affiliation Fees **Note 3**	373	340	
12 Admin costs-postage, stationery etc.			
Membership Secretary	422	500	
President and VP	222	80	
Treasurer	95	30	
Total expenditure	**£10862**		**£8267**
Profit/loss	**-£1389**		**£614**

Balance Sheet as at 30th September 2011

	Session 152 2009-2010	**Session 153 2010-2011**
Members' Funds		
Balance as at 30/09/2009	£59517	£59171
Add back Room hire accrual not invoiced	1043	1189

Surplus/deficit for the year		- 1389			614		
Revised valuation funds for investments		0			0		
Balance as at 30th September 2010			**£59171**				**£60974**
Restricted Funds	**TN George fund**		**380**				**380**
Total Funds			**£59551**				**£61354**
Represented by							
Current assets							
Cash at Bank:							
Royal Bank of Scotland Account		882			1827		
National Savings Investment Account		32193	33075		32478	34305	
Cash in hand:							
Publications Sales Officer		0			64		
Membership Secretary		0			0		
Secretary		71			90		
Meetings Secretary		0			0		
President		142	213		98	252	
National Savings Income Bond		12,000			12,000		
Current valuationof Charifund Investment		8355			8355		
Debtors - Aberdeen Gs &EGSConoco Philips		133			133		
- Gift Aid		900			850		
- w/e excursions		0			72		
- Moine sales		0	21388		76	21486	
Stock of Publications	In house	4040			4012		
	Moine Guide	2131	6171		1819	5831	
Current assets			**£60847**				**£61874**
LESS LIABILITIES							
Subscriptions paid in advance		-40			-40		
Moneys due by Society		-1189			0		
(room hire session 150b)							
Moine Guides paid in advance GSG income		-68			0		
Conoco Phillips Prizes 2011		0			300		
Insueance		0	-1297		-180	-520	
Net Assets			**£59551**				**£61354**

Signed as approved by the Trustees: …….
President M. Donnelly (Ms)

Signed by the Independent Examiners …….
E. Diamond (Mrs)

Notes to the Financial Statements
For the Year Ended 30th September 2011

Accounting policies

Accounting convention

The financial statements have been prepared under the historical cost convention, and in accordance with applicable accounting standards. The accounts are also set out to comply with guidance from OSCR.

The principal accounting policies adopted in the preparation of the financial statements are as follows:-

All income from membership subscriptions, excursions, publications, bank interest and donations is accounted for on an accruals basis.

Resources expended are accounted for on an accruals basis and are recognised when there is a legal or constructive obligation to pay for expenditure.

All costs have been directly attributable to one of the functional categories of resources defined in the Statement of Financial Activities.

Expenditure on equipment is charged to Revenue in the year of purchase.

Notes on entries

1. No drawdown on the National Savings account was made this year.
2. Application has been made to the Inland Revenue for Gift Aid repayment. The accrual of £850 quotes is our assessment of the payment expected.
3. Affiliation fees are payable to the Geologists' Association, The Paleontological Association and The Paleontographical Society.
4. The Stock Market valuation has remained sensibly constant this year but the value of investments is slightly lower than in 2010.The Balance Sheet value of £8355 is still a cautious assessment.
5. The Moine Guide publishing costs were shared, 50%, 25% and 25% respectively between the National Museums of Scotland, The Edinburgh Geological Society and The Geological Society of Glasgow. Income from the sales is also shared on this basis. Entries in the GSG accounts are calculated as follows

			Total	NMS	EGS	GSoG
1	opening stock	01/10/2010	£8524	£4262	£2131	£2131
2	sold		895	648	170	77
3	closing stock	30/09/2011	7629	3614	1961	2054
4	adjust stock share at 30/09/2011		7629	3815	1907	1907
			100%	50%	25%`	25%
5	GSoG sold session 153		145	68	34	43
6	adjusted stock share		7484	3846	1819	1819

7 Stock Value taken to balance sheet £1819
Details of NMS and EGS sales in session 153 not yet received
And will be included in Session 154 accounts

8 The annual account summaries for the three sub-committees of the Society, "Strathclyde Geoconservation Group", "Geodiversity Argyll and the Islands" and "Geoconservation Dumfries and Galloway" have been added to the accounts this year.

M.Pell

Meetings Secretary's Report

The session opened with Brian Bluck presenting some interesting ideas on the Old Red Sandstone and its relationship to the Highland Boundary fault. Another of our local members, Brett Collins gave the November talk discussing the use of shallow geophysics in ground investigation. On the evening of the AGM, two short talks were presented by Alan Owen, standing in for Clare Torney, on the eyes of trilobites and Fiona Meade on Tertiary magmas on Arran in the Drumadoon Sill and elsewhere.

January 2011 brought Dougal Jerram from Durham on the topical subject of the Iceland volcanoes and some consequences of their eruptions. In February Kathryn Goodenough of BGS Edinburgh transported us to an exotic locale, namely Madagascar and told us something of its geology and her experiences while working there. Following the indisposition of Dick Aldridge, Paul Smith from Birmingham very kindly stepped in for the March talk and described the Cambro-Ordovician of North Greenland. The last talk of the session was delivered in April by Hugh Sinclair from Edinburgh University when he considered the effects of climate and erosion on mountain building.

Members' Night closed the season with the usual interesting and varied program of talks and demonstrations, including Margaret Greene telling us about the new Scottish Geodiversity Forum and the activities of Strathclyde Geoconservation Group.

Jim M. Morrison

……..

LECTURES

October

Thursday 14th October 2010

Professor Brian Bluck
of the University of Glasgow
gave a talk on
The Old Red Sandstone in relation to the Highland Boundary Fault

The Old Red Sandstone rocks of the Midland Valley have been considered to have formed as the molasse derived from the rising Dalradian block but age determinations of both the Dalradian and Old Red Sandstone has ruled this out. This has (left)us with two problems: where has all the >1.2 million

cubic kilometres of sediment derived from the Dalradian uplift gone to, and where did the thick and coarse sediments of the Old Red Sandstone come from?

Rocks exposed at Balmaha shed light on the source of the Old Red Sandstone. Resting unconformably on the Highland Border Complex, these conglomerates were derived from the SE and were deposited in an alluvial fan which extended further NW by some distance. However, as the succession is traced to the NE, along the trace of the Highland Boundary Fault, four conglomerates similar in disposition to the one at Balmaha are cut out by the fault, giving a sequence which is c. 4 km thick. When all these conglomerates are projected to their original position, they extend some 13 km to the NW, either over Highland Border Complex or Dalradian rocks.

The Lorne Plateau lava sequence, older than 425 Ma, rests on an eroded surface of Dalradian rocks and would have extended further to the south. By comparison with the rate of erosion of lava escarpments elsewhere they could easily have extended well into the Midland Valley, leaving the Dalradian surface a flat erosion surface at that time. It was upon this surface or the Highland Border Complex that the Old Red Sandstone at Balmaha rested. The source and sediments at Balmaha were later submerged by a sandstone cover which was deposited by an exceptionally large river which flowed to the NW and possibly cut into the receding escarpment of the Lorne lavas.

.....

November
Thursday 11th November 2010

Mr Brett Collins
TerraDat UK Ltd Glasgow
talked on
An Introduction to Shallow Geophysics for Engineering and Environmental Ground

This talk aims at delivering a broad introduction to some of the techniques TerraDat apply in the field, together with Scottish case studies to illustrate their application. We work at all scales ranging from broad regional studies (geothermal energy, gravity mapping, mineral exploration, geological modelling) through major engineering projects (pipeline routes, power station installations, shallow hydrocarbon exploration) down to local site investigations (contaminated land, unexploded ordnance, geotechnical studies).

