THE GEOLOGICAL SOCIETY OF GLASGOW

PROCEEDINGS

Session 166
October 2023 to September 2024

'The Bubble' - a folded megablock of dolostone within the Great Breccia of the Port Askaig Formation on Holy Isle.
Residential Field Excursion to the Garvellachs - May 2024.

Registered Scottish Charity No. SC007013

President: Prof. Simon Cuthbert

www.geologyglasgow.org.uk

Hon. Secretary: David Webster email: sec@gsocg.org

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President's Report

Geology has key roles to play in responding to the enormous challenges currently faced by humanity. In recent years Glasgow has become an exemplar in valuing understanding of the urban subsurface through the "Clyde Urban Superproject" (https://www.bgs.ac.uk/geology-projects/cusp/) and the excellent bid to hold the International Geological Congress in 2028 (sadly pipped at the post by Calgary). These demonstrated the ambition of Glasgow to promote the geological sciences as solutions to humanity's challenges. Public understanding of geology is important if society is to engage in fixing the entangled problems of climate change, resource stewardship and biodiversity loss. Promoting public understanding of geology is the core purpose of the Geological Society of Glasgow. The Society continues to present a fascinating and informative mix from the fundamental processes that shape the Earth and other planets over vast spans of time to "nuts and bolts" topics that connect geology to society. It's critical that folk gain some understanding of new directions in geology so that we can counter the outdated negative perceptions linking geologists to "dirty" industries.

GSG's flagship winter activities are our lecture nights. Ian Millar will be standing down as meetings organiser at the AGM. We thank him for all his work over these past years, especially for diversifying the range of topics and speakers. The inclusion of an on-line speaker from the USA showed the potential for a truly world-wide pool of speakers. Our lecture hall audience sizes have decreased since the pandemic, but we have audiences for the on-line recordings that far exceed any lecture hall audience. Perhaps this will be the way of things, but we continue to seek ways to make the lecture meetings more sociable with opportunities to gather for a chat beforehand and afterwards. This would, hopefully, encourage more to join in face-to-face. In the 2023-4 session we offered a very varied range of excursions, including "indoor field trips" to Museum collections. An adventurous trip to the Garvellach Islands had participants delivered to the field sites by landing craft! It was satisfying for the party to engage in ongoing, live research and make a genuine contribution. Thanks to Lindsay Smith and the Field Trips group for setting up a great programme of excursions.

Much of geology is rather impenetrable (a friend said to me a while back "Why do you geologists insists on speaking Martian??") so the Society has run activities suited to beginners in the lunchtime Geonatter sessions at Kelvin Hall. We also ran a field trip with youngsters in mind (see "Dunure Pebble Event" below). It's wonderful how kids love the excitement of discovery. The jewel in the crown of Glasgow geology – Fossil Grove - was the venue for several popular open-day events and visits from university parties. Thanks to members of the Strathclyde Geoconservation Group for giving up their time to support these brilliant events. The Fossil Grove Trust have done a fantastic job of bringing the long-needed refurbishment of the Fossil Grove building in sight of becoming a reality. If you think that the Society could help run an activity (indoors or out) for your school, youth group, forest school, countryside ranger activity or just an informal group of families, please do get in touch.

Protection of geological sites needs constant vigilance. This is where Strathclyde

Geoconservation Group (SGG) is so important. They work with local authorities to bring geoconservation into Local Biodiversity Action Plans and scrutinise planning applications. SGG also promotes geological sites through leaflets. Researching these sites involves group field visits, which make great days out! Everyone is welcome to join them. The Society is supporting a great project run by the Scottish Geology Trust to make information about Scottish geosites available online at https://geosites.scottishgeologytrust.org. It's a great resource and we encourage you to explore it. Our geoconservation and promotion work is another way in which your Society is getting its hands dirty with real practical geology.

The Society supports forefront research through the Scottish Journal of Geology, jointly owned with the Edinburgh Geological Society. During session 166 the publishing agreement with the Geological Society of London was renewed and updated. The editorial board is implementing new ways to attract more submissions in a very challenging publishing world. The departing Editor-in-Chief, Colin Braithwaite, was presented with a gift from the two societies as thanks for his long service to the Journal at the recent launch of the new "Geology of Scotland" book.

Your Society owns its own library, acquired over more than 150 years. This has been audited by staff from the University of Glasgow Library to establish its value and utility, all free of charge. The collection is now fully catalogued. The plan is to house it in the University Library, where it will be available to members; we encourage you to obtain a free GU Library card, to which members are entitled. After a long period of difficult access you should soon be able to browse and borrow our books again. We hope they will also become useful research resources for historians of geology and the Glasgow region. Many thanks to Lindsay Smith and her team for the enormous amount of work done to bring this about. Meantime, our website continues to be our main source of news, information and geology learning materials. Once again, we are grateful to Bill Gray, webmaster, and the Communications Working Group for all their work maintaining the website, email and social media systems. Unfortunately, sales have declined in recent years. Council will need to review its policy about book sales. Gary Hoare is standing down from Council, but his great work with publications, the library and latterly the membership system is greatly appreciated. We'll miss you, Gary!

The Society's finances remain in good shape. A healthy surplus is available to fund grants and awards. These funds remain under-spent, so we encourage you to apply for a grant, for example to support student research, public events or publishing.

This is my last President's report for my term in office. Much of this has been preoccupied with updating the way the Society is run, publishes and stewards its resources. I hope all this will ultimately prove beneficial to members. I wish to thank with all my heart the members of the Society's Council for all three sessions. They have been a fantastic team to work with, giving generously of their time, energy and ingenuity. I'd also like to give a huge thanks to all members of the Society for their continuing support and participation.

Simon Cuthbert

Council Members Session 166

At a Special Meeting on 7th December 2023 (prior to the AGM) the members of the Society present adopted the new Constitution. The management structure of the Council now comprises President, Secretary, Treasurer, 2 Vice Presidents (usually ex-Presidents), 9 Ordinary Members, a co-opted Junior Member, the Chair of the Strathclyde Geoconservation Group and one further co-opted member - A total of 17.

Elected Officers

At the AGM on December 7th 2023 the following were elected to Council:

Position	Nominee	Proposed by	Seconded by
President	**Simon Cuthbert**	D Webster	N Clark
Secretary	**David Webster**	S Cuthbert	I Millar
Treasurer	**Ian Veitch**	W Gray	G Hoare
Vice President	**Neil Clark**	S Cuthbert	D Webster
Vice President	**Maggie Donnelly**	I Veitch	C Forrest
Ordinary Member	**Gary Hoare**	L Smith	B Alexander
Ordinary Member	**John Guerrier**	C Forrest	M Anderson
Ordinary Member	**Bobby Alexander**	M Donnelly	I Millar
Ordinary Member	**Bill Gray**	D Webster	S Cuthbert
Ordinary Member	**Campbell Forrest**	I Veitch	N Clark
Ordinary Member	**Ian Millar**	J Guerrier	B Alexander
Ordinary Member	**Lindsay Smith**	G Hoare	B Gray
Ordinary Member	**Margaret Anderson**	S Cuthbert	G Hoare
Ordinary Member	**Vacant**		
Junior Member (co-opted)	**Vacant**		
SGG Chair (co-opted)	**Margaret Greene**		
Ordinary Member (co-opted)	**Vacant**		

It was unanimously agreed to re-appoint Brian O'Neil as Independent Examiner

Appointments to Council

At a Council Meeting on 22 February 2024 Council agreed to appoint **Luisa Hendry** as an Ordinary Member (proposed by D Webster, seconded by S Cuthbert).

At a Council meeting on 5 September 2024, Council agreed to co-opt **Ben Hardman** as the Junior Member.

Roles and Responsibilities

Under the new constitution the assignment of various roles and responsibilities and the setting up of appropriate Working Groups are matters for the Council. During the session the following Council Members adopted roles as follows:

Membership - **Gary Hoare**
Publications - **Gary Hoare**
Meetings - **Ian Millar**
System Administration (webcollect) - **Ian Millar**
Library - **Lindsay Smith**
Archivist - **Margaret Anderson**
Website - **Bill Gray**
Newsletter Editor - **David Webster**
Proceedings Editor - **David Webster**

Working Groups

A **Field Trips Working Group** was set up and Lindsay Smith agreed to monitor the excursions@gsocg.org email account. Previous email addresses (daytrips and restrips) were discontinued.

The scope of the previous Website Group was expanded and is now a **Communications Working Group** - chaired by Bill Gray

Several ordinary Members continue to be part of a **Library Group** run by Lindsay Smith

Fossil Grove Trust

The Fossil Grove Trust has ten Trustees - four of whom are appointed by the Society. At present these are Walter Semple (Chair and Secretary), Ian Veitch (Treasurer), Campbell Forrest and David Webster.

Membership Secretary's Report

Honorary Members	*3*
Ordinary Members	*189*
Ordinary & family Associates	*16*
Senior Associate Members	*60*
EGS associates	*11*
Junior Members	*23*
Special & admin	*9*
TOTAL MEMBERS	*311 (295 at end of Session 165)**

*Note. Membership categories have changed with the introduction of webcollect and the new constitution.

WebCollect is working well this system allows members to manage their own data. We urge everyone to log in and check all their details are correct and up to date. We would also ask all members to pay by direct debit, rather than bank transfer or standing order.

A note of thanks is due to Ian Millar and Ian Veitch for webcollect administration duties.

Gary Hoare

Treasurer's Report

Financial results

The financial results are as set out in the attached financial statements.

The Unrestricted Funds which represent the day to day running of the society show a surplus of income over expenditure of £2,611.

The Designated Fund which is used to pay grants and awards generated income of £3,834 and £4,350 was paid out in the year in grants and awards. At the end of the year the balances on this fund totalled £96,839.

Investment policy

Investments are held under the title of Designated Fund which is an Endowment Fund and are in the care of our broker Redmayne Bentley apart from a direct investment of £4,000 in the M&G Charifund. The Council has adopted the following investment policy for the Endowment Fund:

"To invest the funds in investment trusts or comparable funds of the highest quality which would expect to provide yields or income returns representing a reasonable return on such investments and at the same time capital growth intended to maintain the real value of each fund. These investment trusts or funds would provide a wide diversification of investments and a satisfactory history of successful past performance."

An Investment Committee, appointed by the Council meets annually or as required to review the investment performance and if necessary, make changes. Note 9 to the accounts provides information on the investments this year

Reserves Policy

The trustees have adopted what is considered to be a prudent policy of maintaining cash reserves of at least two years' running costs. With unrestricted reserves of £9,270 at the year end and running costs, excluding a one off book write down, of £4,476 the society is operating within this policy.

