The Edinburgh Geologist

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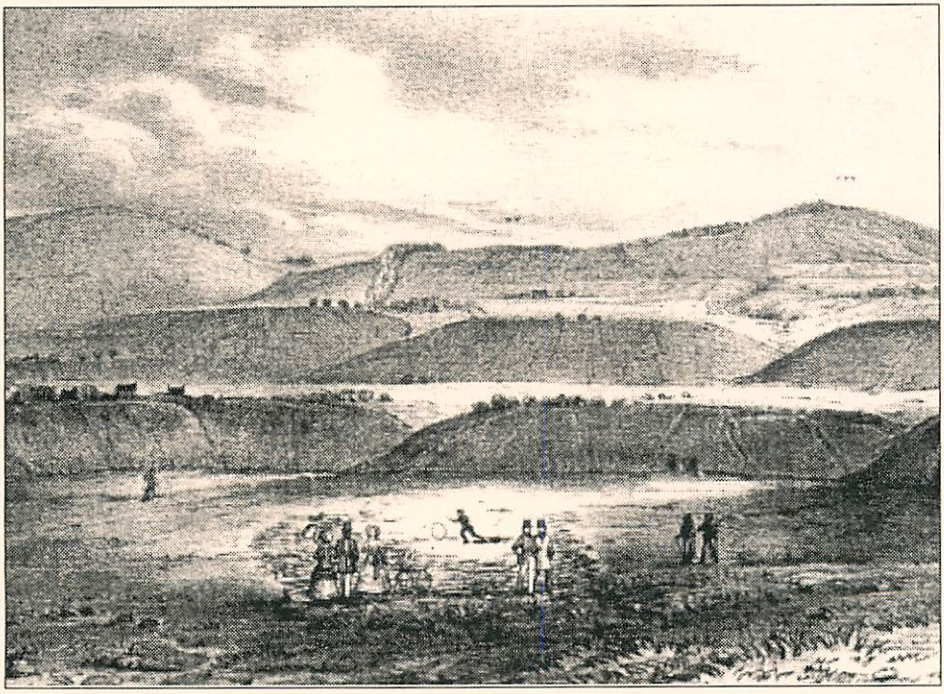

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Cover illustration

The cover shows a nineteenth century view westwards from St. Andrews Links. The engraving illustrates the raised beaches that so intrigued Robert Chambers.

The engraving was originally published in Chambers, 1872.

For further information, turn to the article by Michael Taylor on page 32.

Acknowledgements

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Editorial

by Alan Fyfe

This summer, despite unseasonably cold weather, I found myself standing on a beach watching the waves breaking on the shore. The swash, as water was carried up the beach, was followed by a backwash and on each water movement, the shelly sand was carried back and forth. As the tide went out, we were left with those familiar ripple marks on the beach. I recalled the time when I was in my first year of geology, learning that the present is the key to the past. I still find it remarkable that everywhere we look, we cannot help but see geological processes and rocks in the making.

Imagine, then, feeling and hearing rocks in the making. That is what happened to Eileen Holttum on a walking and camping trip in the Highlands and in this issue, she gives us a first hand account of the Shiel Bridge earthquake of 3rd May this year.

Peter Dryburgh has written to me about another kind of geology in the making. He tells readers of the synthetic production of minerals for use in technological applications. I hadn't realised that we could manufacture quite so many otherwise naturally-occurring substances. This and another letter are at the end of the issue.

Peter has also given me this issue's main article, a biography of the mineralogist and geologist, Matthew Heddle. The story of how Peter set of in quest of Heddle's history is almost as fascinating as the history itself. He takes us through a tale of violence by Jacobites and Hanoverians, by teachers at the Edinburgh Academy, and in the pursuit of mineral extraction.

I was inundated with correspondence over the Song of the Moine Thrust. This takes us far beyond another Poetry Corner and rather into a fascinating detective story. My thanks to all who have contributed and in particular to Anne Burgess and Dorothy Forrester for their translations and to Sinclair Ross, who has brought it all together.

I sometimes worry that we have too many historical articles but, despite that, I am pleased to say that we have another contribution by Mike Taylor, this time on the Robert Chambers, whose bicentenary is celebrated this year along with that of Hugh Miller. The two men have a good deal in common. Chambers too held down a day-job in publishing but was most passionate in the field of geology and evolution.

But this issue is not totally dominated by nineteenth and twentieth century geologists. Dan Evans, Colin Graham and Heather Stewart bring us up to date with an article on the Millennium Atlas, published this year. This is a major modern work on thegeology of the central and northern North Sea. I doubt that many of you will consider buying an individual copy: it is expected to weigh about 9 kilograms! But there will be a copy in the library at Murchison House and Fellows may look at it there.

Editorial

Another twenty-first century article is that by Diane Mitchell and me on the new Geological Society web site. There may be some of you who have not looked at it yet, but the average number of visits to the site is around a thousand per month, so someone must be looking at it! If you have not browsed there, you should do so. If you have no computer of your own or are not connected to the Internet, take our advice and get yourself and a computerate friend down to an Internet Café.

In the regular series of articles, this issue's WHAT'S IN A NAME? comes from Allen Fraser who tells us about Norn names used in Shetland. This was originally prompted by the red rocks article in last autumn's issue. Allen had sent it in as a letter for the Spring issue, but I persuaded him to expand it into a full article and here it is.

This issue's GEO-VINEYARDS is based on a further label sent to me by Cliff Porteous. The original is magnificent and readers are advised to wait until this issue comes to the web site and look at it there for a full-colour version.

Lastly, I have another ROCKSWORD PUZZLE by Angela Anderson. Angela tells me she has recently obtained a new geological dictionary and she believes that future puzzles will benefit from it!

On the subject of puzzles, I am pleased to be able to tell you that there were two all-correct solutions to the Silver Anniversary Competition that appeared in the Spring 2002 issue. The winner, whose name was drawn out of the hat by the President, is David Ross. David will receive a copy of Alex Livingston's *Minerals of Scotland.*

I have been thinking about how I introduced this editorial. The rising sea destroyed the sand castle that we had built. But only on the surface: our digging is, I suppose, a form of bioturbation. Future geologists will surely wonder at the strange creatures that must have lived on beaches during one interglacial period in the middle of the Cenozoic Ice Age.

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The copy date for the next issue of *The Edinburgh Geologist* is St David's Day, Saturday 1st March, 2003.

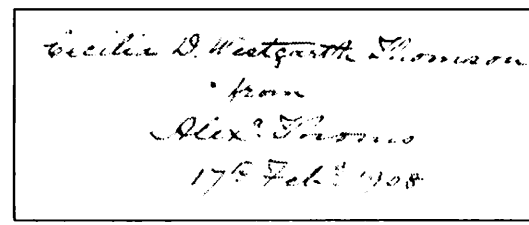
Matthew Forster Heddle and The Mineralogy of Scotland

by Peter Dryburgh

Introduction

In the nineteen-fifties, degree courses in geology at St. Andrews included some lectures by Harald Drever on the history of the subject. They provided an introduction to Neptunism, Plutonism and other early theories of the earth, as well as outlining the contributions made by such pioneers as Hutton, Werner, Hall, Playfair, Lamarck and Smith. Drever's lecturing style was rather measured and plodding so that when he treated a topic with explicit enthusiasm, it tended to catch the attention and stay in the memory. When he discussed Heddle's famous book, *The Mineralogy of Scotland*, his admiration obviously overcame his normal reticence and he described the work in glowing terms and referred to it as 'the most comprehensive mineralogy of a single country ever written'. While Drever's lecture was still fairly fresh in my mind, a quirk of serendipity gave me the opportunity of acquiring a copy of Heddle's book.

In those days, John Macgregor of St Andrews Ltd. held auctions on Wednesdays at their premises in Market Street, now used by the company as a shop and restaurant. There were no classes on Wednesday afternoons so, while most of my fellow students were out playing rugby or hockey and inflicting minor injuries on each other, I often attended the auctions. Large collections of books appeared in many of the sales and, at one of them, I got the chance to buy a copy of Heddle's *Mineralogy* in excellent condition. There was a hand-written inscription on the title-page but I paid no attention to it at the time. Many years later, however, having just returned from a long EGS excursion to Shetland, I was checking a reference in Heddle and, for the first time, read the inscription carefully and was astonished to realise that the book had been presented by Alexander Thoms, Heddle's son-in-law, to Cecilia Westgarth Thomson. The book was published after Heddle's death and Thoms was responsible for its production as well as assisting J.G. Goodchild with the editing.



I made no real attempt to find out anything about Cecilia Westgarth Thomson but obtained some information about the Heddle family from local records in Orkney and visited Melsetter on the island of Hoy, Heddle having been born in Melsetter House.

Some further years elapsed until, in September 2001, Richard Batchelor led an interesting EGS excursion around St.Andrews and announced that one of Heddle's great-grandsons, Hamish Johnston, had corresponded with him. In answer to my enquiry, Richard quickly established from Mr. Johnston that Cecilia Westgarth Thomson was one of Heddle's daughters. By this time I was determined to discover as much as I could about Heddle, his work, his family and Goodchild, and this article summarises some of what I have learned up to now.