Our work is carried out using non-invasive methods with the latest equipment to produce the highest quality solutions. TerraDat is a leader

in state-of-the-art Geophysical Site Investigation and Geological Mapping.

.....

December
Thursday 9th December2010

ANNUAL GENERAL MEETING

The AGM had to be postponed until January as the .meeting was inquorate. Members were prevented from attending because of extreme weather conditions. Ms Torney was also unable to attend the meeting and her talk was presented by Dr A. Owen.

Dr A. Owen on behalf of Ms Clare Torney
Peering into the schizochroal eyes of trilobites: new techniques for understanding natural calcite lenses

The compound eyes of trilobites represent one of the earliest fossilised visual systems. The schizochroal eyes of the Ordovician to Devonian phacopine trilobites have been the subject of study for over 120 years and, with their large biconvex calcite lenses, are unlike any eye in the animal kingdom today. Until recently, study of the internal structures of these lenses has largely been limited to light microscopy and relatively simple electron microscope imaging. However, recent advances in technology now provide us with the means of looking at these intriguing lenses in much greater detail to determine their original structure and composition on a sub-millimetre scale.

....

Dr Fiona Meade

Plumbing the depths of Arran: Tracing a magma's path through the Scottish crust

The Isle of Arran was the site of intense volcanic activity 61-57 million years ago. Today we can see the results of this volcanism in the form of the Northern Granite, the Central Complex and Drumadoon Sill. The mineralogy and chemistry of these rocks tell us important information about the magma's journey from the mantle through the thick Scottish crust; including how far it has travelled, and where it has stopped along the way.

.....

January
Thursday 13th January2011
AGM

At the first indoor meeting of the New Year

Dr Dougal Jerram
Durham University
Addressed the Society on
The Billion Dollar Volcano:
Iceland, volcanic rocks and our future?

Volcanic margins form the main focus of the presentation where ancient volcanic activity from the Iceland plume may hold the key to some new discoveries in possibly the final frontier of the UK petroleum industry.

.....

February

Wednesday 2nd February 2011

There were two meetings during February. The first was the

Joint Meeting with Edinburgh Geological Society
Professor Iain Stewart
University of Plymouth
SCOTLAND ROCKS.

The joint meeting this year was hosted by the Edinburgh Geological Society. It was their James Wright Memorial Lecture.
Following up his BBC television series 'Men of Rock' .geologist and University of Strathclyde graduate Professor Iain Stewart explored how many of the fundamental ideas about how our planet works were inspired by the Landscape and rocks of Scotland.
This lecture was held in the David Hume tower in George Square.2011 is the tercentenary of David Hume's birth.

.....

Thursday 10thFebruary2011
The meeting was addressed by

Dr Kathryn Goodenough,
BGS Edinburgh
on
Madagascar – a geological jigsaw

The number of unusual species in Madagascar stems from its isolation since it split from India 90 million years ago. But Madagascar once lay in the heart of the supercontinent of Gondwana. It resembles a geological jigsaw, made up of

several pieces of Precambrian continent that were brought together as Gondwana formed at the end of the Precambrian and into the Cambrian period.

March meeting

Thursday 10thMarch2011

This , the sixth indoor meeting of the session was addressed by

Professor Paul Smith
University of Birmingham
On
A tropical paradise in polar climes - the Cambro–Ordovician of the Scotland–Greenland sector of Laurentia.

During Cambrian to Ordovician time, from around 540-445 million years ago, the continent of Laurentia (ancient North America) straddled the equator and was isolated from other major continental blocks. This was a time when Lyell's aphorism that ' the present is the key to the past' begins to break down-the continental surface had been planed by prolonged erosion to billiard table smoothness , and there was no vegetation to bind the sediment on land, creating non-uniformitarian sediment sytems.TheCambrian revolution of animal life is represented by the Sirius Passetlagerstättte of North Greenland and provides a window into the evolution of early marine ecosystems. Thereafter, limestone deposition became dominant and the Great American Carbonate Bank stretched unbroken from North Greenland to New Mexico , covering most of the continental interior during periods of sea level highstands. Reef structures are present , but are dominated by microbial rather than animal framework builders . This environment became the engine room of animal diversification and the origin of modern marine ecosystems.

.....

April meeting

Thursday 14thApril 2011

Dr. Hugh Sinclair
The University of Edinburgh
talked on

Can long term change in climate affect the growth of mountain ranges?

For the last two decades one of the great challenges in understanding the growth of mountain ranges (orogenisis), has been to determine the impact of long term climate change. It has been proposed that the transition into a cool world dominated by icecaps since around 2.7 million years ago has caused global accelerations in th erosion if mountain landscapes .The proposed result is topographic rejuvenation of inactive mountain

ranges and accelerated sediment flux to rivers and coastlines. If this were true it would undermine notions of the present being the key to the past and would suggest we are living amongst anomalous and transient landscapes relative to most of earth history.

May meeting

Thursday 12th May 2011

MEMBERS' NIGHT

On the final indoor meeting of the session we had an excellent mix of talks beginning with Tim Hunter and MerielYoungon their respective experiences on a BSES expedition to Svalbard last summer. Their joint talk highlighted the dangers as well as the wonderful opportunities for study experienced on this trip.
Jim Morrison gave us a talk on An Garradh illustrated with photographs from many viewpoints from both sea and land.
Finally Margaret Greene brought us up to date with the formation of the new Scottish Geodiversity Forum and the activities of the Strathclyde Geoconservation Group.
Displays

There was the usual wide range of displays of rocks, fossils and photographs including:
Margaret Donnelly; photos from excursions
Robert McNicol: geological sketches from his field notebook from Poland, Northern Ireland, north Yorkshire and various Scottish localities
Robert Jamieson and Emma Fairley: display of rocks and maps from the Earth Science 4th year excursion to Spain
Bill Gray: Dob's Linn and Greater Cumbrae
SGG: Clochodrick Stone
Chris Burton: donated books, free to good homes.

EXCURSIONS SECRETARYS' REPORTS

Day

This year we had six well attended Saturday excursions and hosted the annual joint excursion with the Edinburgh society.
The excursions were:

30th April Great Cumbrae	Dr. Mike Keen
14th May Ballachulish	Prof. Ben Harte
11th June Edinburgh	Dr. Colin MacFadyen
25th June Portencross	Dr. Chris Burton
6th August Kingsbarnes	Dr. Colin Braithwaite
3rd September Strathblane (Joint with EGS)	Dr. Jim McDonald

This was the last of my 3 years organising the logistics associated with the day trips. Once again I would like to record my gratitude to the geologists who led us on the excursions. We are much indebted to them for sharing their knowledge and time so generously and

willingly.Also a word of thanks to Dr .Iain Allison, our retiring Hon Secretary, who has helped me throughout. Thanks to Alison Drummond and Barbra Balfour for deputising for me at Portencross. Financially the day trips made a surplus.

Finally thanks to everyone who supported the programme.

Jim Martin

……..