Independent Examiner

Mr Brian O'Neill has been appointed as Independent Examiner to the charity for this year.

Notes to the accounts

1 Basis of Accounting

These accounts have been prepared on the Receipts and Payments basis in accordance with the Charities & Trustees Investment (Scotland) Act 2005 and the Charities Accounts (Scotland) Regulations 2006 (as amended)

2 Nature and purpose of funds

Unrestricted funds are those that may be used at the discretion of the trustees in furtherance of the objects of the charity.

Designated funds are those that have been allocated by the trustees for a specific purpose, in this case the making of grants and awards.

Restricted funds may only be used for specific purposes. Restrictions arise when specified by the donor or when fund are raised for a specific purpose. The restricted funds are: The T N George Fund - to be used to engrave a medal for the annual T N George lecture, The Brian Bluck Fund - to be used to award a prize to the top student in the final year of Geology at Glasgow University and the The Fossil Grove Trust Fund - to be used for expenditure on the Fossil Grove on request from the Fossil Grove Trustees. The balance on this fund was repaid during the year.

3 Related party transactions

The Society's insurance policy includes Trustee Indemnity Insurance for all council members. No remuneration was paid to the trustees during the year (2022: nil)

4 Grants and Awards

Designated Funds	
Strathclyde Geoconservation	300
Friends of Hugh Miller annual donation	50
Cendi Dana-Grant	1000
Joseph Benson - Grant	1000
Urszula Filipowicz - Grant	1000
Iain Neill - Grant	1000
Total Grant and Awards	**4,350**

5 Expenditure

As Glasgow University generously allows the society to use a lecture room free of charge our income continues to exceed expenditure.

To encourage members to attend excursions the cost of day excursions was subsidised by the society this year resulting in a net cost of £575.

Due to a low level of demand the stock of books held by the society has been written down to £667 resulting in a write off of £1,700.

6 Restricted Funds

	T N George Fund	Brian Bluck Fund	Fossil Grove Trust fund	Total
Movement on the Funds:	£	£	£	£
Balance at 1 October 2022	340	7,500	11,467	19,307
Income	0	0	0	0
Grants & Awards	0	0	0	0
Fund Repaid	0	0	-11,467	-11,467
Balance at 30/9/2023	**340**	**7,500**	**0**	**7,840**

Notes

The T N George Medal was not awarded this year.

The Brian Bluck Prize has not yet been awarded for 2024

The balance on the Fossil Grove Trust Fund was repaid following a request from the Fossil Grove Trustees

7 Prepayments

This represents the deposit of £630 for a 2025 residential excursion to the Garvellach Islands which has been carried forward.

8 Payments Due at the year end

	30/09/24	30/09/23
Independent Examiners Fee	150	150
Day Excursion Costs for 2024	80	0
Due to EGS for the Scottish Journal of Geology	160	0
Total Payments due	**390**	**150**

9 Investments

The investments are held in an Endowment Fund as approved by the Council with the proceeds to be used for making grants and awards. The Endowment Fund is shown as a Designated Fund in the accounts.

Following a recommendation by the Investment Committee the Council transferred a further £30,000 into the Endowment Fund which will generate additional income for future grants and awards.

The investments consist of 4 income generating managed funds which paid £3,834 of income.

At the year end the investments were valued at £87,403, an increased in value of £5,610

Ian Veitch
treas@gsocg.org

THE GEOLOGICAL SOCIETY OF GLASGOW

Income and Expenditure Account for year ending 30th September 2024

	Note	un restrict -ed funds	Desig -nated Funds	Restrict -ed Funds	Total	*Year Ended 30/9/23*
Income						
Subscription Income		6,816		0	6,816	*7,123*
Investment Income		578	3,834	0	4,412	*3,607*
Gift Aid		800		0	800	*1,058*
Publication Sales		743		0	743	*394*
Donations & Grants Received		0		0	0	*965*
Miscellaneous Income		0		0	0	*0*
Total income		**8,937**	**3,834**	**0**	**12,771**	***13,147***
Expenditure						
Cost of Charitable Activities:						
Lectures	5	1,946		0	1,946	*1,245*
Excursions		575		0	575	*0*
Printing & Postage		445		0	445	*269*
Insurance & Fees		686		0	686	*532*
Website	5	187		0	187	*175*
Admin Costs		0		0	0	*103*
Publication costs		544		0	544	*0*
Book write off		1,700		0	1,700	*213*
Grants and Awards	4	0	4,350	0	4,350	*18,487*
Miscellaneous		93		0	93	*6*
Total Charitable Activities		6,176	4,350	0	10,526	*21,030*
Governance Costs						
Independent Examiner Fees		150	0	0	150	*150*
Total expenditure		**6,326**	**4,350**	**0**	**10,676**	***21,180***
Surplus (Deficit)		2,611	-516	0	2,095	-8,033
Gain (Loss) on Investments		0	5,610	0	5,610	*699*
Surplus (Deficit) for the year		**2,611**	**5,094**	**0**	**7,705**	**-7,334**

THE GEOLOGICAL SOCIETY OF GLASGOW

Statement of Balances at 30 September 2024

	Note	Un-restrict-ed Funds	De-signated Funds	Re-stricted Funds	Year Ended 30/9/24	*Year Ended 30/9/23*
Funds Balance as at 1st October 2023		36,659	61,745	19,307	117,711	*125,045*
Transfer to (from) funds		-30,000	30,000	-11,467	-11,467	*0*
Surplus (deficit) for the year		2,611	5,094	0	7,705	*-7,334*
Funds at 30 September 2024		9,270	96,839	7,840	113,949	*117,711*
Represented by:						
Bank and Cash Deposits						
Royal Bank of Scotland		8,644	8,478	7,840	24,962	*36,125*
National Savings Income Bond		0			0	*12,000*
National Savings Investment Account		0			0	*4,892*
Investments		0	87,403		87,403	*52,327*
On deposit with Redmayne Bentley		0	958		958	*11,105*
Cash in Hand (float)		200			200	*300*
Total Cash and Savings		8,844	96,839	7,840	113,523	*116,749*
Stock of Publications		667			667	*2,624*
Prepayments		630			630	*0*
Less Liabilities:						
Subscriptions paid in advance		-481			-481	*-1,512*
Payments Due	7	-390			-390	*-150*
Net Assets		**9,270**	**96,839**	**7,840**	**113,949**	**117,711**

Meetings Secretary Report

This sessions lecture attendance mirrored that of the previous one with average audiences of around 35, essentially half of the pre-Covid average. As before the lectures were recorded and posted on the society's YouTube channel, attracting on average an audience of around 225 and peaking at 355 views, which we hope is of value to our members who are unable to attend in person. Continuing lower physical attendance numbers may represent the post-Covid world, but I would encourage those members who could attend to consider doing so to enhance their experience, meet fellow enthusiasts and our excellent speakers. If you missed any of these you can still experience them via our YouTube channel, links below.

Thursday 12th October 2023

Prof. Jane Evans, *British Geological Survey*

"A Boatload of Vikings - Isotope evidence from a mass execution in Weymouth"

Much infrastructure work was undertaken in the run up to the 2012 Olympics. This included improving the access route (A354) to Weymouth. A burial pit containing over 50 skeletons were uncovered during this work; they had all been beheaded. The talk followed the isotope work undertaken to determine who these individuals might have been, where they came from and why they came to this gruesome end.

https://www.youtube.com/watch?v=ZUtCfCZxP1o

Attendance: 34 YouTube views: 138 Total: 172

Thursday 9th November 2023

Prof. Tony Prave, *University of St. Andrews.*

"The Birth of the Dalradian Supergroup and its path through Neoproterozoic Earth history"

The most enduring concept of the Dalradian Supergroup is that it formed during a prolonged phase of extensional tectonism, starting with breakup of the supercontinent Rodinia and ending with opening of the Iapetus Ocean. In his talk he revised and refined that concept, integrating the Dalradian's rock record into the geological and environmental conditions recognised currently as those that define the latter half of Neoproterozoic time worldwide.

https://www.youtube.com/watch?v=tnsw0mQu0zI

Attendance: 35 YouTube views: 355 Total: 390

Thursday 7th December 2023

Prof. Craig Storey, *University of Portsmouth*

"The Onset of Modern Plate Tectonics"

Since the 1960s we have accepted the plate tectonic paradigm as being central to how our planet operates at the present day. However, there is much ongoing debate as to when plate tectonics began and how similar it was to the current observable mode. Hypotheses range from the Hadean to the Neoproterozoic and therefore span across profound changes in the Earth system, including atmospheric oxygenation and the proliferation of life. In the talk he reviewed (some of) the "hallmarks" of plate tectonics, their first appearance and secular evolution, and speculated on when it all began and how it evolved.
https://www.youtube.com/watch?v=nQGFjAl1asY

Attendance : 40 YouTube views : 233 Total audience : 273

Thursday 11th January 2024

Dr. Stephen Hollis, *University of Edinburgh.*

"The Closing of the Iapetus and associated mineralisation"

The Grampian orogeny marks the first phase of the closure of the Iapetus Ocean in the British and Irish Caledonides during the Late Cambrian to Middle Ordovician.