The Heddles, the Moodies and Melsetter

The family of Heddle, like many old Orkney families, is of Norse origin, although the name Heddill or Hedal was recorded by G.F. Black (1946) as being of local origin. The family is said to have held land in Harray and Stenness before 1303 and, according to David Balfour (1859), William in Hedal was one of the most prominent men in Orkney in 1424. Despite the existence of such an ancient pedigree, my brief account of the family of Matthew Forster Heddle starts with his grandparents, John Heddle and Elizabeth Flett, who were married in April 1772. John Heddle had the title 'Heddle of Cletts and Ronaldsay'. With an energy and dedication, notable even in the eighteenth century, John and Elizabeth produced 15 children, of whom Robert (born in 1781) became the father of Matthew Forster Heddle.

In 1769, some years before John Heddle's marriage, Major James Moodie became ninth Laird of Melsetter and inherited Breckness, Snelsetter Castle and Melsetter. He married Elizabeth Dunbar and had 6 children, the youngest of whom was Henrietta, later to become the wife of Robert Heddle. The Moodies, like the Heddles, were an ancient family and could claim to be able to trace their descent directly from Robert the Bruce as well as from the Kings of Norway. The first written record of the family seems to date from about 1470, when William Mudie appears in a list of Scottish bishops as Bishop of Caithness. The non-conjectural pedigree of the Moodies (or Mudies) starts with another William, the first Laird of Melsetter, who was a man of some importance, being, among other things, Chamberlain in Orkney to Mary Queen of Scots. His lands were listed and confirmed by King James VI in 1591. At that time he disposed of his properties on the mainland of Scotland to consolidate his position in Orkney.

The story of the Moodies is an astonishing saga of feud, adventure and fighting, the decay of the family's fortunes having started at least two decades before the Rising of 1745, during which Melsetter House was sacked by Jacobites. The eighth Laird, Benjamin, was serving on the mainland as an officer in the Hanoverian Army at the time and, for years after his return to Orkney, he spent most of his energies in wreaking a terrible revenge on surviving Orkney Jacobites, although he did conserve enough

to enable him to father 13 children in subsequent years. For the next 40 years, financial affairs deteriorated so rapidly that, in 1818, Major James Moodie was forced to sell the estate which had been in his family for more than 500 years, despite his strenuous efforts to save it. James Moodie died heartbroken and is buried in the Canongate Parish Churchyard in Edinburgh. The breaking up of the Melsetter estate gave rise to an acrimonious and extended legal battle involving, among others, Lord Dundas, and was never settled to the satisfaction of the Moodies.

As a young man, Robert Heddle was paymaster to the Royal African Regiment of Foot in Senegal while his eldest brother John held their father's title, Heddle of Cletts and Ronaldsay. After John's death, Robert returned to Orkney in 1817 and inherited the title. He brought with him the considerable fortune of £90,000, a circumstance which suggests that being a regimental paymaster in those days afforded ample opportunities for personal enrichment. He married Henrietta Moodie and, possibly having some sympathy with the financial plight of her family, purchased Melsetter for £26,000. He later extended his estate by buying the island of Papa Stronsay.

Although the connection between the Moodies and Melsetter in Orkney was irrevocably severed by the sale of the estate in 1818, another Melsetter connection was created years later in another continent. Just before the sale of the estate, the son Benjamin and others had emigrated to Africa and within a few years the Moodies had become one of the of those pioneering families whose story is interwoven with the history of Southern Africa in the nineteenth century. One of the family, Thomas, led a trek to Gazaland, in what was then Rhodesia, and founded the town of Melsetter at an altitude of 1586 m in the Chimianimani Mountains.

Meanwhile, Robert Heddle prospered, as the New Statistical Account of 1842 records:

> The whole of the parish of Walls, with a small exception, belongs to the Crown and Mr. Heddle - the latter being the proprietor of two-thirds of the property.

Three generations of Heddles owned Melsetter House until it was eventually sold by Robert's grandson, John George Moodie Heddle in 1898 to Thomas Middlemore, who employed the architect W.R.Letherby to design a new mansion and garden. This is the house which stands now as an internationally famous example of the architect's work and a Grade A listed building. During the Second World War, Melsetter House was requisitioned by the government to accommodate the Admiralty Headquarters controlling the fleet in Scapa Flow but after the war it was returned to private ownership.

Melsetter House Etching by F. Theys

Matthew Forster Heddle was born in 1828 and his mother Henrietta died in 1833 at the age of 39. Henrietta is usually described as John Heddle's first wife but there are no obvious references to the identity of any other wife. Matthew had two brothers, John George and Robert, and three sisters, Emily, Elizabeth and Henrietta. His father died in 1842, leaving the fourteen-year old Matthew under the guardianship of William Henry Fotheringham, Sheriff Clerk of Orkney, and two other Curators. Fotheringham, who had practised law in Edinburgh between 1817 and 1830, was a man who seemed to collect appointments and titles. He was, amongst other things, Keeper of Register of Sasines, Clerk to the Justices of the Peace, Comptroller of Customs at Kirkwall, Admiral Clerk and Commissary Clerk.

Heddle in Edinburgh

Matthew had already been a pupil at Edinburgh Academy for five years when his father died, leaving him £2500. He had been nine when he entered the Academy and left it when he was fifteen to attend Merchiston Castle School. Records of his schooldays are sparse but there is an account in the Chronicles of the Cumming Club (1887) about an encounter with one of the fearsome teachers at the Academy, James Gloag, 'Master of the Arithmetical and Geometrical School'. Matthew had become the possessor of a handsome pocket-knife which on one occasion he used to sharpen his slate pencil, unaware that Gloag detested any means of sharpening a pencil other than by rubbing it on a stone. The well-sharpened pencil emitted a loud squeak

which incensed the irascible Gloag so much that he led the offending pupil to the side of the large fireplace and dropped his knife into the heart of the fire. The punishment was completed by a routine flogging with the tawse. Even at a time when corporal punishment was common, Gloag seems to have been noted for his enthusiasm for flogging and it was said that he had acquired a taste for it – 'taste with a distempered appetite.'

In the most extensive obituary of Heddle that I have found, Goodchild (1897) describes how Heddle helped to found a Natural History Society at Merchiston and began to develop his propensity for collecting, 'which became his most dominant characteristic in after-life'. As part of his natural history collection, Matthew had created a herbarium which had involved some years of effort. He lent this herbarium to a friend who accidentally dropped it into a stream and ruined it. Heddle decided that he would collect no more things that could so easily be destroyed and began to collect minerals instead, a decision which marked the beginning of his lifetime's work.

While he was attending Merchiston School, he lived at 51 Albany Street, the house of Dr. John Brown. Heddle attributed much of his own love of natural history to the genial influence of Dr. Brown, who provided him with some of the paternal affection and guidance which he had been denied by the early death of his father.

Heddle commenced his medical studies at Edinburgh University in 1845 and, at the end of his course, went to Germany to study chemistry and mineralogy at Clausthal and Freiburg. He returned to Edinburgh and graduated M.D. in 1851. His graduation thesis was entitled *The Ores of the Metals*. In that same year, he became President of the Edinburgh Geological Society, which must then have been a more influential position than it is now because, according to Goodchild, writing Heddle's obituary in 1897,

> He was also at one time President of the Geological Society of Edinburgh and, while holding this office, was instrumental in urging upon the Government of the day the importance of instituting a Geological Survey of Scotland.

(The official Geological Survey of Scotland was started in 1855 under A.C. Ramsay as a result of the petition in which Heddle had played an important part.)

For the next five years he practised medicine in the vicinity of the Grassmarket but found the life increasingly uncongenial so, in 1856, he chartered a boat and went to the Faroes, where he amassed a huge collection of zeolites with multiple specimens of each mineral. He exchanged his duplicate specimens with other collectors and so laid the foundations for his renowned collection of minerals.

Heddle family group in about 1883

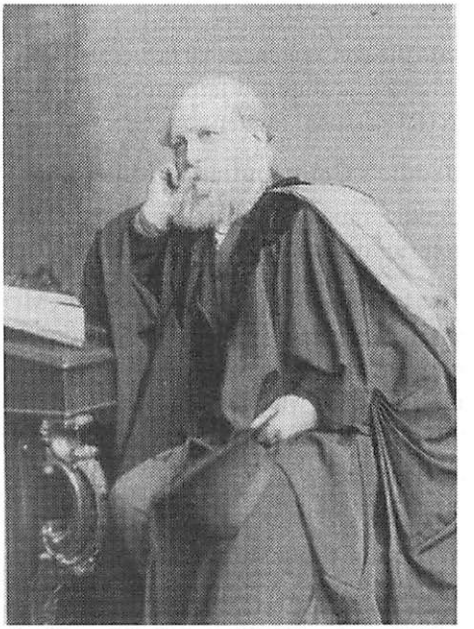
Heddle at St. Andrews

In 1856 he was appointed Assistant to Arthur Connell, Professor of Chemistry at St.Andrews but for several years Connel was so ill that the burden of teaching was carried by Heddle and, when the Chair became vacant in 1862, he was appointed to the post which he then occupied for over twenty years.

Heddle had married Mary Jane Sinclair MacKechnie in 1858 and between then and 1874 they continued the family tradition of fecundity by having 10 children. The eldest surviving daughter, Clementine, was the one to whom The Mineralogy of Scotland was later dedicated by her husband Alexander Thoms, while Cecilia married and became the Cecilia Westgarth Thomson to whom my copy of the book was presented by Thoms in 1908. The 1871 census records Heddle living at 172 South Street with his wife, 6 children, 2 nieces and 3 servants.