Residential

Two residential trips took place in 2011. Dr. Fiona Meade (University of Glasgow) kindly gave up her Easter weekend to lead a group of about 20 members to the Isle of Arran. We were lucky with the Easter weather, spending most of the weekend in pleasant sunshine. In September Dr David Brown (University of Glasgow) took a group of 20 members to Ardnamurchan. Unfortunately the weather on this excursion was wild, windy and extremely wet. Fortunately for those who attended the juicy geology and entertaining waiter Hector, made up for the unfortunate weather. [Ed.: are these adjectives in the correct places?] As this is my first year as residential excursion secretary, I have been asking members where they would like to visit over the next few years. Please feel free to contact me should you have any suggestions regarding future trip destinations.

I would like to take the opportunity to say a special thank-you to our excellent trip leaders Fiona and David, Iain Allison for sourcing our trip leaders, Michael Pell for his assistance with financial matters and to all of you who 'volunteered' to write up the residential trip entries for this year's proceedings (especially those of you who are new to this activity). Thank you to all of the members who attended this year's trips, as without you there wouldn't be any residential excursions.

I look forward to arranging more weekend geology adventures for the society in 2012.

Katerina Braun

…….

Glasgow Geological Society day excursion to Cumbrae Island
Saturday 30 April 2011
Leader:-Dr. Michael Keen
Report by:-David B. Hollis.

Cumbrae Island lies in the Firth of Clyde, opposite Largs. It contains sediments of Upper Old Red Sandstone to Lower Carboniferous age, Faults separate the fluviatile Old Red Sandstone sediments in the north and west part of the island from the Carboniferous marl and sandstone beds in the south and east of the island. Carboniferous dykes run mostly east-west, and Tertiary dykes radiate from Mull and Skye in a north-west to south-east direction. Other features of interest include stromatolite beds and raised beaches. The Isle of Cumbrae is described in detail in the guide to Geological Excursions around Glasgow and Girvan, edited by J.D. Lawson and D.S. Weedon.

About 20 members of the Society assembled at the ferry landing stage after the short sail from Largs. Our first stop was at Lion Rock, on the road from t he ferry terminal to Millport. This is a Tertiary dyke which has been revealed by marine erosion and subsequent uplift of the

land.

We passed the Marine biology station, where another exposed Tertiary dyke, the De'il's Dyke can be seen. At the north-west corner of Kaim Bay, the abrupt junction between the Carboniferous marls and the sandstone beds above led to much discussion about the sudden change in environment.

This sandstone, which is coarser than the Old Red Sandstone, is probably the result of braiding or evulsion of a fast flowing river. The upper part of the marl showed calcrete (caliche} which indicates a period of desiccation and upward migration of water through the marl beds.

Our next port of call was at the north-west tip of the island, at Eerie Port. Here, a Cumbraeite dyke, which consists of crystals of anorthite in a glassy groundmass of Labradorite lies across the road from the "Osprey" holiday apartments. This dyke is a continuation of Lion Rock. The near horizontal columnar appearance, and glassy nature of the dyke leads us to believe that the intrusion was a sill near the original land surface.

Most of the afternoon was spent on the shore south of Westbourne. The area from Westbourne south to the old telephone cable marker post is a shallow antiform. The northerly dip near Westbourne is complemented by a southerly dip near the telephone cable marker post. The shore north of Westbourne is separated by a fault. The strata there show high energy flash flood features, in which matrix supported sediments contained mostly quartz of milllimetre size to centimetre size. Above the Old Red Sandstone strata there are coarse sandstone bands. Our surmise was that these strata represent the transitional Kinesswood formation, like those across the water at Kilchattan Bay on the Isle of Bute.

South of Westbourne, the first item of interest was the stromatolite bed.

These blue algae or cyano-bacteria were able to live in an oxygen poor environment by digestion of sulphides. The same bed occurs again, at the southern end of the area studied on this visit. South of the Stromatolite beds, ripple marks and desiccation cracks reveal a shallow water, intermittently sub-aerial environment, in which calcite joint fillings are present. The landward edge of the shore there is formed by a north-south tholeiite dyke, the only one of its type on the island. Interesting features were found by several members of the party. These included vesicles, and drape structures.

Our final study feature was pointed out by our leader, Dr. Mike Keen. The tholeiite dyke comes to an abrupt end, at which place a slumped sandstone dips south at an angle of nearly 45 degrees. Much time was spent trying to interpret this interesting area,

but the conclusion was that some detailed mapping and structural analysis would be needed before an understanding could be gained.

The visit ended with a vote of thanks to our leader, followed by a well- deserved round of applause. After that, we all went to Millport for some much needed ice cream!

photos by D. Hollis

.....

Glasgow Geological Society residential excursion to Arran.
Day 1 Saturday 23rd April 2011
Leader :-Dr. Fiona Meade
Reports by:- Bob Diamond, David Mollison. Eve Gilmour

After a hearty breakfast the party set off on our circular tour of the north end of the island containing some chlorite. These rocks had originally been a mixture of muds and silts, interspersed with pebble conglomerates, possibly basin sediments with debris coming into it from time to time.

All this had been metamorphosed into gneissic rocks, which had been folded, and cut by quartz veining. Some of the veins had been enplaced when the rocks had been laid down, as they followed the folding of the beds. Our first point of call was to Imachar Point, and our first detailed look at the rocks surrounding the igneous complex. The rocks here were Cambrian/Dalradian metasediments. Other veins crossed the beds, indicating a later intrusion. All of which provided evidence that these rocks had a long, and chequered history.

On then to see more evidence of the deformation in this area, the Catecolsynform. Here we saw examples of axial planar cleavage within the rocks. We also noticed that the compression had not taken place at one time, as there was evidence of overprinting.
We also noted the presence of raised beaches, evidence of Arran's much more recent geological history.

Our next stop was at Lochranza to see the classic site of Hutton's unconformity. Here the Old Red Sandstone lies unconformably on the Dalradian. It was clear that the pebbly conglomerates, probably laid down as part of an alluvial fan, were sitting on a previous landscape. We could see the undulations of the erosion surface of the Dalradian rocks.

Next on our whistle stop tour of the north of the island, we stopped off at Glen Sannox, another classic Hutton site. Here there was a granite contact, which seemed to be following the line of the Highland Boundary Fault marking the boundary between the Highland Boundary Complex and the Dalradian.
This site provided an excellent example of how granite can intrude into weaknesses in the country rock. Not only had the surrounding rock been baked, but there was evidence of interfingering of the granite and the Dalradian. This implies that the granite must have been quite fluid when it was intruded. There was evidence of the intermeshing of crystals from the granite and the Dalradian. There were also granite dykes present.

The granite appears to have come from the mantle, because of its Strontium/Rubidium ratio signature. It is believed that the granite was derived from plume melting of the base of the Dalradian, the melt then rising up through weaknesses in the overlying rocks.

Our final port of call was Corrie. Here we saw a quite contrasting geology, the Permian sandstones. These Aeolian dune systems had evidence of fossilized lightning strikes. The quartz of the sand was fused into a glassy circular feature. Fascinating that such an ephemeral event could be recorded in the geological record.

After a long, but fascinating day we enjoyed an excellent meal together and retired to bed ready for the next day's excursions.

Arran trip Day 2 Sunday 24th April 2011

On a dull cloudy morning the group assembled at Whiting Bay. Our little fleet of cars rolled round to Kildonan where we parked on the Triassic sediments of the main postglacial shoreline. Here we were to examine an olivine rich dyke. Fiona explained to us the difference between a multiple and a complex dyke. This was a multiple dyke and lay, like the numerous dykes along the shore, in a NNW-SSE direction extruded from the Central Ring Complex. It is about 5m in width, almost vertical and had cut the Triassic sandstones. The basalt had, over a lengthy period, baked the sandstones but had not metamorphosed them. The contact is easily identified as the basalt, with iron content, has weathered to a brown colour while the sandstones are grey. The exposure to heat had formed an aureole in the sandstone extending approximately 7m. from the contact. The margin can be identified by the appearance of dessication cracks in the sandstone.