Widespread metamorphism and deformation of passive margin sequences resulted from the accretion of several arc and ophiolite complexes (and outriding microcontinental blocks) to the continental margin of Laurentia. These remnants of that now closed ocean extend across Scotland and Ireland, into Newfoundland and Quebec. The Tyrone Igneous Complex of Northern Ireland represents a young, structurally dissected c. 484-480 Ma ophiolite and c. 473-464 Ma volcanic arc. Extensive fieldwork, geochemistry, isotope analysis (Sr-Nd), and U-Pb zircon geochronology have provided us with a detailed understanding of its tectonic-magmatic evolution, and potential metal endowment. Equivalent sequences in the Newfoundland Appalachians contain some of the most metal-rich massive sulphide deposits globally. Exploration efforts in Co. Tyrone have revealed numerous encouraging occurrences of base (Cu-Zn-Pb) and precious (Au-Ag) metals crucial for the energy transition, and also occurrences of energy critical metals (e.g. Co, Bi, Te). Parallels between the Tyrone Igneous Complex and the Ballantrae Ophiolite Complex were discussed in this presentation, highlighting the possible mineral potential of western Scotland.

https://www.youtube.com/watch?v=LeJ_Tg5iPxc

Attendance : 30 YouTube views : 310 Total audience : 340

Thursday 8th February 2024

Toni Galloway, *University of St. Andrews.*

"Using hot spring systems as analogues to conditions on early Mars"

In a live zoom lecture Toni spoke about her PhD research currently focused on studying biogeochemical cycling of essential elements within Mars analogue sites. This work is primarily on modern hot spring systems on Earth as analogues to Noachian Mars. This period dating from 4.1 to 3.7 billion years ago, was during the interval known as the late Heavy Bombardment and when first life forms likely arose on Earth. Examining hot spring conditions while using geochemical and bioinformatic analyses aids in understanding how those extremophilic organisms associated with the springs use carbon and nitrogen, and the biosignatures which these reactions leave behind in the geological record.

https://www.youtube.com/watch?v=JrBoDYrsHfs

Attendance : 42 YouTube views : 82 Total audience : 124

Thursday 14th March 2024

Murray Reid, *Retired Engineering Geologist*

"What lies beneath: the geology of Strathkelvin "

Strathkelvin covers the valleys of the Kelvin and Allander Waters north of Glasgow and extends from Milngavie and Bearsden in the west to Kirkintilloch and Kilsyth in the east. The presentation described the geology of the area, concentrating on outcrops where the strata can be clearly seen and looking at evidence for what lies beneath the surface in areas where rock is not exposed.

In the north, the lavas and ancient volcanoes of the Campsie Fells are well exposed but most of the built-up areas are underlain by sedimentary rocks of Carboniferous age which are largely covered by thick layers of glacial and alluvial materials. Coal, sandstone and limestone have been exploited and traces of the workings remain. The Kelvin Valley forms a major east – west transport corridor across Central Scotland and has played a significant role in the history of Scotland.

https://www.youtube.com/watch?v=0pzj05vN88E

Attendance : 35 YouTube views : 220 Total audience : 255

Thursday 28th March 2024

Denver Fowler, *Curator of Dickinson Museum Center, North Dakota*

"Finding Dinosaurs in the Late Cretaceous Judith River Formation of Montana"

In this extra live zoom talk, Dr Fowler took us through his ongoing work and research of the Judith River Formation, in Montana. The Formation, dating from the late Cretaceous period, between 79 and 75.3 million years ago, has yielded a wide range of fossils from fish, amphibians, crocodilians, lizards, turtles and of course dinosaurs. It was explored as early as 1876; the same year as Custer's ill-fated last stand at the Little Big Horn, also in Montana; by early American palaeontologists.

https://www.youtube.com/watch?v=GOZRw2DQdDU

Attendance online 58 : YouTubeviews : 197 Total audience : 255

Thursday 11th April 2024

David Webster, *Retired Oil Company Geologist.*

"Neoproterozoic glaciation in Scotland and Ireland: The Port Askaig Formation "

Our own David Webster presented his talk on the Port Askaig Formation (PAF) in the Garvellach Islands and Islay. This sequence is some 1100m thick and includes 48 diamictites. Many were deposited by grounded ice; a few were ice-rafted. The PAF records 76 climatically-related episodes: 28 glacial, 25 periglacial and 23 non-glacial, plus unusual iron-rich and glaciotectonic intervals. Amongst Cryogenian glacial successions, the PAF is exceptional in its combination of formation thickness; the number of climatically-related episodes and the thickness (25km) of its host Supergroup.

PAF studies started with MacCulloch (1819); Thomson (1871) who proposed a glacial origin; Pitcher and Shackleton (1961) measured the strata in the Garvellachs, leading to Tony Spencer's 1971 Geological Society of London Memoir (#6). A large multi-disciplinary team is now preparing a new Memoir, their recent work has led to proposal that the base of the PAF on Garbh Eileach be a candidate GSSP (Golden Spike) for the Cryogenian world-wide. Evidence for and against a 'Snowball Earth' during PAF times was also discussed.

https://www.youtube.com/watch?v=vRCOgHEt5uo

Attendance : 27 YouTube views : 261 Total audience : 288

Thursday 9th May 2024
Members' Night

Talk 1: Angus Miller of the Scottish Geology Trust gave a presentation on the Scottish Geology Trust's Geosites Project. Scotland has over 1000 sites that are designated as important for geology and geomorphology at a national or local level, but the value and importance of these sites is often not recognised, it is hard to find information about them and systematic monitoring is under-resourced.

The Scottish Geology Trust's Geosites project aims to bring information about all these sites together in one place, to make it easy for people to report issues with sites, and to share information. Working with partners, we propose to support a network of volunteers to visit sites and become ambassadors, available to help engage with local communities in learning and benefiting from their local geoheritage.

Talk 2: Neil Clark on the newly identified species of shrimp *Tealliocaris weegie* in honour of the people of Glasgow

Talk 3: Simon Cuthbert on work in the Southern Uplands on palaeo laterites

Attendees: 30. The presentations were not recorded.

I hope that the programme was enjoyable to all those who experienced it in person or online and if you have any ideas on speakers, subjects or themes in the future please feel free to contact me at meetings@gsocg.org.

***

I'll leave the last word to our speakers:

Jane Evans – "Always good to talk to an audience with so many questions and interest in the subject. "

Tony Prave – "Thank you and the Society for inviting me", "I would be delighted to return to your fair city, assuming that I have something new and interesting to talk about".

Craig Storey – " Many thanks for your hospitality, I had a great time and the return home was fine. It was good to see so many enthusiastic faces"

Steven Hollis – "Thank you again for the invitation to come and speak. It was great to meet you all."

Toni Galloway – "Thank you very much for having me, I really enjoyed giving the talk and having so many questions to answer!"

Murray Reid – "Thanks for all the help in setting up and delivering the presentation last night. It seemed to go very well, and I enjoyed doing it, so a success all round."

Denver Fowler – "My pleasure. It's so nice to get to share some of these things with interested people.". Thanks to the Society for the generous donation to our research effort.

Ian Millar
meetings@gsocg.org

Day Excursions 2024

During session 2024, 7 excursions were arranged as follows:-

Glasgow Museums Resource Centre 30.4.24 - 12 (full)

National Museums Collection Centre Tour 15.05.24 - 16

Pentland Hills 25.05.24 - 16

Innellan 15.06.24 - 17

Spireslack Open Cast Mine 06.07.24 - 17

Longniddry to Aberlady Shore (Joint with EGS) 24.08.24 - 24 (12 per society)(full)

Dunure (Scottish Geology Festival event) - 30 booked but more than 100 attended on the day.

This year we once again had a very interesting and instructive set of field trips. We owe a tremendous debt of gratitude to all the leaders who made this possible by giving up their free time to take us to such a wide range of interesting localities. Thank you once again to those who did and please consider offering your expertise if you have any areas which you think you could lead a trip to, we would love to hear from you!

We would like to thank the Society's Council for agreeing to subsidise trips this year due to the increasing costs of hiring buses. This resulted in more participants joining us and a very small deficit in the end. The option to join the trip by your own means also remains and we utilised this for a number of trips where it was deemed a bus was not quite so suitable due to restrictions on capacity at some. 39 non-members attended trips with us and some went on to join the Society so we feel that offering this option worked well.

We introduced the webcollect booking system for trips this year with risk assessments and excursion information all now included on the booking pages via our website and medical forms are processed securely by the system in accordance with data protection guidance. Any members feeling this is a barrier to them attending daytrips should get in touch.

Lindsay Smith
excursions@gsocg.org

Tour of Glasgow Life geology collection - 30th April 2024

Twelve members of the society met with the curator of Geology Ann Ainsworth, who took us all on a fascinating tour of the behind the scenes specimen stores at the collections centre.

We started with minerals, and saw some fantastic Scottish gold, silver and various common metals in their mineral form. We then moved onto quartz and agates – everyone seemed to agree the agates were the highlight of the mineral collections.

Next up was the fossils. Various Scottish fishes were shown – all in an amazing state of preservation, the Rhizodont remains were particularly impressive. Anne had set up

a display for us with Lesmahagow Eurypterid remains and a replica model. The main eurypterid fossil was collected in the late 1800s during the famous camp siluria trips, led by Dr Hunter Selkirk of the Geological society of Glasgow. Seeing the scale model helped bring these remains to life.

Next up was a general display of minerals, rocks and fossils from Scotland. Every specimen told its own story and the group listened intently to the information relayed from Ann. Fantastic trip, the only issue was that time flew!

Gary Hoare

National Museums Tour and Granton shore - 15th May 2024

A group of 16 met at the NMS storage facility on West Granton Road where Dr Rachel Walcott gave us a warm welcome and brief (alas, no collecting was to be permitted on this trip!). We split into 2 groups; one going to the fossils; the others to see the minerals (then swapping over). Drs. Andy Ross, Stig Walsh and Yves Candela were excellent hosts in Palaeobiology, giving us fascinating information and showing stunning fossil specimens from each of their specialties, mostly all from the Scottish Collections. We had requested to see a selection of fossils from the Pentlands which let our members see examples of what we might find on our next excursion. There was great amazement amongst the group at the vast variety of fossils that are to be found in Scotland, everything from giant sauropod remains to tiny ostracods!

We then had a tour of the preparations lab with NMS's amazing preparator Vicen Carrio where work was in progress on a number of projects which quite excitingly for us included a "top secret" dinosaur bone slab from Skye which has yet to be identified… but is big!! We are among the first people to have viewed this bone that will no doubt soon be big news once fully exposed from its host rock….No pictures were allowed!!

We had a chance to see some of the technical work that goes on in the background to identify minerals, explained to us by Dr Bob Gooday. Then finally we admired the fantastic mineral collection including Scottish meteorites, agates, granites, quartz etc with Dr Rachel Walcott, Emily Brown and Peder Aspen

The staff at NMS were thanked for a really great day and they advised that members are always welcome to contact them to request access to any specimens they would like to view for research or interest .

We then made our way to Granton shore for lunch and a fossil hunt for afters! There were a few crinoids and corals found and quite a few "not a fossil" IDs as we found a large number of sea-worn bricks and other industrial waste which proved to be a topic of very interesting conversation led by our very knowledgeable leader Dr Katie Strang who was able to give us lots of details on the local history from current day right back into the Carboniferous!

Lindsay Smith

Pentland Hills - 25th May 2024

We were blessed with fine weather for our fossil hunting trip to the Pentland Hills, dry throughout the day and pleasantly mild. Eleven members boarded the minibus at the Molema Building at 8.30am prompt (after a minor panic relating to lost car keys!) and we arrived at Carlops village car park at 10am, where we met five others, including our trip leader for the day, Gary Hoare.