At some time in the eighteen-eighties Heddle temporarily vacated his chair at St. Andrews to act as a consultant to a financier who had an interest in South African gold mines. When he reached South Africa he quickly realised that the claims being made were totally unjustified or, as Goodchild politely phrased it:

> after making a full and proper inspection of evidence on the ground, he felt himself unable to endorse some of the statements that had been made regarding the enterprise referred to.



Professor M. Forster Heddle about 1880

He returned to Britain and immediately engaged in a successful legal action in connection with the gold mining enterprise. The result was an award which significantly enhanced his income for the rest of his life. (There is some uncertainty about the year in which the South African events occurred: in 3 different obituaries Goodchild quotes 1880,1883 and 1890.)

Despite his interests and reputation as a mineralogist, he was still a professor of chemistry and some of his students, like Purdie, became distinguished chemists in fields unconnected with mineralogy. He was reputed to be an excellent teacher, good at practical work and popular with students. Nevertheless, as Drever (1955) pointed out, mineralogy was sadly neglected at this time in Great Britain and:

> it must be admitted without disparagement that his chemistry was in effect a camouflage.

Heddle had a powerful physique, had probably climbed more Scottish mountains than anyone before him and was a Member of the Scottish Mountaineering Club. His physical toughness and stamina were necessary attributes for his tremendous exertions in collecting minerals and other work in the field. He explored every corner of Scotland in the company of a few friends who shared his enthusiasm. In his Memoir of Dr. Heddle, Thoms (1902) records that he spent the vacations on mountain-tops, on remote islands and in mines and railway cuttings:

> with hammers up to 28lbs weight, blasting powder, or dynamite, and wedges, he made the rocks give up their hidden treasures

The large size of his hammers was well known to his friends and was the subject of student jokes. It was said that even his alpenstock was bigger than anyone else's. He was a gifted and dramatic raconteur and delighted in telling elaborate stories. He had

high principles accompanied by a quick temper and formed strong likes and dislikes with the consequence that he occasionally made enemies; any dislike he had of certain people was founded upon their having violated some principle rather than on any trivial personal matter.

Heddle's Contribution to Mineralogy

Heddle's many publications range from short notes to extensive papers; 60 of his contributions have been recorded by Richard Gillanders (2001) in the BGS Library.

The foundations of his posthumous Mineralogy of Scotland are to be found in 8 extensive papers in the Transactions of the Royal Society of Edinburgh but he published many items in the Transactions of the Geological Society of Glasgow, the Philosophical Magazine and the Mineralogical Magazine. His sequence of papers in the Mineralogical Magazine is entitled The Geognosy and Mineralogy of Scotland and emphasises the fact that his geological work in the field was not confined to mineralogy.

In writing the history of the Geological Society of London, Woodward (1907) mentioned the meeting held in February 1876 which established the Mineralogical Society. The chairman was H.C. Sorby, while among those present was Heddle, James Nicol and Archibald Geikie. The creation of the Mineralogical Society marked the beginning of a new phase in the growth of mineralogy and Heddle was the Society's Vice-President in 1876 and President in 1879. In his Presidential Address to the Geological Society in 1887, Judd referred to the neglect of mineralogy in the past by the Society and Geikie, in his massive anniversary address of 1908, described the decline and rebirth of mineralogy from its ancient beginnings:

> For many centuries before the Geological Society was founded the science of Mineralogy had flourished as an important and popular branch of natural knowledge.

Geikie quite properly attributed most of the renaissance of the subject to the application of thin-section microscopy in the latter half of the nineteenth century.

Shortly after his St. Andrews appointment, Heddle undertook the revision and editing of Greg and Lettson's *Manual of Mineralogy of Great Britain and Ireland*. The preface of the new edition (1858) states:

> Dr. Heddle has kindly undertaken the general and especially the chemical revision of this work, preparatory to its going to press; and the Authors take this opportunity of acknowledging the great obligation they are under to that gentleman.

One of Heddle's many notes to the Royal Physical Society (1856) concerns the occurrence of oxalates as minerals. The two minerals described, conistonite and heddleite, do not appear in any modern list of Scottish minerals, the only oxalate recorded being glushinskite, which occurs as a result of lichen attacking serpentinite. However, a sentence in his paper summarises very well his painstaking approach to mineralogical research:

> It is always desirable that a mineralogist should be able to account for the occurrence of every substance which comes under his notice.

The section on mineralogy which Heddle wrote for the *Encyclopaedia Brittanica* (1883) extended over 85 pages and covered classical crystallography, aggregation, pseudomorphs, physical properties and a table of 1150 minerals from abriachanite to zwieselite. The article is beautifully illustrated with his line drawings.

He took a particular interest in the structure and origin of agates and his collection of Scottish agates in the National Museum is unsurpassed in quality and variety. It is noteworthy that the origin of agates is still a subject of active research (see, for example T.J. Moxon, 1991 and M. Landmesser, 1998).

Heddle expended much labour on the preparation of his comprehensive work *The Mineralogy of Scotland* and before his death in 1897 had completed the greater part of the manuscript and about 600 beautifully drawn figures but it was left to his friend and son-in-law Alexander Thoms to supervise the completion of the work in conjunction with its dedicated editor, J.G. Goodchild.

I have not found any annotated bibliography of Heddle's publications but am convinced that a detailed review would reveal an enormous and largely unrecognised contribution to mineralogy, despite his already established reputation.

Heddle's Contribution to Geology

Heddle is widely thought of as a collector and mineralogist but his contributions to geology were considerable and so, for example, in 1853 he supervised the excavation of fossil fish from Dura Den, one of which, *Gyroptychius heddlei*, is named after him (see Batchelor, 1995). We should recall that when he started work, not only were there no geological maps but even OS maps were unavailable. These deficiencies and the virtual absence of public transport did not deter him from producing a geological map of Sutherland which was for a long time the only one available. He produced also maps of Orkney and Shetland and worked for years on a geological map of Aberdeenshire, Elgin, Nairn, Banff and some adjoining areas of Inverness-shire. Although this map was never completed, the scale of these enterprises is almost

superhuman considering the nature of the ground and the absence of reliable maps and transport.

He made important observations on the composition of Scottish granites and on the nature of pegmatites and showed that the change in volume during the conversion of limestone to dolomite led to a commonly observed form of dolomite. His observations on the development of structure during dynamic metamorphism can easily be extended to describe granulite. Goodchild records that Heddle provided him with the laws governing the rounding of sand grains in desert conditions and finishes his obituary with the comment:

> enough has been presented here to justify the statement made at the head of this section, and to which the present writer is disposed firmly to hold, that Dr. Heddle's geological work is nearly equal in importance to his contributions to mineralogy.

Discussion and Conclusion

What started as a simple quest for information about Heddle, his sisters and his editors led me down more byways than I expected but has been an educational experience. J.G. Goodchild, for instance, was known to me only as the editor of Heddle's book but emerged as an important early member of the Geological Survey. He joined the Survey in 1867 and was mapping in the Lake District until 1883 when ill-health forced him to abandon fieldwork and return to London, where he worked in the Survey's Headquarters in Jermyn Street. In 1887 The Edinburgh Museum of Science and Art - which later became the Royal Scottish Museum - assigned the upper gallery of the west wing to the Geological Survey of Scotland for the purpose of exhibiting specimens and maps illustrating the geology of Scotland and Goodchild was appointed to be curator of the collection. It was during his work in Edinburgh that he became acquainted with Heddle and his collection of minerals.

Goodchild was an imaginative and enthusiastic worker who published over 200 papers on a variety of subjects including glacial geology, dyke formation, sandstones, mineralogy and stratigraphy. Outside geology his interests ranged from ornithology to Japanese clocks. He seems to have been an affectionate and generous man who was widely admired for his scrupulous honesty and his unstinting support for people whom he considered had received insufficient credit for their work.(For a detailed obituary see J.W. Gregory 1905-10.)

Cecilia Heddle married William Westgarth Thomson who had been born in Lanarkshire but traded in sugar as a commission merchant in the Philippines. Heddle's other sister, Clementina, married Alexander Thoms whose family wealth came from

William Westgarth Thomson

Cecilia Heddle

To

CLEMENTINA C. S. THOMS (NÉE HEDDLE),

OLDEST AND LOVED DAUGHTER OF THE AUTHOR,

WHO, ON THE DEATH OF HER MOTHER, ASSUMED THE CHARGE OF HER FATHER'S HOUSE,

ACTING A MOTHER'S PART TO HER BROTHERS AND SISTERS

WITH LARGE-HEARTED GENEROSITY AND UNSELFISH LOVE, AND

DEVOTED HERSELF TO HER FATHER

UP TO AND ALL THROUGH HIS LONG AND LAST PAINFUL ILLNESS

WITH A TENDER LOVING CARE WHICH NEVER FLAGGED,

This Work of her Father's is Dedicated by

HER AFFECTIONATE HUSBAND.

Dedication of The Mineralogy of Scotland *by Alexander Thoms to his wife Clementina*

the tea trade. He was a close friend of Heddle and had a great interest in geology. The 1901 Census describes him as a retired Bengal zemindaar and indigo planter, a zemindaar being a feudatory in British India who held rights to a large amount of land by paying the government a substantial revenue.

As for Matthew Forster Heddle, I have read nothing to detract from his status as a major figure in the fields of mineralogy and geology but it is fairly clear that his robust character must have alienated some of his contemporaries. His death was announced at a meeting of the Royal Society of Edinburgh and reported in five lines of the Transactions. The Geological Society published no obituary and in the President's Anniversary Address, Henry Hicks listed obituaries but Heddle was not included. The Royal Physical Society, the Mineralogical Society and the Geological Society of Edinburgh all published extensive obituaries and a memorial address was delivered to the Glasgow Geological Society. All these obituaries were written by Goodchild and, with minor variations, are from the same text. I was surprised to discover that even the 1897 edition of *Who's Who* has no entry for Heddle.