We continued on to Blackwaterfoot and walked along the shore to a formation which caused debate as to whether it was a dyke or a sill as the dip is approximately 45 degrees. Our guide explained that it was actually a sill 30m.thick and was the lower part of the Drumnadoon Sill. The sill exposed was two layers of basalt. The upper layer had a few crystals of feldspar and pyroxene. The lower layer showed many more feldspar crystals evenly distributed, this layer is closer to a rhyolite than a basalt. A theory is that the two layers came into contact, there being no cooled margins, and a few feldspar crystals of the more viscous rhyolite were able to migrate upwards during shear movements into the basalt. The basalt and the rhyolite are not genetically related so did not come from the same magma chamber. The lavas are from north of the Highland Boundary Fault and have travelled about 30 km. After lunch, taken at the sill, we climbed to the base of the 30m. high Drumnadooon sill . Here we saw the columns of porphyritic diorite. The lower levels contain xenoliths of dolerite; these tend to weather out and are best seen in fallen blocks lying on the slope. The columns sit on a thin band of tholeite which rests on Triassic sandstones. The sandstones have been baked. The group then traversed north along the path at the foot of the sill stopping at the end to examine the sandstones. Some areas of reduction were seen. We returned to the shore then diverted to the old seacliff and**, after** a short uphill struggle with the shrubbery, were shown a dinosaur print on a fallen block of Triassic strata.

The tide , fortunately , being low we walked out onto the Triassic Auchenhew Beds four hundred metres north of Creiteadh nan Sgarbh.Fiona , by studying photographs , was able to navigate us to dinosaur tracks. Although we were only able to identify a few of the trackways, a practised eye is required, these were studied with interest. There were 36 known trackways but searches on an exposure to the south have revealed several more. The 36 trackways are in a 35cm thick sandstone on four levels with two ripple laminations. The top of the unit shows dessication marks. Analysis of the footprints suggests that they are of Isochirotherium herculis and not Chirotherium barthill as previously thought. I. herculis has been found at many sites in England. In Europe and North America Isochirotherium has been recorded from Lower to Middle Triassic rocks but in Britain only in the Middle Triassic. The party next walked to King's Cave in the sandstone cliff. A gate was found to be unlocked so a closer inspection was allowed. The cave is irregular in shape and is 120ft. by 30 ft. There are carvings of archaeological interest on the walls of horses, cup and ring marks, crosses and serpents. A shower arrived to usher us back over the golf course to Blackwaterfoot.

In the evening we gathered for an excellent dinner at the Burlington Guest House where we thanked Fiona for the geology and complimented Katerina for the organisation of the dinner.

Arran trip 2011 day 3 Monday 25th April 2011

We were taken to Glen Sannox to view the remains of the Barytes mine. This mine was opened briefly in in the mid 19th Century and then again in the 1920-30's: Very dense Barytes being used as an additive in white paint and more recently in the oil drilling process. The Barytes is hosted in Old Red Sandstone but is Hydro-thermal in origin; veins of Barium Sulphate coming off the granite. We explored the opening to numerous adits and were impressed at the weight of the Barytes in the numerous spoil heaps.

Dr Fiona Meade was thanked by us all for giving us an excellent weekend's geology. She proved a very able and enthusiastic educator, in addition to impressing us with the detail of her knowledge and research on the volcanics of Arran.

.....

Glasgow Geological Society day excursion to Ballachulish and Glencoe.
Saturday 14th May.
Leader-: Ben Harte
Report by- R J Diamond
Participants 21

Our first stop was at **Rubh' AirdDaraich** on the north shore of Loch Leven, in order to look south, and get an overview of the Ballachulish Igneous Complex.
This granitic complex had been intruded into the existing metamorphosed Dalradian rocks about 400 – 425 Ma

Before examining the different outcrops along the shore we noticed two features indicating the activity of ice. Firstly there were examples of rochemoutonees which had been left by the ice. Then further along we saw evidence of stria on some of the rocks, indicating the direction of ice flow

We then went on to examine the Leven schists, and the Ballachulish slates, which are separated by the Ballachulish Slide. The Ballachulish Slide is believed to be a splay of the Great Glen fault complex, and is a thrust slide, which occurred at the same time as the folding events.

The reasons for the differences in metamorphic grade between the two formations had been the focus of an intense debate between E.B.Bailey, and Elles& Tilley, only recently resolved in favour of Bailey's original position. Details of this controversy can be found in '*The Ballachulish Igneous Complex and Aureole: a field guide by David Pattison and Ben Harte'* (Edinburgh Geological Society, 2001).

The Leven Schists are a series of metamorphosed shales containing garnets, biotite, some muscovite, and chlorite .This 'garnet grade' metamorphism is typical of the Regional Metamorphism, which indicates that the original rocks reached a temperature of c450 C and a depth of 15km. There is strong schistosity and folding, in places showing knappe like structures, due to the compressive forces that the rocks have undergone.

In contrast the Ballachulish slate had no biotite or garnets in it, indicating a lower grade of metamorphism

One final outcrop of note at this site showed a metamorphosed calcarious mud, indicative of a marine depositional environment.

Our second stop at the South end of Ballachulish Bridge we looked at the margin of the Igneous Complex.

The rocks were a microdiorite containing pyroxene, K feldspar, plagioclase feldspar and horneblende. It was very fine grained, and contained xenoliths. Details can be found in the 'Guide'

At our third stop at the pier by Holly Tree restaurant we further examined the metamorphosis around the complex. At this location there was evidence of secondary metamorphosis. The rocks had both been exposed to temperatures of c750C indicated by the presence of kentallinite (olivine, K feldspar, pyroxene hornblende and biotite mica) There was cordierite in some of the veins, indicating in situ melting and injection from the granite margin. The chlorite had been changed to cordierite and the muscovite to biotite.

There were also metamorphosed limey muds and sandstones. The different strata had various colours depending on the minerals present. Diopsite gave the rock an 'apple green' colour, epidote a yellow green colour, and Ca garnets a greeny purple colour.
Finally we visited **AlltCoirenamBeithach** to examine the unconformity of the volcanic rocks overlying the Leven Schists within the Glencoe cauldron subsidence.

There has been c1km of subsidence over the 400Ma, and this exposure is a place where the structure of the cauldron has been revealed by subsequent erosion. The lavas are either andesites, which appear as diorites, or rhyolites, which appear as granites.

By the river there is evidence for the original contact surface between the Leven Schists and the lavas.

After this strenuous but very informative day, we all returned safely to Glasgow

Photos R McLean and M Cummings

▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪▪

Glasgow Geological Society day excursion to Edinburgh11 June 2011
Leader Dr Colin MacFadyen
Report by: Marion Ballantyne **participants22**

We met at the Floral Clock in Princess Street. Ahead of us we could see the geology to be investigated. We approached the Mound where a bronze relief displayed the Geomorphology of Edinburgh Castle and the surrounding area, with strong evidence of crag and tail. Our attention was drawn to the National Gallery which held sandstone from Cragleith and Hailes Quarries, two of the many that provided the sandstones for the expansion of Edinburgh in the 19th century.