The day's objective was to search for a variety of fossils in steeply dipping Lower Silurian rocks within the core of the Pentland Hills. This small area of Silurian exposure is relatively unusual in that it lies north of the Southern Uplands Fault and is therefore one of only a few Silurian inliers within the Midland Valley. As we set off there was an air of anticipation at the prospect of finding trilobites and other inhabitants of the Silurian sea.

From the Carlops car park we followed an excellent track leading northwest into the hills. We stopped briefly half way along the route, ostensibly to examine a contentious exposure in a small cutting (but also to catch our breath). The top of this cutting was said to be a Silurian conglomerate but there was some discussion as to whether this was a genuine conglomerate of Silurian

age, or a more recent drift deposit containing abundant Silurian cobbles. Without resolving this issue we continued on our way to the main exposures of mudstones and siltstones of the Deerhope and Wether Law Linn formations (Llandovery/Wenlock age, about 435-430 million years old).

The exposures themselves were well hidden among the hillside grass and heather and could easily have been missed without the expert knowledge of Gary, our guide. The outcrops were present in only small areas and on fairly steep slopes, so fossil hunting was a cosy and precarious activity as we scrambled about with our heads down while trying not to knock each other off the hillside.

Many fossils were found, including brachiopods, crinoids, corals, gastropods and yes, some trilobite fragments; also a few conularids (new to me), an extinct Cnidarian, rather like a sea anemone with an outer cone-shaped shell preserved as the fossil. Much use was made of hand lenses as many of the fossils were very small; indeed some rocks appeared to be barren until examined closely with a hand lens to reveal evidence of Silurian life. As the day progressed, and we began to 'get our eye in', the finds came thick and fast.

Thanks go to Gary and also to Katie who provided the expert knowledge and then explained to many of us what exactly it was that we were looking at. This was a welcome foray into a part of the country that the Society hasn't visited for some time, and it was good to see rocks of an age not usually found in our more familiar Glasgow environment.

Bobby Alexander

Innellan and Toward - 15th June 2024

Most of the group came on the bus from Glasgow University. We had a pleasant journey on the spacious coach passing by Loch Lomond, Arrochar, Rest and be Thankful and Strachur and finally stopping by Hunters Quay to meet the rest of the party and our leader Dr Keith Torrance.

The first location (NR 18595 78688) was just along from Hunters Quay going towards Dunoon, easily spotted by the large rock on the beach painted like a puffin (Fig. 1). The rocks at this location were Dalradian metamudstones, slates, schists and phyllites aged from between 1000 and 541 million years in the Precambrian. These rocks are


Fig. 1


Fig. 2

difficult to date precisely because they lack fossils. There was certainly visible folding in the rocks with probably at least three phases of deformation (Fig 2). There was some debate as to whether there was any bedding visible and there seemed to be some faint graded bedding indicating a possible “way up’. Some greener rock was identified as Loch Katrine volcanoclastic member.

The second location (NR 15389 70776) was by the pier at Innellan walking down to the beach in the direction of Toward. This rock outcrop is within the Highland Boundary Fault zone (Fig. 3). Much of the rock here was serpentinite, characterised by its green snake-like appearance and greasy texture. This rock is altered ultramafic oceanic crust from the Iapetus ocean that was scraped off in the continental collision during the Ordovician. This serpentinite weathers further into talc, which was also observed here and, as Keith explained, was used for carving by the early Celts. Trossachs group metagreywackes are pointed out here by Keith. Rip-up clasts possibly the result of turbidite movement on a slope (Fig. 5). Some discussion was also had on a rock as


Fig. 3


Fig. 4

Fig. 5

Fig. 6

a possible pillow lava (Fig. 6). With the weather staying fair, although looking more threatening we had our lunch.

The third locality (NR 13639 67174) was at Toward point around the lighthouse. Here were good exposures of red Devonian sandstones and conglomerates (Fig. 7). Examples found of cross-bedding and ripple marks formed by braided river channels (Fig. 8)

Fig. 7

Fig. 8

The final location was a short drive further on, just opposite the new driveway to Castle Toward. Here we were back in the Highland Boundary Fault zone. As at location two the was serpentinised ultramafic rock, along with Devonian breccias and haematite veining. A very enjoyable excursion with many thanks to Keith and Bobby.

John Guerrier

Spireslack - 6th July 2024

Waooow! What a hole in the ground!

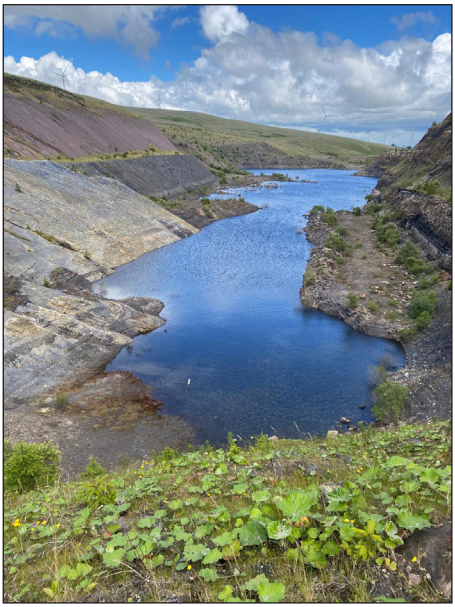
The GSG outing to the now commercially redundant opencast Spireslack Quarry was attended by a large contingent of members and proved to be an extraordinary insight into a cross section of the Carboniferous Coal Measures – mining on a scale not seen anywhere else in the United Kingdom.

The group started off the day at the remnants of the old miner's village of which only the foundations remain. Preservation has been promoted in part due to Glenbuck being the birthplace of one William (Bill) Shankley whom some may recall as having prominence in the game of soccer!

Our guides for the day were the duo of Graham Leslie and Mike Brown, both from the BGS. As in all geology, there can be differences of opinion on some aspects of the evidence! Graeme and Mike gave us all an introductory history of the area, with the coal having been discovered due to the occurrence of ironstone deposits in the locality. We saw very old and simple smelting installations as we drove into the village.

The Coal Measures were initially exploited at the base of a broad synclinal structure at the bottom of the hill, close by Glenbuck, where the seams may have been thickest. The miners then worked their way uphill, following the seams until the structure became too steep for safe working and underground mining was abandoned in 1930.

With the introduction of high powered hydraulic excavation equipment in the middle of the 20th century, it became feasible to dig opencast pits in many locations, however with the collapse of Scottish Coal in 2013, this site, like many others became abandoned with limited restoration completed by Banks Mining 2018.



A long string of participants then required to walk up the access track to the open pit mine and 'sneak' through the security fence to be greeted by the vast open vista of the excavations. To put the scale into perspective, we could view a 'line up' of lorry tyres in the base of the quarry –except when viewed more closely these were the scrap tyres from huge site dumper trucks!

The southern steep face of the quarry consists of a series of limestones, shales and coal seams which were laid down consecutively as water levels rose and declined in the shallow seas of around 330m years ago. These fluctuations of forest and sea resulted in 6 separate seams

of coal being exploited by the excavations. We had evidence of excavator driver skills in skimming out the black bounty without removing adjacent 'waste' – all of which saves on cost!

Of great interest was evidence of the earlier miners, with their pit props and backfilled former tunnels being seen on the quarry wall. Incredible to think of the candle lit conditions in which they operated in comparison to the natural light with which we viewed the structures

The Coal Measures have been intruded by several basaltic dykes of later Carboniferous age, which were evidenced on the walls on either side of the quarry.

Many of the group had considerable interest in exploring one particular limestone exposure for fossil remains with extensive crinoid, coral and some brachiopod finds.

Despite the forecast of the day being for showers, we escaped all but one deluge and after a trek downhill to the waiting vehicles, the many contented participants were on their way home.

Austen Brown

Longniddry to Aberlady Point - 24th August 2024

In August the Glasgow Geological Society was hosted by the Edinburgh Geological Society for the annual joint excursion along the River Forth shoreline from Longniddry Bents to Aberlady Point. We were kindly led by Professor Mark Wilkinson of University of Edinburgh and current president of EGS who was extremely informative throughout the day. The purpose of the excursion was to carefully verify earlier shoreline surveys and to provide a more general audience with an excursion along the top of the Aberlady Formation and the overlying Lower Limestone Formation, into which is intruded the Gosford Bay Sill.

We made our way northwards along the coast, and past the sandy bay that surrounds

the tidal inlet of Green Craig; then along the coast to Aberlady Point. We were able to observe, in the cliffs, cyclic sedimentation with the typical cycle of an upward sequence of marine limestone, shale, sandstone, seat-earth, coal, marine limestone. (Occasionally individual units were very thin or absent). These cycles are representative of the normal sequence of events in a subsiding delta.

As we moved onto the beach formations we could sometimes see traces of rootlets within the fossil soils and the intruding Gosford Sill. There was a good deal of debate and careful observation at a number of the more notable and less "clear-cut" outcrops. A highlight for some was an unusual outcrop in Gosford Bay, described in previous literature as a 'cryptovent' associated with localised volcanic activity. The complex relationship between the variously dipping sedimentary and igneous blocks was extremely puzzling and quite unlike 'normal' vent agglomerates, and much discussion was had about the origin of this enigmatic outcrop.

Many fossils were also examined by the group along the way, a mixture of both colonial and solitary corals, brachiopods, bivalves, crinoids and bryozoans along with some very interesting trace fossils.

The day ended with a well-earned 'high tea' from Alandas, the long-established dispenser of fish suppers conveniently located in the Longniddry Bents car park.

Christine Hamilton

Dunure Pebble Event

The trip to Dunure on 7th Sept, held as part of the Scottish Geology Festival 2024, was another successful trip for the GSG. This outing to scour the bay and beach north of the harbour at the picturesque fishing village of Dunure in Ayrshire, was a family event to hunt for treasure in the form of agates. Over 30 young people accompanied by enthusiastic adults joined the hunt, and none were disappointed. There were cries of "Wow, look what I found" all along the beach as everyone young and old were presented with fantastic examples of agates which had been dug from the sand and carefully washed in the surf. There will be many beautiful examples now sitting pride of

place on mantelpieces and sideboards, a memory of a great day out.

Drs. Neil Clark and Katie Strang from the Hunterian Museum, and several GSG experts including Lindsay Smith and Bobby Alexander were on hand to identify their many finds including a beautiful amethyst geode found by a local lady in their garden; lots of quartz from the beach including smoky quartz; jasper; basalt containing tiny agates; and of course, beautiful example of local agates.