Goodchild, with his characteristic decency, was generous and perceptive when he wrote:

> For myself, who had much to do with him, I may say that, taking him all in all, I looked up to Dr. Heddle much as Boswell looked up to Johnson. Like his prototype, Dr. Heddle did a vast amount of work of good quality, and in the face of many difficulties; like Dr. Johnson he was modest and never sought honours (so none were conferred on him); like Dr. Johnson he never appropriated other men's ideas; and like Dr. Johnson he was much given to kindly acts, in a quiet way, towards his fellow-men and looking for no reward.

Acknowledgements

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Peter Dryburgh is a retired physical chemist whose main research was in the field of crystal growth of optical and electronic materials. He worked in industrial research laboratories and as a lecturer in the Electrical Engineering Department of Edinburgh University. He has a long-standing interest in geology, has been a Fellow of the Edinburgh Geological Society since 1985 and is currently its President.

Kintail earthquake

by Eileen Holttum

It was just after midday on Thursday 2nd May when I left Camas-luinie for a couple of days walking in the northern reaches of Kintail. I walked along the track up Glen Elchaig, past the path that leads up to the Falls of Glomach and up to the abandoned farm of Carnach. From here, I climbed the stalker's track north on to Faochaig, a spectacular Corbett. It was late afternoon when I descended stalker's track to the east and came down at to the MBA bothy at Maol-buidhe.

The following day, I climbed the Corbett, Ben Dronaig, where I loafed about and read in the sun for 2 hours, then walked south up the track to camp at the high point 500 metres above sea level (grid ref NH042321). I was pitching my bivvi tent just next to the track that leads to Iron Lodge at 7.45pm when I heard from deep in the earth a faint but definite grinding noise, followed almost instantly by a sustained rumbling vibration. The whole thing was over in 5 seconds.

You can imagine my excitement and initial alarm. I knew there were geologically active areas around and my instant reaction was 'that's an earthquake'. Two thoughts followed almost at once. First I had a picture of the earth swallowing me up; my rational mind instantly self-flicked this to fast rewind: this was not California. Second, I downgraded the event to blasting at some unknown quarry: why should I be so lucky as to experience an earthquake? I then asked myself whether I had even imagined it, but another, slightly smaller tremor followed two minutes later. I felt it but this time heard no noise. But this aftershock convinced me, and subsequently I was in a state of high glee and excitement. There was a second aftershock at around 10 pm which was so faint that it could only have been picked up by someone lying on the ground as I was.

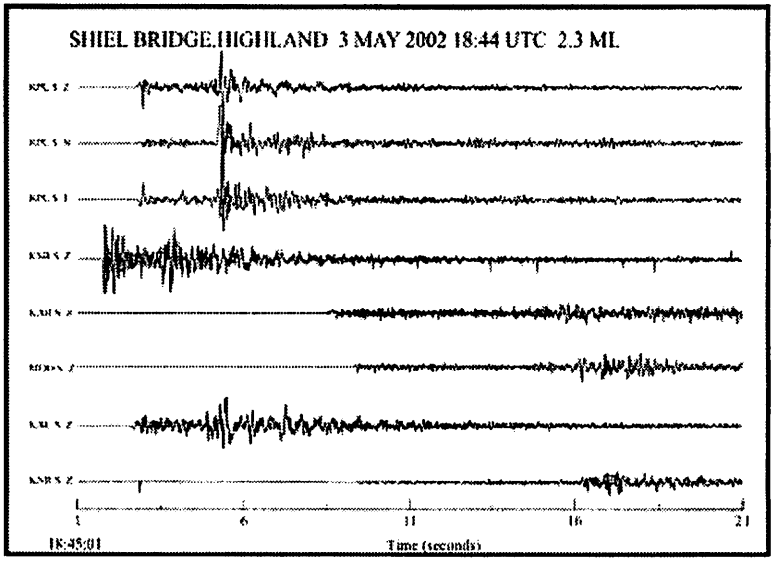
I can't say much more about the actual earthquakes. Each was over quickly. The drama was in my solitary and remote location rather than the quake itself. Subsequently I checked out a website (www.gsrg.nmh.ac.uk.recbrit.html) which is full of interesting stuff, and this confirmed that I had felt the effects of three earthquakes in the locality of Sheil Bridge, of 2.3, 2.0 and 1.4 on the Richter Scale. Looking at a geology map, I saw the Strathconan Fault shown as a major feature, with Iron Lodge on or very near the fault line.

I am geologically blessed. Twenty two years ago, in Bellingham, Washington State, where I was on holiday, huge explosive bursts in the sky drove us out of the house in fear, and some Americans to their nuclear bunkers. We could see nothing. Someone sensibly switched on the radio. Mount St Helens had blown twenty minutes earlier.

We were two hundred miles to the North. A week before I had stood on the summit of Mount Hood (11,235 ft), on the Oregon border. Black belching smoke rose from the then unerupted Mount St Helens some thirty miles away. "Erupt now", we wished in our ignorance.

Ten years before that, in 1970, I climbed to within 1000 ft of St Helen's summit, then a cone of perfect whiteness. High wind made the summit unreachable. We camped by Spirit Lake, an oasis of calm blue water and scenic splendour. After the 1980 volcano I travelled back to Oregon by train, and saw the havoc caused by the near emptying of Spirit Lake. Houses were lying stranded in mud, miles from their origins. Great swathes of farmland had vanished, with fences marching into black sludge, like stone dykes from former fields vanish into reservoirs. It is all etched on my memory.

And now, so is the Shiel Bridge earthquake. It had been a great couple of days walking: hearing the tremor was the high point of a beautiful evening.



seismogram of earthquake provided by courtesy of British Geological Survey

Eileen Holttum is the wife of Fellow and ex-Council member Bill Coppock. She herself is a graduate of Glasgow University where she studied geography. She is a keen hillwalker and mountaineer and the above incident happened while she was on a Corbetting expedition in the Highlands.

La Chanson du Moine Thrust

- a detective story -

by Sinclair Ross

I have rarely had as much interest in an article as was evinced by La Chanson du Moine Thrust, *contributed for the last issue of* The Edinburgh Geologist *by Averil Hope-Smith. The various pieces of information have been pieced together by Sinclair Ross. The full story of the BA excursion to Assynt is given in the Society's publication* 'Assynt, the geologists' Mecca'.

Averil Hope-Smith is not the first to have been intrigued by *La Chanson du Moine Thrust*. When a group of us were researching the history of the 1912 BA excursion to Assynt for the booklet *Assynt, the geologists' Mecca* in 1995, we followed up references to the song. David Horsely, an active member of the Geologists' Association, was able to add to the story by sending us correspondence from the GA circulars of 1983 and 1984. One of their members, Mrs Alice Tyler was searching for a lost specimen of geological whimsy and wrote:

> It is a song – words and music – called, I believe, *La Chanson de la Moine Thrust*. I saw a copy of it in the mid 1960s but when I tried to track it down over the last couple of years, I found no trace.
>
> From memory the copy I saw had, on the cover, a picture of a group of bearded worthies, dressed in a style from before 1914. I seem to associate the group with a gathering such as an International Geological Congress, or a meeting of the BA (in Canada perhaps since the words were in French)...

This was followed in the next circular by a longer letter from Alice Tyler, in which she wrote:

> Within a week of seeing my letter in print, I received a copy of the song from Ms Angela Anderson of IGS in Edinburgh. She had found it in one of the scrap books, known collectively as the *Grizzly Bear Books*, which form an unofficial history of the IGS. And T.C. Nicholas, who heard the first performance 70 years ago, sent me details. The composer has also recorded the story of how the song came to be written [this is printed on the back of the sheet, along with a list of those present on the excursion. See opposite. Ed.].
>
> Armed with the words and music, I managed to record the song, so GA members at the 1983 Annual Reunion were able to hear *La Chanson du Moine Thrust*. It caused great interest and was played several times during the afternoon.

Mrs Tyler was accompanied by her daughter on the recorder.

GEOLOGICAL EXCURSION

in the North-West-Highlands of Scotland

ASSYNT-REGION

conducted by

B. N. Peach, LL. D., F. R. S. E and John Horne, LL. D, F. R. S. E.

2 to 18 September 1912.

PARTNERS:

Prof. Ch. Barrois, Lille.
Mme Barrois, Lille.
Dr E. Tietze, Dir. k.k. geol. Reichsanatalt, Wien.
Dr Hans Reusch, Dir. Norges geol. Unders., Christiania.
Dr Alb. Heim, President geol. Comm. of Switzerland, Zurich.
Prof. E. Haug, Univ. of Paris.
Prof. Leith, University of Wisconsin, Madison, U.S.A.
Prof. Maurice Lugeon, Univ, Lausanne.
Mme Dr E. Jérémine, Cours supérieurs des femmes, St-Pétersbúrg.
Pruvost, Assist. Univ. Lille.
A. Strahan, D.Sc., F.R.S. Geol. Survey, London.
Prof. Reynolds, M.A., Univ. Bristol (England).
Prof. Boulton, B.Sc., Univ. Cardiff (Wales).
J. J. Jehu, M.A. M.D., Univ. St Andrews (Scotland).
T. D. Falconer, M.A., D.Sc., Univ. Glasgow.
Albert Gilligan, Univ. Leeds (England).
W. J. P. Mc Lintock, B.Sc., Museum Edinburgh.
E. M. Anderson, M.A., B. Sc. Geol. Surv., Edinburgh.
E. B. Bailey, B.A. Geol. Surv., Edinburgh.
C. B. Crampton, M.B., Geol. Surv., Edinburgh.
C. H. Dinham, B.A., Geol. Surv., Edinburgh.
G. V. Wilson, Geol. Surv., Edinburgh.
G. W. Lee, D.Sc., Geol. Surv., Edinburgh.
M. Mac Gregor, M.A., B.Sc., Geol. Surv., Edinburgh.
J. E. Richey, B.A., Geol. Surv., Edinburgh.
W. B. Wright, B.A., Geol. Surv., Dublin.
Cosmo Johns, Scheffield.
A. W. R. Don, B.A. Cambridge.
T. C. Nicholas, B.A. Cambridge.