Edinburgh is built almost entirely of creamy local sandstone from Cragleith Quarry. The city was fortunate in its architects and planners, who built with vision, grace and good sense. Much of Edinburgh architecture is of classical design and the Georgian architecture of the New Town stands comparison with that of Bath.

Princess Street Gardens is a glacial hollow which was carved by glaciers. The softer sediments of Carboniferious and Tertiary which surrounded Castle Rock to a great height was also enveloped by the weight of the ice which had travelled from West to East across the Midland Valley This formed Waverley Gorge later to become a marshy lake, filled hollowed and drained to be reclaimed for Princess Street Gardens. We climbed part of the hill leading to the castle to view hummocked ground, evidence of the dumping by glacial retreat. The last retreat was 15,000 years ago; in all four glaciations had occurred.

Edinburgh old town developed round Castle Rock and down glacial crag and tail features of the Royal Mile. Evidence of ice carved striations and polished rock were viewed from a road running directly below Castle Rock, about twelve feet above ground level.
At this point we viewed a wire mesh strengthening the rock face and covering the basalt leading down from the castle. This was placed to protect rock fall which has occurred recently.

Castle Rock is now recognised as the eroded remains of a volcanic pipe which cooled as a circular vertical plug of dolerite. The magma had cut through the Ballagan Beds of sedimentary sandstone with evidence of chilled margins; this could be best viewed from 'Granny Greens Steps'. On walking further round the basaltic exposures hexagonal features could be seen tilting horizontally. An excellent view of Castle Rock with the Ballagan Bed exposures could be seen from the Grassmarket. The city fathers of earlier days planted vegetation where the basalt ended and the Ballagan Beds began which helped to prevent rocks bouncing on to the Grassmarket.

After lunch we visited Hutton's grave in GreyFriars churchyard to pay homage to 'The Founder of Modern Geology', whose observations gave him an insight into the earth's process.

We moved on to Hutton's memorial garden constructed in 2001 by Edinburgh University which marks the site of the house and garden of James Hutton [1726 – 1797] at St John's Hill. The garden contains five boulders. Two boulders from Glen Lilt with granite veins penetrating the country rock. The three other are conglomerate from Dunblane and are full of fragments of older rocks, demonstrating the continuity and cyclic nature of the geological process.

James Hutton's Theory.
The surface of the Earth is constantly being eroded and the products deposited in the sea. Hutton believed the sediments were then compressed, folded and uplifted sometimes with volcanic activity, for the cycle of erosion to resume. He also said the earth's processes of the past were similar to those acting at present, and that the slow cycle was capable of repeating itself.
The result, 'therefore of our present enquiry is that we find no vestige of a beginning – no prospect of an end.'

Heading towards Calton Hill we witnessed Fish Fossil of Orcadian type [350 - 390Ma] Middle to late Devonian within the Caithness Flagstones. The fish living in these basins were primitive, whose anatomy and evolution were studied by Hugh Miller, the Cromarty stonemason, who published the first account of the Old Red Sandstones in 1841. The paving stones are tough well bedded grey and buff flagstones used on many pavements in Edinburgh.

On reaching Calton Hill we climbed steps and on arriving near the top we viewed lower lavas and tuff which had emanated from a vent in Arthur's Seat volcano. Calton Hill is a

displaced part of Arthur's Seat. A fault lies between Arthur's Seat and Calton Hill, as Edinburgh was subject to violent earthquakes which occurred 250 Ma and these fractured the strata along major faults. This could be the cause of the displacement. We viewed the pyroclastic sequence comprising thirteen flows of well defined tuff. Lower flows are basalt and ankaramites of Dunsapie and Craiglockhart type which also occur to a lesser extent on Calton Hill.

We climbed to the top of Calton Hill which was a pleasant way to end our visit, giving a view of the Forth Estuary and the skyline of Edinburgh. The vote of thanks was given by Robin Painter on a most enjoyable sojourn through Edinburgh.

Photos Dr. C. MacFadyen

.....

Glasgow Geological Society day excursion to Portencross
Saturday 25th June 2011
Excursion leader:-Dr Chris Burton
Report by Barbara Balfour
Participants: 24

After arriving at the car park at Portencross Castle, our first area of interest was at the northern end of Ardneil Bay. Looking inland we saw, at South Cottage, the faulted junction of bright red Upper Old Red Sandstone (UORS) dipping ca. 35^0 WSW of the Seamill Sandstone Formation and to the east the dip was ca. 80^0 E. The junction is formed by the most easterly of the faults of t he Largs- Hunterson Fault Zone..

On the shore, we saw good examples of cross bedding in the sandstone. This cross bedding was created by crevasse splays when levées broke, and sand and mud flowed out. At this time the area was 20^0 south of the equator at a time just before the Carboniferous age

At Farland Head, there was an E-W trending, 10m quartz dolerite dyke of late Carboniferous age which cuts the ORS sandstones. They contain extensive caliche (cornstone) horizons suggesting that palaeosols had been developed on the floodplain within which they were deposited.

Sandy's Creek, west of Farland Head, is a narrow triangular inlet at the eastern margin of which the UORS abuts across a fault, the Sandy's Creek Mudstone Formation. At the western margin, formed by a fault formed gully where the Sandy's Creek mudstones meet the Portencross sandstone Formation, the Creek contains a series of faulted highly deformed grey shales. At the centre of the Creek is a deformed, boudinaged, carbonated basalt dyke which has been dated by sporomorphs

(fossilised spores) as being of lowest Devonian age.

As we worked our way back to Portencross Castle, we encountered the Portencross Sandstone Formation, a chocolate brown sandstone with minor conglomerate units.
The clasts in the conglomerate consist of porphyritic andesites of which there were examples of rhyolite. The stone from which the 14th century castle is built is crude rubblestone from the local ORS but with quoins made from pale sandstone with occasional vein quartz pebbles within it.

After lunch, we went north of the Castle and beyond the harbour. There the Portencross Sandstone Formation is cut by an E-W trending quartz dolerite dyke, "Jenny's Dyke". This dyke is ca. 20m thick and has been cut through to allow access to the path northwards. It is called the Throughlet.

Continuing northwards towards Hunterston, we examined cross-bedded sandstone interbedded with conglomerate units. These units, forming gravel bars, became more prominent as we approached the Hunterston fence. The gravel clasts show a wide range of lithologies including vein quartz, quartzite, sandstone, porphyritic lava and a small amount of greenschist. Looking east, on our way back to the bus, we could see the old sea-coast, a sill, overlying the ORS of the cliff's lower section. The thick sill forms the height of Goldenberry Hill.

Chris had not only supplied comprehensive sheets on the geology at Portencross but also gave us his customary clear and thorough explanation of all the formations we had seen. It had been yet another great day.

Photos B.Balfour

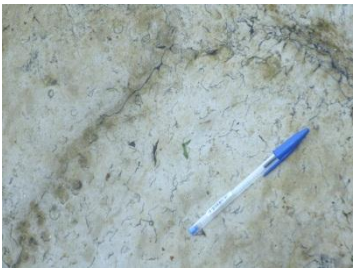
Glasgow Geological Society day excursion to KINGSBARNS: 6TH August 2011
Leader: Dr. Colin Braithwaite, University of Glasgow
Report: Eve Gilmore

A full coach party were taken toKingsbarns carpark, south of St Andrews to meet our leader. He introduced us to the sequences of the Lower Carboniferous which are exposed along the Fife shoreline south of Kingsbarns. We started working south from the fault which separates the Cambo Sands (Upper Old red Sandstone) from the Lower Carboniferous. We were impressed with the obvious succession of thin layers of limestones and sandstones and softer, more eroded shales, which could be seen dipping to

the southeast. These have all been eroded to greater and lesser extent to add to the dramatic rock shapes of the present shoreline.