The trip was inspired by a collection of over 2000 agates, collected by Barbara Coats (née MacPherson) of Ayr. She collected agates weekly from Dunure and the Heads of Ayr in the 1970s. A geology trip from Fife in 1991, reported that her garden was awash with agates such that she invited them “Help yourself to my path”. Barbara cut and polished many of these stunning and often large examples, with the Hunterian retaining a few of the most interesting examples.

Clare Clark

Residential Field Trip to the Garvellachs

10-13 May 2024

Leaders: Tony Spencer & David Webster. Attendees 10

The Garvellach islands expose a magnificent section of the glacial Neoproterozoic Port Askaig Formation (PAF). The base records the transitional onset of glaciation at the start of the Cryogenian - which is a prime candidate for a global 'golden spike' or GSSP. It is a good place to see evidence for a possible 'snowball Earth'.

We stayed on Lunga at the Rubha Fiola Field Centre expertly run by Ninian & Becky.

Day 1. Saturday 11 May - Garbh Eileach

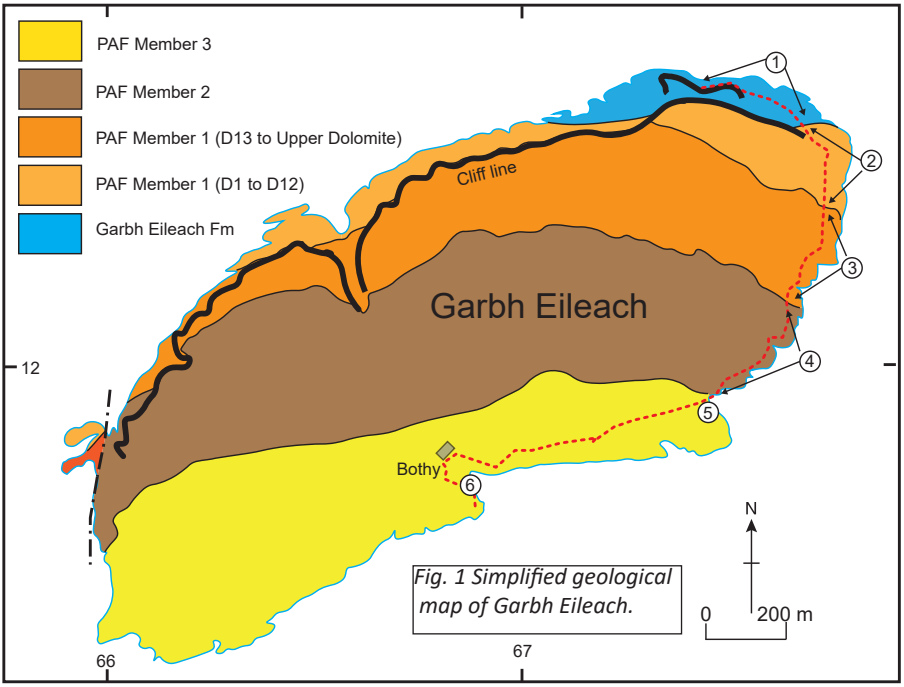


Fig. 1 Simplified geological map of Garbh Eileach.

Garbh Eileach (Fig. 1) is the largest island in the chain and exposes the most complete succession (including the base of the PAF) so its a logical place to start. Ninian landed us near the start of the route using the purpose built landing craft 'Trudy'.

Locality 1 The Garbh Eileach Formation [NM 6747 1269] to [NM 6768 1261]

About 70 m of the GEF are exposed below the PAF, dipping at about 30^{O} S and have been divided into 48 numbered beds. We started at Bed 8, brown dolomitic siltstones with grey calcitic stromatolites (Fig. 2). A large variety of sedimentary features were observed as we walked SE up the stratigraphy including desiccation cracks, ripples, anhydrite psuedomorphs (Fig. 3) and a puzzling vertical sandstone dyke. Bed 20 marks the last grey limestone. Carbon isotope values (d13C) are negative (the 'Garvellachs Anomaly') until Bed 39, where detailed sampling has revealed a sharp shift to positive

Fig. 2. Stromatolites at Locality 1

Fig. 3.Anhydite pseudomorphs at Locality 1.

Fig. 4. Bed 39 of the Garbh Eileach Fm. Arrow marks possible 'Golden Spike' location.

Fig. 5. Brecciated horizon at top Bed 47.

values within the bed. This cross-over point (arrow on Fig. 4) is a potential location for the base Cryogenian GSSP (Golden Spike). Bed 47 is a dolostone with a pronounced brecciated top (Fig. 5), marking the first definitive signs of glaciation, although there is some evidence of small dropstones in underlying beds.

Locality 2 PAF Member 1 (D1-D12) [NM 6768 1261] to [NM 6775 1241]

Diamictite beds in the PAF have been numbered D1, D2 etc. Twelve brown dolomitic diamictite beds can be identified along this section of coast. As the diamictites contained original clay minerals they now show a cleavage (Fig. 6), which is invariably steeper than the bedding. Some evidence of glaciotectonic shearing is evident as well as interbeds of sandstone (Fig. 7).

Fig. 6. Bedding and (steeper) cleavage well demonstrated in D1 of the PAF. Locality 2

Fig. 7. Top D5/Base D6 with thin intervening sandstone. Locality 2.

Fig. 8. Megablocks of dolostone in D13. Locality 3.

Fig. 9.Clasts in Fe-siltsones of the Disrupted Beds. Locality 3.

Fig. 10. Wedges in top D15. Locality 3.

Fig.11. Upper Dolomite at top of Member 1. Locality 3 (end).

Locality 3 PAF Member 1 (D13-UpperDolomite) [NM 6776 1239] to [NM 6767 1218]
A cleft in a ridge marks the base of D13 (the Great Breccia), here comprised of blocks of dolomitic material (probably originating from consolidated dolostone beds of the Garbh Eileach Formation in a matrix of dolomitic diamictite material probably derived from D1 to D12. A glaciotectonic origin is likely. On the south side of the cleft two particularly prominent 'megablocks' of dolostone are evident. Participants 'chalked' the outlines of these which Tony likened in size to a 'bathtub' and a 'caravan' (Fig. 8). The next bed is the Lower Dolomite, not particularly well exposed here (but to be seen better on the other islands). The Disrupted Beds above (Fig. 9) are better developed elsewhere but are distinctive with ferruginous siltstones, concretionary dolomite and a wide variety of clasts, mostly dolostone and metamorphic schists, gneisses and what suspiciously like a piece of 'Torridonian' grit. Thin diamictites correlated to D14-D18 lie above and one bedding plane (top D15) displays prominent periglacial wedge fills (Fig 10). Succeeding these is a bed of dolstone - known as the Upper Dolomite (Fig. 11) which marks the top of Member 1.

Locality 4 PAF Member 2 [NM 6767 1218] to [NM 6750 1194]
A thick succession of distinctly grey diamictites with only thin interbeds comprises Member 2. Features such as lag conglomerates (Fig. 12), periglacial involutions (Fig. 13), hydrofractures (Fig. 14), and varved siltstones (Fig. 15) make this a fascinating section to examine.

Fig.12. Lag conglomerate of granitic clasts. Top D26. Locality 4.

Fig. 13.Involution fold in D25. Locality 4.

Fig. 14.Hydrofracture. Locality 4.

Fig. 15.Varved siltstones at top of Member 2 at the end of Locality 4.

Locality 5 PAF Member 3 - Sandstones [NM 6748 1191]

The bay here exposes a thick bed of 'white' quartz cemented sandstone with obvious large-scale cross-bedding (Fig. 16). These are interpreted as having been deposited in a marine tidal deltaic setting. The route turns inland and follows faint paths essentially along strike, heading west for about 500 m to the old bothy.

Locality 6 PAF Member 3 Diamictites [NM 6684 1174]

South of the bothy there are a number of ridges of diamictite running eastwards with nice clean dip-slopes where granitic boulder pavements are very obvious (Fig. 17). It is thought that these lags are produced by wind erosion transporting fines. This suggests arid conditions. These fine particles (like loess) fill the periglacial cracks to form the polygonal sand-filled wedges.

Fig. 16.Cross-bedded sandstones at the base of Member 3 at Locality 5.

Fig. 17. Lag conglomerate of grantic clasts at Locality 6 near the bothy.

Day 2. Sunday 12 May - A'Chuli

We were landed via Trudy at the extreme NE end of the island (Fig. 18). The aim was to spend the day on the rock platform on the NW coast and end up at the SW tip then walk back over the centre of the island.

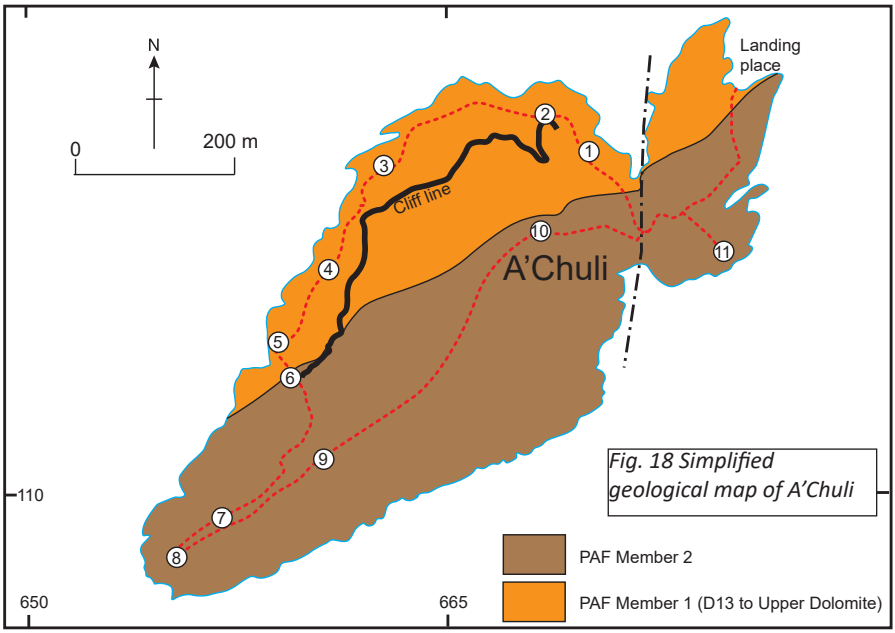


Fig. 18 Simplified geological map of A'Chuli

We passed over outcrops of M1 and M2 on the western peninsula knowing that we'd see plenty of these rocks in better context later. We crossed a small beach with a fault separating the peninsula from the main island.