After part of the back sheet of La Chanson, showing the participants (with corrections)

The 'story' to which Alice Tyler refers was written, as was the song itself, by Maurice Lugeon of the University of Lausanne. It tells how, after the BA meeting, a group of geologists left the 'charming city of Dundee' to go and visit famous localities on the foreland of the old Caledonian mountain chain. It recounts how those two 'grand masters' Horne and Peach led the '*studieuse et joyeuse troupe*' over the intricacies of the nappes and folds of the Moine. Peach revealed to the field party the secrets of the pipe rock and they witnessed other 'amazing phenomena' such as the Glencoul nappe overthrust on the 'Old Boy', the Ben More nappe and, of course, the Moine Thrust itself. Lugeon remarks that they could not see the actual 'forehead' anywhere but that maybe 'in olden times, it reached out to where the green waves of the sea reign'.

In the evening, their headquarters were at the Inchnadamph Hotel on the shores of Loch Assynt. During the merriment of the last evening, the 17th September, a number of the party told of their impressions of the excursion. From the top of the table, Peach regaled the company with anecdotes in his uniquely charming way. Charles Barrois of Lille University spoke and they found him, as always, 'so pleasing to hear'. Haug of the University of Paris, also took part in this 'tournament of words' and the Swiss geologist Albert Heim, enthused the party with some really novel ideas. A number of others spoke and then, 'the good Dr. Horne', having heard Lugeon during the day singing some 'petty couplets' to the glory of the Moine Thrust, asked him to perform them. And so the Song of the Moine Thrust was born.

Back home, Maurice Lugeon was asked by a few friends if he could publish the song, but he felt that some of the lyrics were so bad that he had to replace them as well as rewriting some stanzas altogether. So what we have is, in a way, the second edition of this song. Lugeon also had to write the music and was helped in this by a Mlle. Pfender, who took charge of composing the accompaniment.

In circular no 842, Alice Tyler's letter was followed by one to the GA from Donald McIntyre, then at Pomona College, California. He had been a student with Wegmann in Neuchatel in 1947. He wrote:

> Wegmann was a student and successor to Emile Argand who in turn was a student of Lugeon's. Lugeon gave me several papers and photographs inscribed to his great grandson in tectonics. I treasure these precious possessions.

Among the papers was La Chanson, to which McIntyre had referred in a note in the Geological Magazine in 1954. He passed on a xeroxed copy of his inscribed version to Mrs Tyler.

The following is a translation of La Chanson du Moine Thrust by Anne Burgess and Dorothy Forrester, both Fellows of the Edinburgh Geological Society:

If the Moine Thrust, when it rose from its roots,
Would you believe it?
had wanted to sail over the sea
Or leap over land,
What horst could have hindered it?
It would have filled the Atlantic,
If the Moine Thrust had wanted,
Would you believe it?
It could have smothered America!

If the Moine Thrust had wanted
Would you believe it?
To turn Brittany into a tectonic window,
And cover the mountains of France,
Barrois would have been baffled
And Haug would have been delighted
To tell us from his book of spells,
If the Moine Thrust had wanted,
Would you believe it?
So thrilling a story.

If the Moine Thrust had wanted,
Would you believe it?
To cover the Glaron nappes
And so put Heim at his ease,
We would have seen fold upon fold,
What a mechanism, my friends!
Then continuing on its arrogant way,
If the Moine Thrust had wanted,
Would you believe it?
It would cover the whole of the Earth.

If the Moine Thrust had wanted,
Would you believe it?
To pursue its march with fury,
To pounce upon Austria and Bosnia,
It would lie on the black Balkans,
And Tietze would be exhausted,
His K K would have had too much to do,
If the Moine Thrust had wanted,
Would you believe it?
To seize Austria from behind!

If the Moine Thrust had wanted,
Would you believe it?
To flatten everything in its path,
To carry Sweden to the banks of the Tagus,
Switzerland to the banks of the Neva,
Russia to the Himalayas,
And put China in Germany's place,
If the Moine Thrust had wanted,
Would you believe it?
Great Britain would have been everywhere.

If the Moine Thrust had wanted,
Would you believe it?
It could have climbed up to the stars,
For, accompanied by the sails
Of every British ship,
Who then would have dared stop this
Vast exposition of the Earth?
If the Moine Thrust had wanted,
Would you believe it?
The Moon would have been Scottish.

But the Moine did not want,
Would you believe it?
To embark on such a distant journey,
For Peach with his full paunch
Was a little heavy to carry,
The Moine preferred to stop,
Not wanting to pass its limits.
And the Moine did not want,
Would you believe it?
To sadden the good Doctor Horne.

La Chanson du Moine Thrust

No, the Moine did not want,
Would you believe it?
To leave the fair land of Scotland,
To seek confrontation
With ancient unknown horsts,
It would have arrived naked,
Having lost all its 'pipes' on the way,
No, the Moine did not want,
Would you believe it?
To lose a drop of its good whisky.

No, the Moine did not want,
Would you believe it?
To leave its land of peat bogs,
And carry its fine stones far away,
And we were able to admire it,
And can depart
With pride in our step.
No, the Moine did not want,
Would you believe it?
To leave its heather moors.

The song refers to a number of the alpine luminaries and their contributions. It tells how the Frenchmen Barrois and Haug and the Swiss geologist Albert Heim would have reacted had the Moine covered their own study areas. Dr Tietze, the director of the Austrian Imperial Survey (K. K.), is also mentioned. It is sad to think that within a couple of years, the governments of these countries would embroil their citizens in a War that would claim the life of at least one of the participants.

Another piece of information on the 1912 excursion came from Graham Chinner of Trinity College, Cambridge: T.C. Nicholas and A.W.R. Don were both members of Trinity College. Neither of them were Research Assistants, as stated in our booklet. Nicholas was a newly elected Research Fellow of Trinity and Don was a newly-graduated (June 1912) student, shortly to start clinical medical training.

T.C. Nicholas said that Archie Don was a real 'live wire', whose family lived near Dundee at Broughty Ferry, and who helped to arrange the field trips for the Dundee meeting. He hired several quarrymen to excavate new exposures of the fish beds at Dura Den during the meeting, and it was his idea to take advantage of Peach and Horne and alpine luminaries to run the Assynt trip – he made all the arrangements. Nicholas said that he would not have had a hope of getting a place on such an excursion if he had not been a friend of Archie Don.

A.W.R. Don died in Greece during the First World War, and T.C. Nicholas died in 1989, aged 101.

Sinclair Ross is a long-standing Fellow of both the Edinburgh and Glasgow Geological Societies. He was one of the co-authors of the E.G.S. publication 'Assynt, the geologists Mecca' *and it was while researching this that he first came across the song and became interested in its history.*

Thanks are due to Anne Burgess and Dorothy Forrester for translating the song and to Sonia Bressey for helping me with the 'story' on the back of the sheet.

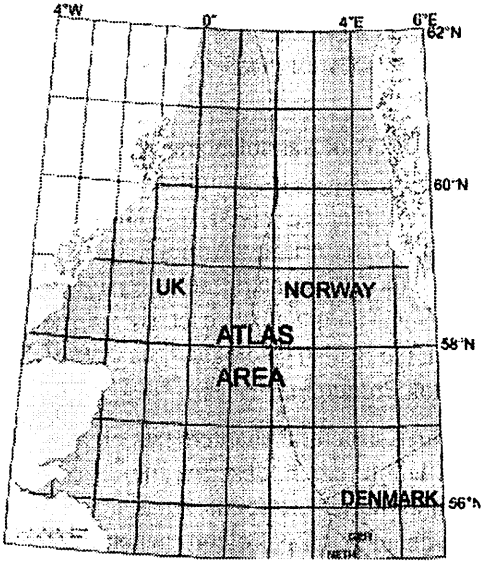
The Millennium Atlas: Petroleum geology of the central and northern North Sea

- a major new publication -

by Dan Evans, Colin Graham & Heather Stewart

As you read this in the Autumn 2002 edition of the Edinburgh Geologist, you may be somewhat surprised at the title of this article. You probably think that most things related to the Millennium are by now things of the past, are completed, or are perhaps even falling into disrepair. But the Millennium Stadium in Cardiff remains a place where visiting rugby teams are treated with excessive courtesy, and the end of 2002 will see the publication of the Millennium Atlas.