Red limestones, probably a reflection of an Iron rich situation at time of deposition contained high densities of bi-valves.

The resulting rocks were dramatic enough for a few to be pocketed by the 'collectors' of the group.
However, we all could admire the cross bedding and the very obvious animal burrow tracks which feature in the structure of these beds.



We also found carbonised parts of various sized ancient trees, thin coal layers and diffusion cracks within a number of the beds.

A highlight was Muriel's stigmaria of lepidodendron! However, all of us found examples of Lower Carboniferous fossilised Stromatolites, with the distinctive mound-like shape of calcareous formations produced by cyanobacteria.

The dip of the beds change south of the Cambo Burn, indicating a syncline which is shown also by the repetition of the bedding sequence along the shoreline. This syncline and dome structure is perhaps indicative of folding due to the proximity of a subterranean volcanic vent.
However the main feature of the area is of thin repeated r ock sequences with thin layers of limestone interbedded with calciferous sandstones and shales , including bi-valves of low diversity and high density . This whole is indicative of estuarine, rather than marine conditions; cycles of sedimentation and sequences of shallow seawater, brackish and deltaic conditions. This is consistent with the slow subsidence of a basin in the Lower Carboniferous the resultant rocks of which have been exposed to form what are now very attractive features of the Fife shoreline.

We are all very grateful to Dr Colin Braithwaite for leading us along a stretch of coastline which he clearly knows well and can interpret in such an interesting way.

Photos M. Cummings

Excursion to The Strathblane Area: joint excursion with GSE
3 September 2011
Leader: Jim MacDonald
Report by: *Bill Gray* Participants: 20 from GSG, 12 from GSE

This was a joint excursion with the Edinburgh Geological Society. The aim of the excursion was to study some exposures of the Lower Carboniferous (Dinantian) succession of the Strathblane area. Our attention was equally focused on the volcanic rocks of the Clyde Plateau Volcanic formation, and the sedimentary formations between the lavas, with the additional bonus of some glaciation features. The study area is bisected by the Campsie Fault, which runs E-W and is downthrown to the south. The locality numbers in this report are those in the handout for the trip.

The weather started off wet and miserable, but improved as the day progressed. We had arranged to meet our Edinburgh colleagues at the Kirkhouse Inn at Strathblane, and on our way to the rendezvous we stopped at Loch Ardinning (Locality 5; NS 564 799), which is located on the south side of the Campsie Fault. In fact, there is now little of geological interest to be seen here, as the dam has lost its clay seal and has drained and become overgrown. However, Jim gave us a concise account of the loch's position at the top of the Clyde Plateau Volcanic Formation, on volcanic detritus which is overlain by the Douglas Muir Quartz-Conglomerate, the basal unit of the Craigmaddie Muir Sandstone.

Our Edinburgh colleagues arrived at the Kirkhouse Inn shortly after us, and we all took the chance to warm up with tea and coffee, and also enjoy a slice cake, provided by David from Edinburgh to celebrate his 70th birthday. The morning's activity was concentrated on the Ballagan Formation and the lower beds of the Clyde Plateau Volcanic Formation, which lie immediately above it. The buses dropped us at Ballagan House on the A891 (NS 572 795), where Jim explained that we were now just north of the Campsie Fault, and that the lavas in this area had come from the North Campsie Linear Vent-swarm, which also was the source of the prominent volcanic plugs of Dumgoyach, Dumgoyne and Dumfoyne. We then proceeded down to the Ballagan Burn, where we had our first sight of the Ballagan Formation (Locality 1a; NS 572 798). This consists of alternating beds of cementstone (an argillaceous limestone) and mudstone, with veins of gypsum mineralisation. At this locality the strata were displaced by an oblique fault, and were cut by an Early Carboniferous dyke.

We then had a rather tricky walk down a slippy grassy bank, and along an overgrown muddy path to the east bank of the Ballagan Burn (Locality 1b; NS 572 800), from where we had an excellent view of the Ballagan Formation on the west bank, with its alternating thick layers of grey mudstone and thin layers of lighter cementstone; we also saw a gypsum vein under a cementstone overhang.

We climbed back to the path on the hill flanking the glen, and walked further along it before descending again to examine a hawaiite exposure just north of the Spout of Ballagan (Locality 2; NS 573 802). This flow has similar platy jointing, microporphyritic texture and chemical composition to that at the Jenny's Lum (see photo).
The jointing changes direction from horizontal to vertical, reflecting the path of the original lava flow. Jim described how the microphenocrysts, which are of plagioclase feldspar and up to 2 mm in length, are aligned parallel to the jointing; they were present when the lava was erupted, and the exposure represents an early phase of the magma's evolution.

The Campsie Scarp as seen from the Broads road. Jenny's Lum is the dark fissure that can be seen in the centre near the top of the scarp.

We now walked back down to Ballagan House, where the buses picked us up and took as to Mugdock Park, where we had our lunch.
The buses then took us to the east end of a minor road (NS 560 789), and we walked along this road as far as Boards. On the way we had a good view of the Campsie Scarp and the fissure known as Jenny's Lum, and passed the Gouk Stane (Locality 6; NS 553 791), a large basaltic glacial erratic. Just north of Boards (Locality 7; NS 543 793), we examined an exposure of ankaramite (Craiglockhart basalt), a rock rich in ferromagnesian minerals (e.g. augite and olivine), which had a vesicular texture at the top.
We now walked north through Cuilt Wood along a descending muddy path through a series of thick lava flows of Markle basalt and past a series of blocks of ankaramite that had been loosened from their original location by glacial action. The path took us to the B821 road, where we were met by the buses.
The excursion ended with a visit to the Beech Tree Inn near Dumgoyne for drinks and high tea with our companions from Edinburgh. Jim Martin of the GSG thanked Jim MacDonald for the expertise and enthusiasm with which he had led the excursion, and presented him with a bottle of wine.

Selected bibliography

Cameron I.B. & Stephenson D. 1985. Dinantian. In: *British Regional Geology. The Midland Valley of Scotland, 3rd ed.* HMSO, London, 54-65.

MacDonald, J.G. 1967. Variations within a Scottish Lower Carboniferous lava flow. *Scottish Journal of Geology*, 3, 34-45.

MacDonald, J.G. 1973. Carbon-dioxide metasomatism in the Campsie Lavas. *Mineralogical Magazine*, 39, 119-120.

MacDonald, J.G. & Whyte, F. 1981. Petrochemical evidence for the genesis of a Lower Carboniferous transitional basaltic suite in the Midland Valley of Scotland. *Transactions of the Royal Society of Edinburgh: Earth Sciences*, 72, 75-88.

MacDonald, J.G. 2003. Campsie Fells, Stirling and East Dunbartonshire. *In:* Stephenson D., Loughlin S.C., Millward D., Waters C.N. & Williamson I.T. *Carboniferous and Permian Igneous Rocks of Great Britain North of the Variscan Front*. Joint Nature Conservation Committee, Peterborough, 85-91.

Read W.A., Browne M.A.E., Stephenson D. & Upton B.G.J. 2002. Carboniferous. *In*: Trewin N.H. (ed.) *The Geology of Scotland*. The Geological Society, London, 251-299.