Locality 1. Disrupted Beds [NM 6566 1140]

Blue-grey Fe-siltstones and concretionary dolomite. Classic Disrupted beds (Fig. 19).

Locality 2. Great Breccia [NM 6563 1144]

100% outcrop and passed over Main Dolomite onto the Great Breccia (Fig. 20). Just to

Fig. 19.Disrupted Beds at Locality 1.

Fig. 20. Matrix of Great Breccia at Locality 2.

the NW is a large dipping megablock (aka a 'raft') of mudstone/dolostone derived from the pre-PAF stratigraphy somewhere (Fig. 21). The rock platform from here westwards for the next 200 m or so is comprised of the Great Breccia with a number of these 'rafts' (Fig. 22). The rock is very sharp!

Fig. 21. Dipping megablock in Great Breccia.

Fig. 22. Great Breccia on wave-cut platform.

Locality 3 Large Megablock in Great Breccia [NM 6542 1138]

The large megablock (Fig. 23) is approximately oval shaped (120x50m) and comprises folded and faulted strata which from lithological and carbon isotope data can be matched to the Garbh Eileach Formation. There are also some diamictite beds within it and it is cut by a 10m thick Carboniferous dolerite dyke. From this point the platform exposes successively younger rocks.

Locality 4. Big Boulder Conglomerate and Main Dolomite [NM 6536 1127]

This unusual bed (Fig. 24) occurs somewhat sporadically across the island at the top of the Great Breccia, it probably has a glacitectonic origin. A few metres further SW it is overlain by an apparently structureless cream dolostone bed - the Main Dolomite.

Crossing over the Main Dolomite the overlying Disrupted Beds - which are spectacularly seen in the cliffs above (Fig. 25) - are encountered on the wave-cut platform (Fig. 26).

Fig. 23.Folded and faulted megablock in Great Breccia at Locality 3.

Fig. 24. Big Boulder Conglomerate at Locality 4.

Fig. 25. Cliff of Disrupted Beds over the Main Dolomite en-route to Locality 5.

Fig. 26. Disrupted Beds at Locality 5.

Locality 5. Disrupted Beds [NM 6530 1118]

More ferruginous siltstones, concretionary dolomite and clasts. The combination of high iron and magnesium suggests a marine setting with high Mg and Fe contents. Speculation that the iron precipitation was as a result of fresh oxygenated water from a melting glacier mixing with this unusual sea-water - which may have been separated for a long period from the atmosphere by sea ice. Some inconclusive discussion about whether some small-scale fold features were later tectonic deformation or syn-depositional glaciotectonic shears or even slump folds. The cliffline becomes lower at this point and about 100 m Se the beds above the Disrupted Beds are well exposed, including diamictites of D14-D18 - which are thin and either amalgamated or some are not present. The topmost diamictite is overlain by the Upper Dolomite

Locality 6. Upper Dolomite and base Member 2 [NM 6532 1115]

The Upper Dolomite here (Fig. 27) is overlain by a very uneven bed of red-brown diamictite which appears to be the basal part of a thick grey diamictite - D19. The latter is the basal bed of Member 2 and the red-brown material at the base is thought to be glaciotectonically-incorporated diamictite material from underlying Member 1. We then walked through Member 2 diamictites to towards the SW tip of the island.

Locality 7. Member 2 [NM 6524 1097]

This locality exposes some finer grained diamictites (D24) with cleavage and sand injection/wedge features as well as probable glaciotectonic folding (Fig. 28).

Fig. 27. Upper Dolomite with red-brown diamictite at base of Member 2. Locality 6.

Fig. 28. Diamictite D24 with cleavage, injection features and folds. Locality 7

Fig. 29.Involution folds in D26 at Locality 8.

Fig. 30. Involuted horizon (D26) at Locality 9.

Locality 8 Member 2 Involutions [NM 6519 1093]
In about 100 m further SW near the tip of the Island a diamictite bed (D26) containing perplexing fold features was encountered (Fig. 29). These became easier to see following a chalking exercise and were interpreted as periglacial involution folds.

Locality 9 Member 2. D26 Involution horizon [NM 6536 1105]
Retracing steps NE this same bed was followed along strike to Locality 9 (Fig. 30) where the cleaved silty bed was seen again with the involuted D26 bed above.

Locality 10. Top of hill [NM 6560 1131]
We then climbed to a high viewpoint on the island and had a great view looking NE to Garbh Eileach where the 'giant' cross-beds of Member 3 are well-exposed (Fig. 31)

We crossed back onto the NE peninsula and had a chance to examine some more Member 2 diamictites near where Ninian was planning to pick us up in Trudy.

Locality 11. Member 2 [NM 6585 1139].
Dolomitic diamictite clasts in grey D26 diamictites plus some wedges.

Another great meal, more whisky and more geological chat rounded off a memorable day.

Fig. 31. View to Garbh Eileach from Locality 10

Fig. 32.Diamictite clasts in D26. Locality 11

Day 3. Monday 13 May - Eileach an Naoimh (Holy Isle)

The aim of the day was to land at the monastic centre with its chapel and beehive cells and walk to the extreme SE tip of the island. We hoped to view the west coast from the boat on the return to see the spectacular folded megaclast known as the The Bubble'.

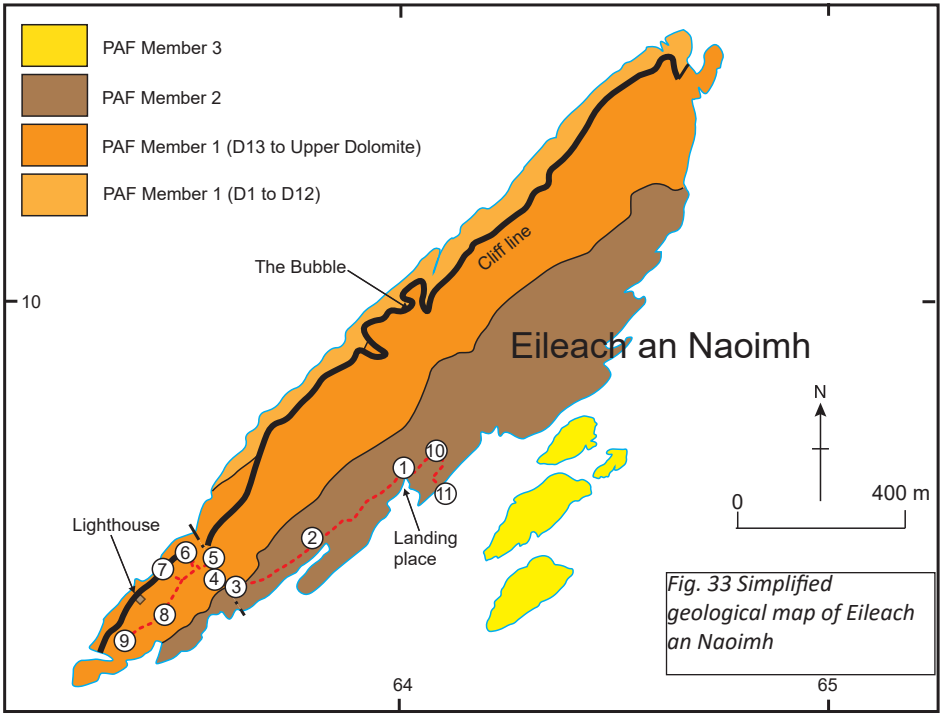


Fig. 33 Simplified geological map of Eileach an Naoimh

Locality 1. Monastery. [NM 6403 0975]

Ninian landed us using Trudy below the monastery area. The walls of the chapel (Fig. 34) are interesting in that they are not local PAF sandstone or diamictite but mainly bedded 'flaggy' sandstone (Fig. 35), probably from the Ardrishaig Phyllite on the mainland.

Fig. 34. The chapel on Holy Isle.

Fig. 35.'Flaggy' sandstone blocks in the chapel walls.

We followed a path SW past a old ruined building and onto a ridge overlooking an inlet

Locality 2. Wedges on top D22 [NM 6382 0944]

The rock slope down to the inlet is the dip slope of the top of D22. It is covered in spectacular sandstone wedges arranged in polygonal patterns, probably the best examples in the islands (Fig. 36).

Fig. 36. Polygonal wedges on top D22 at Locality 2.

Fig. 37. Possible stromatolitic layering in the Upper Dolomite at Locality 3.

Following a rough path past some small pools we started going down the stratigraphy and encountered the Upper Dolomite.

Locality 3 Upper Dolomite [NM 6363 0934]

A laminated dolostone with suggestions of stromatolitic layering (Fig. 37). We then followed a prominent NW-SE trending fault gully past a thin development of Diamictites D14-18 until we reached a spectacular exposure of the Disrupted Beds, perhaps the best in the islands.

Locality 4 Disrupted Beds [NM 6360 0937]

Beds of ferruginous siltstone with clasts (Fig. 38), very irregular dolomite layers with some folding (Fig. 39) and beds dominated by clasts (Fig. 40), some metamorphic, some red metamudstone and sandstone (Torridonian-like?).

Fig. 38. Disrupted Beds at Locality 4. Fe-siltstones and concretionary dolomite.

Fig. 39. Cliff of Disrupted Beds at Locality 4.

Fig. 40. Clast-dominated Disrupted Beds at Locality 4.

Fig. 41. The Main Dolomite at Locality 5. Foresets of detrital dolomite.

We crossed over the fault gully and looked at the cliff opposite (Fig. 41).

Locality 5. Main Dolomite [NM 6358 0940]

The best exposure of the Main Dolomite. Massive beds, brecciated beds, foresets, (Gilbert-style delta), conglomeratic in parts. A lot going on (Fig. 42). Probably fluviatile reworking of earlier dolomitic material from D13?

We nipped up a short slope and had lunch overlooking the sea and looking down on the extensive wave-cut platform below.

Fig. 42. Foresets in the Main Dolomite at Locality 5.

Locality 6. Megaclasts in Great Breccia [NM 6353 0940]

The platform below the viewpoint exposes the Great Breccia underlying the Main Dolomite (Fig. 43). A megablock of white dolostone (derived from pre-PAF strata) is evident (Fig. 44). No lithologies like this are seen in the exposed Garbh Eileach Formation on the islands so it must have been quarried from deeper in the succession.

Fig. 43. The Great Breccia below the Main Dolomite from Locality 6.

Fig. 44. Megablock of white dolostone in the Great Breccia at Locality 6.

A broad valley leads SW and after 50 m or we climbed up a grassy break in the right-hand ridge to a cleft in the cliff-line overlooking the sea (Fig. 45).