The Atlas describes the geology for the UK (largely Scottish if you will), Norwegian and Danish sectors of the central and northern North Sea (see map), with a slant towards the petroleum aspects. This is the first attempt to describe the geology of the North Sea Basin across these national boundaries, and is a consequence of the co-operation of the Geological Society of London, the Norwegian Petroleum Society and the Geological Survey of Denmark and Greenland (GEUS). These organisations together formed the not-for-profit Millennium Atlas Company Limited (MACL) with the sole purpose of producing and distributing the Atlas.



The area covered by the Millennium Atlas is shaded. The Atlas does not cover the southern North Sea and the area west of Shetland is also excluded.

Make no mistake, it will be a big book in full-colour A2 format with about 400 pages, so that it will weigh about 9 kilograms. For those not feeling too strong it will also be available in CD-Rom format. It will have 458 Figures (many of them comprising multiple diagrams, and we haven't counted them all yet), a list of about 1600 references, and each chapter will have an appropriate full-page frontispiece image. An example of a diagram is shown in Figure 2, but remember that full colour will be used throughout the Atlas itself.

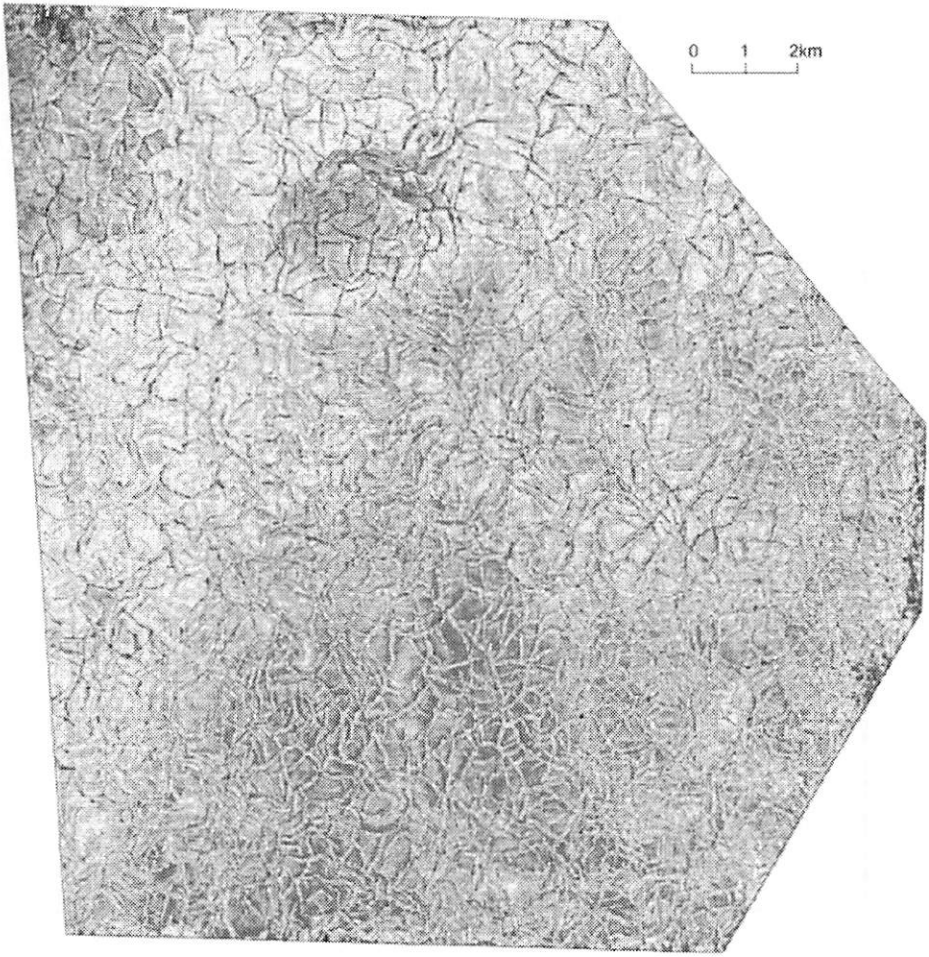
The atlas will be printed in Haddington by Scotprint; the large size of the Atlas means that the pages will have to be hand-stitched as machines would not be able to cope. We understand that the book will be produced at a rate of 5 copies per day. It has been suggested that it is not so much a coffee-table book, but with the addition of four legs could be made into a coffee table!

The idea for producing such an Atlas came from Paul Bathurst of Exploration Geosciences Limited, a small consultancy company that has worked extensively in western Canada where they had found a major atlas to be invaluable for their oil-exploration work. Paul considered that the production of a comparable atlas would be a good way to mark the Millennium at a time when the North Sea had become a mature oil province (the Atlas specifically excludes the southern North Sea gas province). However, Paul might perhaps have been a little more circumspect in calling it the Millennium Atlas given that the Canadian atlas took seven years to complete! In 1997 he began to raise sponsorship for the production of such an atlas, and the Atlas now has full sponsorship from 35 oil companies (even if some of them no longer exist due to several recent mergers) and lesser support from a number of others.

At that time, the oil industry was flourishing, so that Paul was able to raise sponsorship pledges from a large number of oil companies, and also their commitment to helping produce chapters for the Atlas. It was then evident that the project was feasible, and it was at this stage in 1998 that MACL was set up, and Andrew Armour, at that time Exploration Director of Enterprise Oil, became the Chairman of the Company and a driving force for the project. Subsequently the main contracts were let to Exploration Geosciences Limited for Project Management, the British Geological Survey (BGS) for Editing, and Lovell Johns Limited for Book Production.

After an Introductory chapter, the Atlas has three structural chapters that outline the tectonic evolution of the broad north-east Atlantic region, describe the deep crust beneath the North Sea, and provide the structural framework for the Atlas area. There then follow 12 stratigraphic chapters before chapters on petroleum generation and formation waters. The Atlas ends with chapters on exploration history and the resources of the basin, followed by the extensive list of references, a glossary to help those not familiar with some terminology, and an index.

The project was set up so that individual companies or small groups of companies were responsible for writing chapters and producing the associated illustrative material. In some cases this work was contracted out or other experienced groups of workers were brought in to help; in fact BGS were contracted by Murphy Petroleum



A figure from the Millennium Atlas

This is an image of one specific horizon in the Cenozoic at a depth of several hundred metres below the sea bed. It has been produced through the use of 3D-seismic data, that is individual seismic profiles collected on a very close grid such that a 'cube' of data is collected. Once a horizon has been picked on the individual profiles, a variety of images of that horizon can be computer-generated. Seismic data and recent improvements in its acquisition, processing and interpretation techniques, have been very important to the exploration and production history of the North Sea. This image shows the pattern of polygonal faults in a mudstone interval.

to write the Oligocene to Holocene chapter, and the lead author was none other than your very own Editor of this estimable booklet. It was well into 1999 before all chapters had been properly allocated authors, and the progress of the project was not helped by the slump in oil price that resulted in many oil-industry geologists, including authors of the Atlas, losing their jobs. Each chapter was provided with a broad outline framework and a standard set of stratigraphic tops for each stratigraphic chapter.

A few facts and statistics that emerge for the Millennium Atlas area are:

The first well to find oil was in the Danish sector in 1966, in chalk.

The first UK oil discovery was in 1969 at what is now the Gannet Field, but it was not economic to extract oil from that well until over 30 years later in 1997.

The deepest well drilled is to 6085 m.

The total of recoverable hydrocarbon reserves is 12,500 million m^3 of which 43% have been produced.

About 40% of the total reserves are in Lower and Middle Jurassic reservoirs.

Statfjord is the largest oilfield, and Troll the largest gas field.

A total of 92 authors and a further 62 contributors have produced the chapters, and a great deal of work has also been done by the draughting personnel supporting these groups. Each chapter has been externally refereed, involving a total of 60 referees. After resubmitting the chapter following refereeing (some chapters were reviewed twice), the editing work really began. Although there was a great deal of overlap, Dan dealt mainly with the text and Colin with the diagrams; Heather joined at a later stage to finalise work on the references, glossary and related work. After the diagrams had been marked up by Colin, they were sent to the wonderfully named draughting company 'Could-you-Just?' where Cathy Hickey co-ordinated the standardisation of all the figures.

It has been an objective of the Atlas to maximise the overall consistency of approach by all the authors; a difficult task given the number involved and the ranges of data from which they would be working. To help with this, a number of workshops were held for the authors, the most notable of which was a 3-day residential meeting at the wonderful field-centre premises of Chris Cornford's Integrated Geochemical Investigations at Bideford in Devon where a good time was had by all.

Producing the Atlas has been a long, if most rewarding, haul, and as we write this in late August, there is a very intense period of work to ensure that the material is delivered to the printers on time to ensure that copies are avaialble for a series of launches of the Atlas in early November. And the last chapter was not even completed by the authors until the end of July! The finalising of the layouts is being worked on by Jon Gammage at Lovell Johns' offices near Witney. We are greatly looking forward to a little trip to Haddington to see the presses rolling...

Oh, there is one other small point; you will want to know how much it costs and how you can buy it. It is published by the Geological Society of London, and will cost you a mere £199, or £149 if you are a member of that, or a related society. We believe that the CD-Rom, being produced by Lynx, will be similarly priced.

We very much hope that you will like it.

Bibliographic reference:

Evans, D., Graham, C., Armour, A., & Bathurst, P. (editors and co-ordinators) 2003. *The Millennium Atlas: petroleum geology of the central and northern North Sea.* The Geological Society of London.

Dan Evans has worked in offshore geology for over 30 years, following up a PhD study by joining the marine group at BGS. He has produced several offshore maps and was lead editor of the UK Offshore regional reports. He has been involved in the Millennium Atlas project from the start.