Whyte, F. & MacDonald, J.G. 1974. Lower Carboniferous volcanicity in the northern part of the Clyde Plateau. *Scottish Journal of Geology*, 10, 187-198.

.....

Residential excursion to Ardnamurchan

ARDNAMURCHAN:9-12 September 2011
Leader: David Brown, University of Glasgow
Report by: *Ben Browne, David Parkinson, Jim Casey* Participants:18

Friday 9 September

About 18 rather weary travellers gathered for dinner at the Sonachan Hotel after which David Brown gave a brief outline of the local geology and presented us with a beautifully professional colour printed booklet outlining the development of the interpretation of the dramatic features we planned to visit. Between 62 and 58Ma, with the initiation of the North Atlantic, a landscape of Moine metamorphic rocks overlain by shallow marine and possibly fluviatile Mesozoic sediments was flooded by basaltic lavas of the Mull lava field from fissure eruptions. Later this landscape was intruded by central volcanoes of more evolved rocks. Now we are left with the deeply eroded cores of a sequence of three overlapping concentric structures of which the closest currently active analogue is to be found in the Afar district of East Africa.

Saturday 10 September

With poor weather but a forecast of much worse to come we set out for our most committed and exposed hill day on Ben Hiant. After roadside parking at OS grid reference NM555629 we walked up a track to a viewpoint at NM551625. There we stood on Moinemetasediments. To the east beyond Camas nanGeall was the trap scenery of Mull lava flows on BeinnBhuidhe. To the North West the three overlapping central complexes lay hidden by Ben Hiant the summit ridge and south west flank of was which is formed of a dolerite cone sheet of Centre 1. Homage was paid to J. E. Ritchey who had mapped this

area in the 1920's and identified the three centres of intrusion and the striking geometry of these cone sheets radiating from a common focus.

Passing an exposure of fresh folded Moine(NM54376239) we arrived below a waterfall (NM54246233) formed by a basaltic intrusion of Centre 1 chemistry including a baked 2m xenolith of Moine. At Ritchey's Gully (NM54156202) a waterfall comes over a lava flow under which is exposed in a small excavation on the true right hand bank a sequence of non-fossiliferous siltstones, sandstones and breccias of probable Jurassic age. Dykes here seen to cut the basalt continued to be emplaced up to 47Ma.

At NM53776183 a dramatic view opened up of mega-conglomerate forming a cliff face extending to MacLean's Nose deeply dissected by vertical gullies and horizontal ledges representing siltstone layers (not seen). This is the Ben Hiant Member originally interpreted as vent agglomerate with a vertical contact with the lava. However during his PhD work David Brown had identified a mixed lithology in the conglomerate with an absence of primary pyroclastic material and an overlapping horizontal contact with the lava. We were shown imbrication structures suggesting water borne flow also suggested by lamination and channel structures in the siltstone horizons. Further palynological studies had identified tree pollen including metasequoia in the matrix. This had led to a reinterpretation of the Ben Hiant Member as a sequence of mass debris flows down an unstable wooded valley with intervening fluvial deposits. It was therefore with great delight that we discovered in a fallen block a 15cm specimen of well preserved carbonised wood, of which no previous example had been recorded, further supporting this interpretation. Soon after I was pleased to find my first ever Scottish slow worm whilst a pair of golden eagles circled overhead. The flows contain clasts of Centre 1 origin and are cut by Centre 2 cone sheets implying an origin from a Centre 1 process with the underlying instability possibly due to inflation by Centre 1 magma.

Partly retracing our steps then climbing to NM53996224 we faced across the upper reaches of Ritchey's Gully to a beautiful example of a fan jointed amygdaloidal micro-porphyritic andesitic vitreophyre. This appeared to be a rapidly cooled lobe intruding the conglomerate possibly whilst it was still wet and semi fluid leading to the rapid cooling and a glassy texture. At NM53916233 we passed a fine example of vertical columnar jointing in a Centre 1 cone sheet capping Stallachan Dubha just as another of the same suite caps Ben Hiant.

An exposure at the base of a ridge at NM53266233 showed details of a fine grained laminated tuff with cross stratification and folding suggesting the settling and slumping of fine phraetomagmatic material into shallow water. This represents a surface phenomenon and the first recorded example of in situ pyroclastic rocks in Ardnamurchan.

Turning next towards home our last exposure was of an intriguing rock at NM53716228 consisting mainly of large but fractured crystals typically of plagioclase. This might have originated as an eruption of a crystal rich mush from within an evolved magma chamber.

Sunday 11th September

The unexpected fine weather of the first excursion to Ben Hiant was a distant memory as we emerged from the Sonachan Hotel to be greeted by grey skies and heavy rain. Undaunted we set off for our first location of the day.

Kilmory

The first stop of the day was on the northern shore of Ardnamurchan peninsula at Kilmory. Parking was near the end of an unclassified road (NM 528, 704), but only achieved with the expert guidance of Dr Brown taking on the role of parking attendant. A short walk along a footpath led to the beach and on to the seaweed covered rocks exposed by the tide (NM522, 708). Despite the inclement weather slippery conditions we were treated to a wild colourful vista created by rock outcrops and golden seaweed

In this area Dr Brown firstly introduced us to a series of clast supported conglomerates reddish brown in colour with sub-angular clasts typically 20 to 50 cm. The conglomerates form two distinct units deposited in pulses, with each unit made up of more than one flow or lobe. The two conglomerate units are identified by disparate clast assemblages. The lower unit is dominated by calcareous sandstone and basalt and the upper laminated siltstone clasts.

Dr. Brown interprets the Geology near Kilmoray

A short distance away clast supported units could be identified containing sub-angular clasts of yellow, green and grey thermally altered shale, typically 0.5 to 10 cm in size. Dr Brown explained that the chaotic and tightly packed nature is likely to be the result of shattering of a pre-existing outcrop.

Positioning the group at a suitable vantage point Dr Brown went on to demonstrate his agility and surefootedness outlining a spectacular megablock around 30 metres across. The megablock is composed of calcareous sandstone, which is reddish brown in colour, steeply dipping and planar to cross bedded. The surrounding rocks are conglomerate, which incorporates other large blocks of similar composition up to 5 metres across. Dr Brown explained that the presence of such large blocks is indicative of extremely high energy deposition, possibly resulting from a catastrophic debris flow event.

Leaving Kilmory we headed back to the vehicles and headed west to our next locality.

Eilean Carrach

The second stop of the day found us almost as far west as is possible to go. After parking up at a road side passing place (~NM 425, 673) and with strict instructions that geological hammers were not to be wielded at this location, we followed our leader along a track towards the bay. A seemingly deserted, very wet and windswept caravan park soon appeared

spoiling an otherwise beautiful bay with views across to the lighthouse at Ardnamurchan Point.
Dr Brown led us to an outcrop at the northern end of the bay with a promise of magma mingling. We arrived at one of the classic localities of the Centre 2 Sgurr nam Meann Ring Dyke (NM 440, 710).

The Mingled Magmas of the Sgurr nam Meann

The Sgurr nam Meann Ring Dyke outcrops for around 6 kilometres to the south of Sanna Bay. This is a hybrid intrusion formed by a turbulent mixing of basic and silicic magmas. The rock comprises dark angular and crenulated dolerite clasts with microgranite and felsites forming a paler silicic matrix. Both magmas were molten at the time of formation with the hotter (~1200^{o}C) dark basic magma undergoing rapid cooling as it mixed with the cooler (~900^{o}C) lighter silicic magma. The basic magma forms the dolerite clasts and thin chilled glassy margins can be observed. Our hand lens proved useful here. This phenomenon occurs as a result of cooling during mixing with the lighter silicic magma. More rounded dolerite pillows were also observed. Veining was also observable within these features.