Locality 7. The Lighthouse Breccia [MN 6348 0937]

The cleft is formed by the erosion of a basaltic dyke. There were some iron pegs in the cleft as it continued down to the sea and Tony explained that the lighthouse keepers used to carry gas bottles up the cliff here! The Great Breccia is exposed here and the topmost part of it is highly brecciated and has been termed the Lighthouse Breccia (Fig. 46). It is interpreted to have been developed during an extensive period of severe periglacial conditions. The Great Breccia was formed by immense ice movements and created a complex topography. These 'gelifluctite' breccias (sometimes referred to as 'head') were developed as the weathered material slowly moved downslope. The Great Breccia/Lighthouse Breccia combination is arguably the best evidence we have in the PAF for a possible 'Snowball Earth' event , with the overlying Main Dolomite/Disrupted Beds succession being the result of melting into a sea that had been ice-covered for a long period. In all a good place to reflect on the Snowball Earth story and how the rest of the PAF fits into the picture.

Fig. 45. The top of the Great Breccia at Locality 7. The upper part is brecciated.

Fig. 46. The Lighthouse Breccia was developed during severe periglacial conditions.

Returning to the valley and continuing SW for another 100 m or so there was a narrow gully on the left, opposite the lighthouse. The gully exposes more Disrupted Beds on both sides (Fig.47).

Locality 8 Disrupted Beds [NM 6347 0928]

The bands of dolomitic concretions have some pronounced fold features and the consensus here was that this was a Grampian tectonic fold as axial planar cleavage had been developed.

*Fig. 47. Disrupted B**eds at Locality 8 with** tight isoclinal folds and axial planar cleavage.*

Fig. 48. Band of iron-rich siltstone in the Disrupted Beds at Locality 9.

A further 100 m to the SW near the tip of the island there were more exposures of the Disrupted Beds and the succession below them to the NW through the underlying Main Dolomite, Lighthouse Breccia and the Great Breccia with more megablocks.

Locality 9 Fe-Beds [NM 6338 0922]

The main interest here, however, is a band of very iron-rich siltstone mostly hidden in rock pools (Fig. 48), it is very dark and iridescent with angular dolomite fragments.

We then retraced our steps back towards the chapel, picked up the lifejackets and en-route to a pick-up point visited the beehive cells (Fig. 49). Unlike the chapel the walls are made of local rocks.

Locality 10 Beehive Cells [NM 6412 0971].

Next to the cells is a unusual abandoned sea-stack (Fig. 50). This is the involuted horizon seen on A'Chuli at top D26.

Fig. 49. The beehive cells made of local rocks.

Fig. 50. Sea stack of D26 involutions.

We then followed a path SE for 100 m and crossed onto bare rock slabs where Ninian was due to pick us up.

Locality 11. Member 2 [NM 6410 0959]

The seaward sloping slabs are Diamictite D28/29 of Member 2 (distinguished by its grey matrix colour) and it contains large megablocks of red-brown dolomitic diamictite which is very similar in colour and clast content to Member 1 diamictites.

Ninian picked us up using Trudy for the last time and the big boat took us back to Cuan via 'The Bubble' (photo on cover). This isoclinally folded megablock is mainly white dolostone derived from unseen pre-PAF strata.

Fig. 51. Megablock of a Member 1 diamictite in D28/29 diamictite at Locality 11.

Strathclyde Geoconservation Group Report

The office bearers have not changed and Margaret Greene (MG) remains chairperson, David Hamilton (DH) remains as Treasurer and Barbara Balfour (BB) as Secretary. Maggie McCallum is in charge of website matters and Margaret Anderson in charge of archives. The attendance at meetings is usually 6 to 8 people. The meetings have all been on Zoom. There are 36 names on the SGG mailing list. One person has asked to be taken off the mailing list but two new people have been put on.

Leaflets/Booklets/Geology Walks:

Leaflets:

Campsie Glen	2024 version	Completed and distributed
GU Building Stones	2024 version	Completed and distributed
Dumbarton Rock	2024 version	Completed and distributed
Portencross	2024 version	Completed
Kelvin Walkway Trail	New in 2024	Completed and distribution in hand
Linn Park	New in 2024	Near to completion
Kelvin Country Park	In progress	
Glennifer Braes	In progress	
Pavement Geology	In progress	
Mugdock Park I	In progress	

Flier:

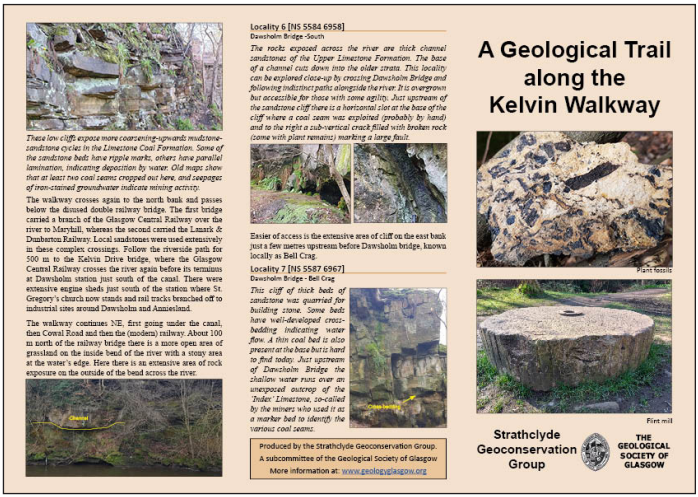
Calderglen Country Park	2024 version	Completed and distributed

Reprints:

Calderglen

Walks:

Carron Glen	April 2024	Hosted by Paul Carter
Dumbarton Rock	April 2024	



Dumfries and Galloway:

Daria Zandomeneghi DZ met with Dumfries and Galloway Council with regards to investigating what geological information they held, if any. The Planning Dept. showed interest in geodiversity and possible commitment to local geodiversity sites being included in next Local Development Plan. DZ identified 14 sites and has visited some. SGG has been supportive of DZ as she is working alone.

Fossil Grove:

Progress on FG with regard to the upgrade work, to be financed by the Glasgow Council grant, has been slow. David Webster DW had hoped work would have started by September/October but no scaffolding has yet been erected. However this has allowed FG to be open on five Sundays this season, have a visit from 25 students from GU Geography Dept., supported Victoria Park Summer Fun Day and also be open as part of the Glasgow Science Festival. SGG volunteers once again 'manned' the FG itself and outside SGG had stalls where children (and some adults) were entertained/educated in geological matters. These activities have been very popular with the public as have the fliers and leaflets that are available.

Local Authorities:

MG continues to keep in touch with Renfrewshire Council re. Biodiversity Action Plan which contains some geology.

North Ayrshire Council had a number of years ago been sent 22 sites that Dr Chris Burton had compiled but the council appear to only have seven. MG has the original information on a CD disc which are not now compatible with modern computers but DW has offered to help with this as the information is useful for the Geosites Project (see below).

Paul Carter PC and Mike Browne MB have completed the write up and photos of sites in Falkirk District and these have been submitted to the Biodiversity Officer for inclusion into Local Plans and a Geodiversity Audit Report. PC and MB have now completed all the site assessments they intended to do, documenting geology sites in North Lanarkshire, South Lanarkshire and Falkirk Council areas and submitting them to appropriate Biodiversity Officers. BB on behalf of SGG, typed the majority of this work. It is hoped sometime in the future this work can be put onto the Geosites Project.

Scottish Geology Trust and Geosites Project:

DW is promoting the Geosites Project to SGG but there are so few 'active' members that volunteers are really required from elsewhere.

Change of SGG Secretary:

BB gave notice earlier in the year that she wished to 'retire' as SGG Secretary after 11 years at the post. BB will finish at the end of 2024. In the interim, MG has said she would write up the Minutes if another member would take the notes.

Margaret Greene
sgg@gsocg.org

Library Report

Library

This year contact has been made between the society and Glasgow University Library to explore the possibility of the society donating some or all of our library collection. We have an extensive collection of important historical and in some cases valuable texts which we feel deserve to be preserved for the future in the best possible way but also to be utilised by the wider scientific community as well as GSG members. GUL have safe, temperature controlled storage for these books which would then be made available via an online catalogue to teaching staff, researchers and students worldwide. A number of the rarer texts have been identified for possible transfer and work with the university continues. These books will still be accessible to members via your free Glasgow university library membership and we would like to take this opportunity to remind you that a highlight of your membership of GSG is that it also includes free membership of the main Glasgow University Library situated in Hillhead Street. Please do take advantage of this!

Access to our library in the Molema building remains an issue with the room also being used for teaching during term times but a copy of our catalogue can be obtained by emailing library@gsocg.org and an arrangement will be made to collect/return any books you would like to borrow.

We have purchased 2 hard-back copies of newly released "The Geology of Scotland 5th edition" which are now available for members to borrow on request. We have a number of hardback copies of Geological Society Proceedings some dating back to 1800s, London, Yorkshire, Liverpool & Manchester, GA, etc and Paleontological Society and Scottish Journals dating back to 1970s all looking for new homes. If anyone is interested in these please get in touch.

Lindsay Smith
library@gsocg.org

Publications Report

Books and Publications

The bookshop list was reduced after rationalisation and devaluation of inactive stock.
https://geologyglasgow.org.uk/about/bookshop/

All copies of all the societies newsletters, billets and Proceedings have now been digitised and stored in the National Libraries of Scotland (up till November 2024).

25 books were sold by the Society

One set of book donations have been received this year, and these were given away at various events

Gary Hoare
books@gsocg.org

Website Report

Session 166 was one of consolidation for the website, following the return of the society's activities to normal after the Covid-19 pandemic. The site continued to publicise the society's activities, promote the geology of the Glasgow area and report geological developments and discoveries on local, international and even extraterrestrial scales.

The Geoconservation section was enhanced by the addition of a new page about the Scottish Geology Trust's Geosites project and several new leaflets produced by the Strathclyde Geoconservation Group.

A new set of extracts from the society's proceedings for significant anniversary years (150 years ago to 25 years ago at 25 year intervals) was added to the Archive section. Our thanks are due to the society's honorary archivist Margaret Anderson for preparing all the anniversaries material for the past 10 years. The Archive section and the Society Presidents page are well worth exploring for the fascinating insight they give into the society's history.