Colin Graham was brought into the Atlas project to act as diagrams editor once the authors had begun to produce their chapters. For this, his knowledge of IT, added to his considerable marine geological experience, has been invaluable.

Heather Stewart joined BGS less than a year ago after graduating from Glasgow, and has been thrown in at the deep end (including 1600 references!) in helping with the Atlas.

www.edinburghgeolsoc.org

The Edinburgh Geological Society Web Site

by Diane Mitchell and Alan Fyfe

As announced in the Excursions Billet published in April 2002, the Society now has a new web site. This article is intended to give everyone a little insight into its history and development and help you to browse around it.

Everyone should read this!

Maybe some of you have browsed through the Society Web Site already but there are others who may not even understand the meaning of the word 'browse' in this context. "I thought that was something that cows and molluscs did," you will be thinking. Well, this article is for you as well... if you have read this far, of course!

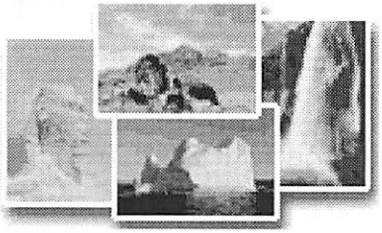
A note for the web-naïve

Do you remember the first time that you looked at a geological map? It was very difficult to work out how to use it, but now it is a piece of cake. So it is with web sites. But you will probably need to get someone to help you. Find a friend with a computer that is attached to the Internet (your friend will know whether it is or not... and if they don't, find a more switched-on friend). Ask them to take you to an Internet Cafe (maybe you should pay for the coffees) and lead you through the process of logging on to the Internet. The address that you need (an address in this context is the computer-title of the web site) is **www.edinburghgeolsoc.org** which should be easy enough to remember; 'www' is short for 'world-wide web' and 'org' is short for 'organisation'. Don't try 'EGS' as this will take you to some electronics company that has the same initials as the Society. Ask your friend to help you browse (browsing in this context is more like browsing through a library than through a field, flicking back and forth through different pages). You will find that it is all pretty easy. There are pictures and 'buttons' on the screen. When you lead the mouse arrow over these and then click on them, you will get to look at a new page. There's a 'button' at the top of the screen marked 'Back' and if you click on this, you will go back to the previous page. You stop when the money runs out.

Where to go from here

The home page has a number of items on it. Down the left hand side of the screen is a bank of blue 'buttons'. These take you to major areas of the site. The home page also has a list of forthcoming events and a 'notice board'. We try to keep these up to date, though during holiday periods, there may be some events mentioned that have already forthcome. You can click on each of the forthcoming events and you will be

taken to the page, usually lectures or excursions, that gives you more information.

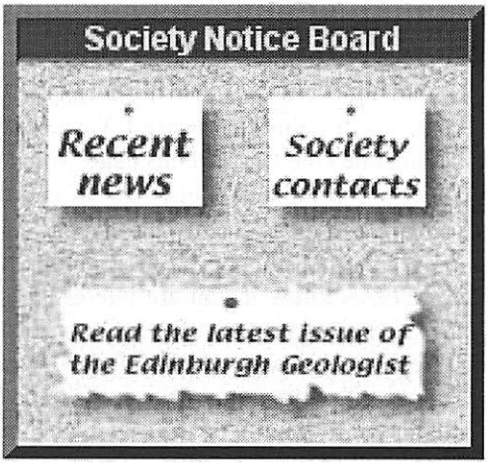


Clicking on any of the 'notices' on the notice board will take you to that information. On the home page, there is also something that looks like a selection of photographs (shown here). Clicking on these will take you to the Fellows Gallery, where you too can exhibit any of your own geological photographs or artwork.

How did we get here?

The Society web site was originally set up in 1998 by David McAdam and Peter Robson of BGS. It was David's vision to have a site that Fellows could look at and find up-to-date information about the Society, be informed of changes in the programme, order books and publications and even read copies of *The Edinburgh Geologist*. The first site made a stab at that, but it was hosted on one of Edinburgh University's computers and access was limited. Last year, Council agreed to pay for a professional host for the site and we were commissioned to put together a new-look, twenty-first century, all-singing, all-dancing version of the original. Hopefully, now, David's vision has been realised. The only thing that we cannot do just yet is to order books over the Internet.

The Society Notice Board

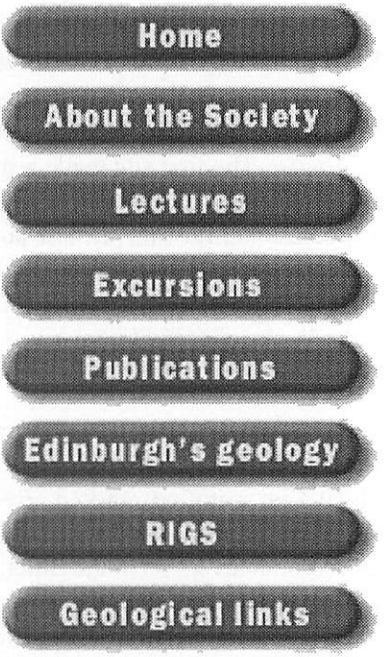


Let's look at this first. It is over on the right side of the screen. There should always be a notice marked 'Recent news'. Clicking on that will take you to a computer version of the Billet. Not all Billet items are included and there may be some left over from old Billets. In particular, excursions and lectures are not reached through here but from the buttons on the left hand side of the screen, or from the 'Forthcoming Events' tablet. Another notice that should always be there is marked 'Society contacts'. This will take you to a list of members of Council. Some of these can be contacted by e-mail and they appear underlined and in bright blue. Clicking on the name should open up an e-mail window. One thing that you will notice about the 'Recent news' and 'Society contacts' pages is that they both have the same button

bar down the left hand side of the screen. In fact, this is there on almost all the pages. It is missing only from those pages that are meant for printing off (membership forms and so on).

The Notice Board is also the place where urgent news is placed. It will probably be flagged up in orange or red. This is intended to let Fellows know of changes to the lectures programme or of cancelled excursions (how useful it would have been through the Foot and Mouth epidemic). The site is worth looking at occasionally for that reason alone.

The Button Bar



The 'button bar' is the bank of blue buttons that appears on the left hand side of every screen. Clicking on any of these will take you directly to the information indicated. For the '**Lectures**' and '**Excursions**', this is pretty self-explanatory. You will find here the programme and detailed information about the more imminent events (these are the same abstracts as are printed in the Billet). The other buttons maybe need a little more explanation.

Clicking on '**About the Society**' will take you to a page which can lead you to a lot of information. There is a link to the Society History. At the moment, this is very brief. We would like it if someone could extend this page. You do not really need computer skills, just an enquiring mind and an interest in searching out old photographs and snippets of information. Please let one of us know if you are interested in doing this. There is also a link to the Library pages, where you can look through the list of books owned by the Society and held in the Robertson Building of Edinburgh University. The 'Society' pages also have links to a complete list of Clough Medallists and Award WInners, together with more information on these and other bequests and funds. The most recent copy of The Laws of the Society are also published on the site and can be reached through the 'Society' page. Finally (at least for the moment), there is a link to a page of obituaries that have been published from time to time in *The Edinburgh Geologist* and the Billet. This, *Olim sodales* (once Fellows) may also be a source of information for historians of the Society.

The '**Publications**' button will take you a page from which you can go any of three ways. First, there is a tablet leading to information on the Society's books and pamphlets. Sadly, it is not possible to order these over the Internet. The logistics and costs of setting up security for transmission of credit card numbers is simply prohibitive. There are two further tablets, one of which will in future take you to the Scottish Journal of Geology and the other of which takes you to *The Edinburgh Geologist*. Here, you can look at the Contents pages of every single issue. There are also several articles published on the Web, mainly those that have been requested by Fellows and others. By far and away the majority of the Society Web Site pages are Edinburgh Geologist articles!

Clicking on '**Edinburgh's geology**' will take you on an illustrated tour of the geology of the Capital. There is general information on the geological history of the Lothians area and more detailed information on Arthur's Seat and other famous landmarks.

The '**RIGS**' pages will give you information on the Lothian and Borders RIGS group and their activities. RIGS are Regionally Important Geological Sites and there is a group of dedicated geologists who meet every month to designate new sites and to look after and publish information on those that are already registered.

Finally '**Geological links**' provides the gateway to a whole load of other geological sites for you to browse through, from the Glasgow Geological Society to Lapidiary Clubs and the like.

Further development

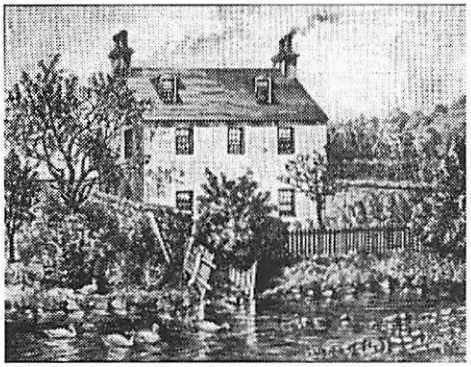
How the site develops is largely dependant upon who uses it and what they ask us for. There is no real limit to what can be put on. Before he became involved in a major overseas project for BGS, Emrys Philips had a vision of developing the Fellows Gallery to include artwork, photographs and written contributions from Fellows of the Society. He also had the idea of providing high-quality geological images that people could download as computer wallpaper. *The Edinburgh Geologist* pages will continue to be expanded and the History pages are just waiting for the right person to come along. At the moment, through the 'Society' page, membership forms can be filled in and printed on the computer. Perhaps in future they can be submitted over the Internet.