Dr Brown explained the veining as arising from the infilling of contraction cracks within the dolerite by the silicic magmatic matrix material.
We moved a short distance to part of the Sgurr nam Meann Ring Dyke at NM 426, 679. Here the mingling of the magmas and veining was less well developed and the basic magma formed a coarser grained gabbro. Large pyroxene crystals up 5 cm long were also observed at this locality.
Leaving this locality we retraced our steps to the vehicles and head to the welcome shelter of the coffee shop at Ardnamurchan point.

Sanna Bay

Nestled in the warmth of the coffee shop with the wind and rain raging outside, a ripple of dissent permeated the group. It seemed that we were about to become rather depleted in numbers. However, once fortified and with the rain abating only one fainthearted member left us at the Sonachan Hotel en route to our third stop at Sanna Bay (NM 440, 701).

Sanna Bay lies north east of our previous location and the rocks here form part of the Centre 2 Hypersthene Gabbro.

An Eye-shaped Augen Structure within the Hypersthene Gabbro of Centre 2

At this locality we were shown the well developed modal layering within the gabbro. This has produced layers rich in plagioclase and iron-titanium oxides, which dip towards the southeast and the focal point of the intrusion.
We also observed an eye shaped structure known as an augen after the german for eyes. Dr Brown explained that this structure was evidence of syn-magmatic deformation.

Moving a short distance we encountered layers of a coarse grained poikilitic textured gabbro.
This was the final scheduled stop for day 2, but a decision had to be made as we returned to the vehicles. A storm was brewing and due to hit overnight and through the following day, therefore we agreed that it was prudent to continue and for the remainder of the day move on to Centre 3 and carry out some of the 3rd day's excursion.
Achnaha

We moved on to a road side location northeast of Meall Sanna (NM 456, 689). Centre 3 is the youngest intrusive centre in the Ardnamurchan Central Complex and the intrusions here form a funnel shaped lopolith. At our first stop we observed at close quarters the gabbros of the Great Eucrite, which forms the ring of hills at the outer edge.

Examining the Great Eucrite of Centre 3

Moving along the road to park at approximately NM 460, 686 we a short distance onto the moor to an area of outcropping gabbro (NM 461, 686). The gabbro here has layers of olivine rich and plagioclase rich cumulate. The layers dip steeply toward the centre throughout the intrusion suggesting that syn-magmatic deformation has taken place (sagging of the intrusion). This supports the interpretation of a funnel shaped lopolith rather than ring dyke formation.
Moving further along the road again (NM 469, 678) we headed across the moor once more towards the centre of the lopolith.
When we reached a point at approximately NM 472, 680 we were able to see a tonalite exposure this is plagioclase rich and more evolved than the outlying gabbros. Pushing further on to a small knoll marking the centre of the lopolith we were treated to a spectacular view of the surrounding hills and the natural amphitheatre of Centre 3. The out cropping rocks at the centre were an even more evolved microgranite dominated by quartz and with large biotite plates. Dr Brown explained that the more evolved rocks towards the centre are considered to be a mix of basic magma and molten country rock ponding towards the centre of the funnel shaped structure.

With Centre 3 now fully understood it was time to return to the vehicles and head for the comfort of the Sonachan Hotel and Hector's chaotic, but warm welcome.

Monday.12th September
The tail end of Hurricane Katia hit Scotland overnight, so after a stormy night we assembled for today's outing. The guest house is 200 metres from the hotel, so most people wore wet weather gear to enjoy their porridge. Having started the weekend with 19 souls we set off on our expedition this morning with 13. Hector, our Spanish waiter asked to

come and we set off in convoy in the rain for Mingary pier. Hector returns to Spain in a few weeks to complete his medical studies and proved to be a great companion. When we got there, Mark from Malta (NHS radiologist, studying part time for a geology degree at Birkbeck College) waited to join us. He was mapping nearby, but felt the weather was too dangerous and that there was safety in numbers.

Parking at Mingary pier we used a boggy track to location 4.1 (shore west of Mingary pier NM 49155 62840). Holding hats and hoods tight against the driving rain, it was hard to find our steps.

Numerous large sharply inclined magma cone sheets presented themselves. Dipping west and NW, they intruded into the Moinepsammites, and there was a marvellous 2 metre wide flat "pavement of dolerite between the cones. Examples of steps, bridges and broken bridges were present, and by this time the weather had abated so we lingered and study these, and the coastal landscape.

Back in convoy, we covered the mile to location 4.2 (shore east of Mingary Castle – NM 504 631). Having trekked along a densely overgrown path, we passed a six foot high gate with a "shooting range" warning sign. Down to the shore and across slippy rocks we found prolific bivalve fossils. The varying orientation of these *Gryphaeaarcuata, Ostrea*- or Devil's Toenail Bivalves - indicated that they were not arranged in life position, providing evidence of deformation. Visual evidence also ruled out a death bed assemblage often found in lagoon type environments with periodic flood events. In the squally, wet, cold, windy weather, David Brown couldn't resist telling us to imagine that we were standing on the equator in a climate like the Bahamas – which is where the bivalves lived and died. It didn't seem like a Bahamas sort of day!

Other fossils can often be seen in this area – ammonites, rarer corals and crinoid ossicles, but we were unlucky with the tide and these could not be observed.
Large magma cone sheets were yards to the west of the fossil beds, pitted with dozens of neat boreholes – evidence of prior, better equipped geologists. Between fossils and cone sheets were numerous circular semi circular rock pools (to 15 cm diameter) formed from eroded limestone.

Built on one of the larger cone sheets (ten metres thick) Mingary Castle lay just to the west of us. Overlooking the sea, it was strategically important for communication with overseas areas and as an entranceway to the Sound of Mull. The castle fell into ruin 600 years after its construction in the 13th century.

Hector picked up an attractive fist sized pink rock and asked what it was. When he was told that it was a nice rock he looked puzzled. David Brown explained the components of the rock which helped a bit, and when he explained that it had travelled from the Outer Hebrides, Hector was impressed. The puzzled look disappeared completely once David explained that the "G" in Lewisian Gneiss is silent

We set off around noon for home, and most of the cars heading east would have met heavy construction traffic headed west along the peninsula on the single track roads. Fortunately, the Corran ferry was on, avoiding any lengthy detours. Finally in Glencoe the scenery was even more spectacular than normal. In between rain squalls and road spray, the bright spells showed off the majesty of Glencoe after a couple of days of heavy rain. Trickles became rivers, stream became torrents, and waterfalls were everywhere and bigger and faster than usual. It was as though someone had draped dozens of lace ribbons over the conical mountains – very memorable indeed.

GENERAL INFORMATION

REQUEST FOR FUNDING

The Hon Sec had tabled a request from Neil Smith for funding of equipment for his BSES Ladakh, Himalaya 2011 expedition. After discussion it was agreed to give him a grant of £200.

INTIMATIONS

With regret we record the deaths of

Dr. Barry C Hepworth on August 10th 2010 Member since session 129 (86-87)

Dr. Brian G Cooksey on October 26th 2010. Member since session 114 (71-72)

Dr. Alistair C McArthur on January 17th 2011. Member since session 108(65-66)