After the website was launched in January 2011, the traffic to it increased steadily until Session 162 (2019-2020), but during Session 163 (2020-2021) there was a major increase in the number of visits, probably reflecting the Covid-induced restriction of outdoor activities. Sessions 164 and 165 saw a return to the previous trend, but Session 166 has seen a slight reduction in traffic to the site. During Session 166, there were 70,724 visits to the site, a decrease of 1.8% from the total for Session 165 (71,991). The number of visitors, as opposed to visits, was 58,363, a decrease of 5.7% from the total for Session 165 (61,694).

The decrease in visits in Session 166 was solely the result of decreased traffic from abroad, as the traffic from the UK actually rose. The number of visits from the UK was 15,766, 22.3% of the total visits and an increase of 30.9% from the UK visits for Session 165 (12,040). Outside the UK, the three most productive countries were the Philippines with 16,753 visits (20,097 in Session 165), Hong Kong with 9,616 (no figure for Session 165) and India with 5,837 (7,108). Thus the UK was second in the league of source countries in Session 166, the same position it held in Session 165. Within the UK, England accounted for 8,336 visits (6,798 in Session 165), Scotland for 6,718 (4,741), Wales for 289 (237) and Northern Ireland for 252 (189).

London was the most productive city within the UK, with 3,756 visits (3,045 in Session 165), followed by Glasgow with 2,246 (1,688) and Edinburgh with 996 (635).

The most popular part of the website was again the Local Rocks section, with the Rock-forming Minerals page accounting for 23.6% of page views, followed by the Rock Cycle page (19.3%) and the Igneous Rocks page (5.1%). Other popular pages were the website's Home page (17.0%), the Arthur Holmes page (2.4%), the Events page (1.0%) and the Local Sites of Interest page (0.9%).

By far the most productive source of traffic to the website was the Google search engine, which was responsible for 47,547 visits or 67.2% of the total number (60,082, 83.5% in Session 165). The next most productive was direct logons to the website,

which produced 19,202 visits or 27.2% of the total (9253, 12.9%), while the search engine Bing produced 798 visits or 1.1% of the total (798, 1.1%). The DuckDuckGo search engine made its first appearance in the annual figures, with 234 referrals (0.3% of the total). The majority of the remaining visits resulted from referrals from social media or other websites. The most productive source of referrals was Facebook with 411 referrals or 0.6% of the total visits (411, 0.6% in Session 165), while WebCollect also made its first appearance with 131 referrals (0.2% of the total visits). The Arran Geopark website produced 115 referrals (no figure for Session 165).

In addition to the website, the society uses its Facebook page and X (formerly Twitter) account (@GeolSocGlasgow for both) to engage with the public. Both of these have been steadily gaining in popularity. The Facebook page now has 278 followers, 48 more than a year ago, and the X account now has 497 followers, 24 more than a year ago. The society is presently considering moving from X to a different social media platform, but, if you have a Facebook account, please "like" and share any society posts that you find particularly interesting.

In my role as webmaster I have been assisted by Maggie McCallum, who looks after the Geoconservation section of the website, and I am grateful for her continuing support.

Bill Gray
web@gsocg.org

Scottish Journal of Geology

During session 166 the publishing agreement with the Geological Society of London was renewed and updated. The editorial board is implementing new ways to attract more submissions in a very challenging publishing world.

The departing Editor-in-Chief, Colin Braithwaite, was presented with a gift from the two societies as thanks for his long service to the Journal at the recent launch of the new "Geology of Scotland" book.

Hard-copy prints of the Scottish Journal of Geology are no longer being distributed by the Geological Society Publishing House, however, under the new publishing agreement with the Edinburgh and Glasgow Geological Societies a printed version of volume 60 Parts 1&2 can be purchased for £10 (online access continues to be free for members at https://geologyglasgow.org.uk/lyell-collection/

Gary Hoare

Obituary: Professor Euan N. K. Clarkson

1938-2023

Euan Clarkson at Girvan in 2006. Photo by David Harper.

Euan Clarkson was an internationally renowned palaeontologist, a tremendous advocate for his science and a good friend to the Geological Society of Glasgow. He was awarded the Society's T. Neville George Medal for his outstanding contributions to palaeontology in 1999. He gave lectures to the Society on trilobite eyes and on the remarkable trilobite faunas of the Cambrian Alum Shales in Scandinavia and was one of the speakers at the Society's 150th Anniversary Symposium in 2008. He led or co-led excursions to Dob's Linn (twice), North Berwick, the Pentland Hills, the Hagshaw Hills, Lesmahagow and Thirlestane Score.

Euan graduated with a BA (1960) and a PhD (1964) from Cambridge University and spent his entire career at Edinburgh University from his initial appointment as Assistant Lecturer in 1963, to becoming Professor in 1998 and Professor Emeritus when he retired in 2002. He was awarded a DSc by the University in 1983. He was an enthusiastic and stimulating teacher in the lecture theatre, laboratory and the field. He considered his students to be his top priority but the quality and significance of his considerable research output is unquestionable.

The study of trilobite eyes, with their lenses of calcite, was a major part of Euan's PhD work and remained an important research theme throughout his career. Initially working alone and then with an expanding field of collaborators from a range of disciplines, he made considerable advances in the understanding of the structure and functioning of the eyes of trilobites and, more recently, those of other fossil arthropods. He also investigated other aspects of the functional morphology, ecology and evolution of trilobites and he described species from every geological period from the Cambrian to the Carboniferous and from many parts of the world. His attention to detail enabled him to study the development through life of some species (ontogeny) as shown by their successive moult stages; from larvae to fully grown individuals. Such

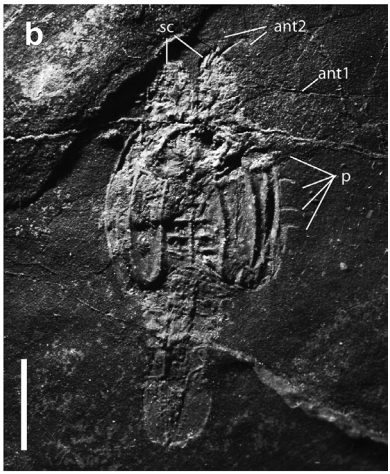
work included beautifully executed drawings that testify to his considerable artistic talents.

Euan's palaeontological works extended well beyond trilobites. In the citation for the T. Neville George Medal, Dr Chris Burton remarked '"….he appears to have published on seemingly everything that swam or crawled in the Palaeozoic oceans". An exaggeration, but a good reflection of the breadth and depth of Euan Clarkson's palaeontological knowledge. This was most clearly evident in his highly acclaimed book *Invertebrate Palaeontology and Evolution,* which went through four editions (1979-1998) and became the standard textbook in many institutions around the world.

Euan made important contributions to the understanding of the Palaeozoic geology and fossils of Scotland resulting from extensive (greatly enjoyed) fieldwork programmes. His expertise and knowledge led to his co-editing geological field excursion guides to the Lothians and Scottish Borders and co-writing two books on the geology of these areas. He undertook collaborative research on fossils from the Ordovician of Girvan and instigated collaborations with a wide range of experts in the investigation of shelly and microfossil faunas in the Ordovician of the Southern Uplands. These included faunas transported in mass flow deposits from their original habitats and, more intriguingly, fossils in limestone clasts in conglomerates eroded and transported from a now 'lost' rock succession.

The Pentland Hills were used extensively as a laboratory for teaching students and as a source of diverse Silurian research programmes almost from Euan's arrival in Edinburgh when he embarked on a career-long journey through their geological and natural histories. He elaborated on these researches in his lucid, very personal, style in his 'Pentland Odyssey' published in volume 36 of the Scottish Journal of Geology. Not only did he catalogue his own achievements but also those of others who he introduced and enthusiastically supported in their own work on this key piece of Scottish Siluria. These many research strands were documented in the Palaeontological Association's 2007 Field Guide to the Silurian Fossils of the Pentland Hills. Much more than a field guide, this state-of-play account of the geological and palaeontological investigations (most initiated by Euan himself) in these rolling hills involved some 18 colleagues in covering all fossil groups. It is a testament to both the significance of the fossil material and Euan's enthusiasm, international stature and persuasive demeanour.

A significant departure from the Lower Palaeozoic rocks and fossils was a major collaborative project initiated in the early 1980s when Euan began to look for Carboniferous crustacean localities in the Midland Valley of Scotland mentioned by Peach in 1908. The work included one of the most detailed descriptions of a Carboniferous crustacean ever completed and significantly advanced the understanding of the early evolution and palaeoecology of these rarely fossilized organisms. Whilst engaged in this project, Euan came across a strange worm-like fossil in collections from the Granton Shrimp Bed at the Geological Survey premises in Edinburgh. It did not take long for him to realise that it was the first ever recognised complete remains of the most enigmatic of fossil organisms – the conodont animal.



Schramocaris clarksoni from Glencartholm:

Euan continued his association with the exceptionally preserved Lower Carboniferous faunas for many years, publishing over 20 related papers. In recognition of his work on Carboniferous crustaceans, one was named in his honour: *Schramocaris clarksoni.*

Euan Clarkson was elected a Fellow of the Royal Society of Edinburgh in 1984 and was an editor for its Transactions including volumes from conferences that he co-convened. Among his many wider contributions to science were his roles as an editor of the Scottish Journal of Geology (1978-1983), President of the Palaeontological Association (1998-2000) and of the Geological Society of Edinburgh (1985-1987) and Trustee of the Natural History Museum, London (1987-1992). In addition to the T. Neville George Medal, he was awarded the Clough Medal of the Edinburgh Geological Society (1993), the Keith Medal of the Royal Society of Edinburgh (1997), the Coke Medal of the Geological Society (2010) and the Palaeontological Association's Lapworth Medal (2012). His considerable scientific contributions, his infectious enthusiasm and the encouragement that he provided to students, professional palaeontologists and interested amateurs all contribute to the wide and lasting impact made by Euan Clarkson who will be very sadly missed.

Alan Owen
Neil Clark
David Harper

Roy Smart

Robert (Roy) McLeod Smart, retired civil servant passed away aged 95 on 28.10.24. Funeral service took place at Clydebank Crematorium, on Tuesday 19th November. He was Society member no 1283 joining in 1991. From 1994 to 2007 he was the Society's Publications Officer. He remained a member of the Society until 2023 i.e. 32 years.

His son has contacted the Society and he has asked that if any member has memories and/or photographs of him. If so please send to sec@gsocg.org

A Strathclyde Geoconservation Group visit to Dumbarton Rock to examine the rocks, check access, update the leaflet and enter information in the new Geosites database.

THE GEOLOGICAL SOCIETY OF GLASGOW

Edited by D J Webster.
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www.geologyglasgow.org.uk