Diane and I were given the remit of revamping the web site about a year ago. Diane works for the National Museum of Scotland as Outreach Officer and has an interest in promoting geology to the general publilc. My involvement was initially in getting the Edinburgh Geologist pages on-line. We have both been swept along on the tide and have both learnt a lot in the process.

Man of Vestiges

- Robert Chambers 200 years on -

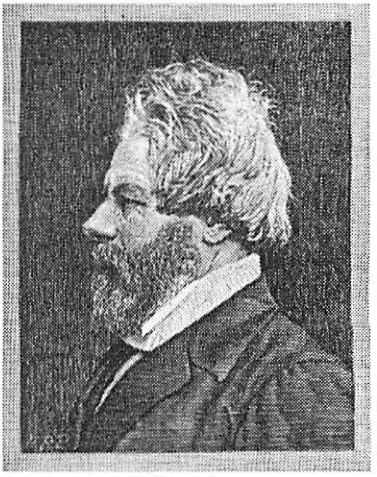
by Michael A Taylor



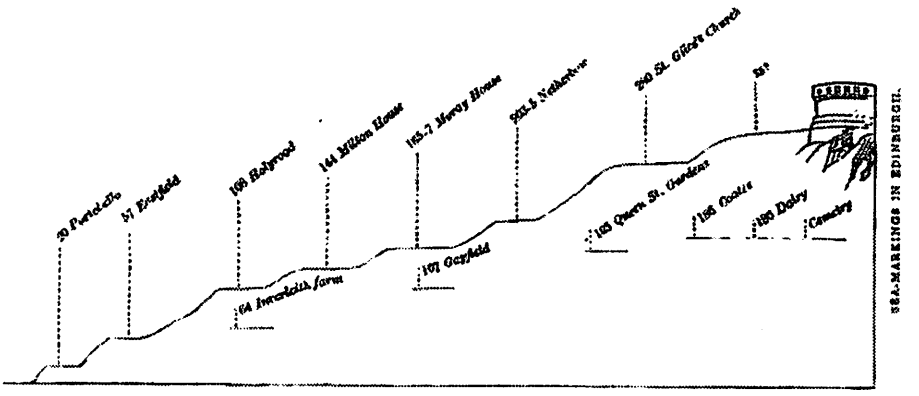
The house in Peebles where the Chambers brothers were born (from Chambers, 1872)

In Peebles, by the Eddleston Water, a modest plaque marks the house where, 200 years ago, Robert Chambers was born on 10th July 1802. Like his fellow Edinburgh journalist and author Hugh Miller, also born in 1802, Chambers rose through hard times by unremitting work and self-improvement in the traditional lad o'pairts style. By the 1840s, Chambers was co-proprietor, with his brother William, of W. & R. Chambers, publishers of *Chambers's Edinburgh Journal* and a variety of other productions for Victorian families and institutions, not least their *Dictionary* which is still going strong. His bicentenary, unlike Miller's, has so far been fairly quiet, with the exception of (admittedly a little earlier) the massive and fascinating new book by Jim Secord (2000), and a characteristically sympathetic article by Jim Gilchrist in *The Scotsman*, but his story has some surprising links with Edinburgh geology.

Chambers liked to push good old Scots and new Victorian self-improvement in his publications, and, as a young, struggling freelance journalist, Hugh Miller for one was grateful for his encouragement. Although Chambers avoided Miller's religious admixture, he was keen on science. He became something of an amateur geologist, though no doubt it helped to own the firm which published *Ancient Sea-Margins* in 1848. This book is only briefly mentioned in Gordon Davies' classic history of geomorphology, *The Earth in Decay*. No wonder! Most geologists had yet to accept Louis Agassiz's newfangled idea of a huge glacial icecap, and stuck to the old understanding that the Pleistocene landforms of Scotland were formed by the erosive effects of marine inundations by an iceberg-laden sea.



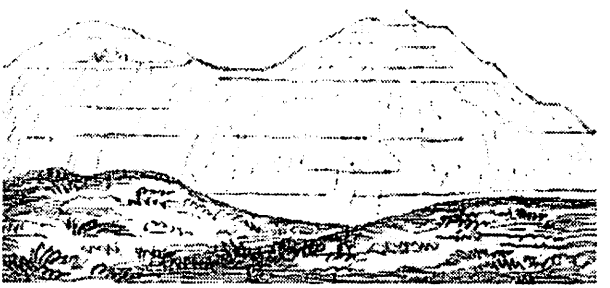
Portrait of Robert Chambers (from Chambers, 1872)



Chambers's enthusiastic identification of old marine terraces in Edinburgh from the shore right up to the Castle! (from Chambers, 1848)

Chambers, with glorious overenthusiasm, counted no less than 57 recognisable marine erosional terraces in the British Isles up to 1340 feet above sea level. He went on to assert the 'perfect equability' of these levels not just across Britain but globally, invoking purely sea-level changes without any role for land uplift and sinking, and he ruled out differential warpage of the land. As Miller pointed out gently but firmly in his review in *The Witness* (reprinted as Miller, 1891), there was plenty of evidence for such differential warpage. And why were there no fossil sea-caves behind supposed raised beaches other than the lowest (i. e. that above the present-day shore), even in hard rocks such as the 'granite gneiss' of the Sutors of Cromarty? Chambers had already been roughly handled at the British Association meeting in the previous year when he presented his ideas - but the scientists had other reasons not to be pleased with him (Secord 2000).

The Royal Physical Society of Edinburgh seems to have been where Auld Reekie's scientists met most easily - people such as Hugh Miller, Charles Peach, and Edward Forbes, and youngsters such as Archibald Geikie. Chambers's Presidential address in November 1856 stressed the importance of



Still more terraces, this time in the Eildon Hills (from Chambers, 1848)

the Society as a place to encourage learners and novices, and the exclusion of selfish and controversial motives (Chambers [1857], p. 175):

> ... I consider myself here chiefly in the capacity of a learner. I come here because I love science, and, from sympathy, like to be among its cultivators; also with the view of communicating any novelty in nature that may occur to my observation; but even in a greater degree, because I feel myself to be but slightly informed on most subjects, and wish to be more largely and more accurately informed on all.

I should have liked to be the proverbial fly on the wall! Some of his listeners must have quietly seethed, for they rightly suspected him of perpetrating a notorious and scientifically unsound book, poaching on the preserves of these new professionals and rocking their boat. This was, of course, *Vestiges of the Natural History of Creation*, a pro-evolutionary work which Chambers published anonymously in 1844, to protect his family's respectability, and the economic survival of the family firm. Even then, suspicion alone lost him the chance of the Lord Provostship of Edinburgh.

In *Vestiges*, Chambers tackled 'life, the Universe and everything', from the creation of the Solar System onwards right down to biological and human evolution. This was a simplicistic, progressionist view of evolution in which the cosmos was programmed to unfold without further divine intervention, much as Babbage's Engine could be - though to speak of it 'booting up' might be a little too anachronistic! He left many hostages to critics in his errors, and laid bets on some promising scientific horses that promptly dropped dead, the cold fusions of their day - my favourite being the electrically generated mites. But these are the occupational hazards of any science writer, and it is missing the point to dismiss it as scientifically fourth-rate. It was a popular book, superbly written with just the right degree of speculation.

Chambers thus let the evolutionary cat out of the bag, updating Lamarckian evolution to suit the Victorian middle classes, who found themselves presented as the acme of creation. The anti-evolutionists were horrified, especially when *Vestiges* came out in a cheap edition. Some, especially aristocratic Tories, opposed evolution as a nasty French democratic innovation that heralded the collapse of society. Others such as Miller found it incompatible with their deeply held religious views, leading not only to social collapse but also personal damnation, though Miller was also very unhappy with the science. He got in some telling blows in books such as the pointedly titled *Footprints of the Creator* (1849) by asking, for example, why his (apparently) early Old Red Sandstone fishes didn't fit well with Chambers's model.

Vestiges may be almost forgotten today, but it inspired Alfred Russel Wallace to go

and hunt the evidence for evolution in tropical jungles, whence one day he wrote the famous letter which levered Charles Darwin out of the closet with *On the Origin of Species*. In no way did *Vestiges* have the depth and scientific credibility of that book, but it had gone before, drawing much waiting flak and getting the world used to the idea of evolution, however superficially, from *Punch* cartoons to Tennysonian poetry. It was Chambers, too, who persuaded Thomas Henry Huxley to change his mind about attending the famous meeting in the Oxford University Museum where he, apocryphally, debated with Bishop Wilberforce the relative merits of apes and Anglican ecclesiastics as grandparents.

With *Vestiges*, Chambers, that astute journalist, had smelt a huge story about which the public wanted to know, but which the scientists didn't have the guts to tackle in the face of opposition. If I were to draw a nice neat Victorian moral, it would be that science isn't just what happens in laboratories, field parties and learned journals, and that we are wise today to put great emphasis on the public understanding of science.

References and further reading

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Secord, J. A. 2000. *Victorian Sensation. The Extraordinary Publication, Reception and Secret Authorship of* Vestiges of the Natural History of Creation. University of Chicago Press.

Mike Taylor is Curator of Vertebrate Palaeontology in the Department of Geology and Zoology of the National Museums of Scotland. The National Library's first edition of Vestiges, *and at least one fossil Miller used in the ensuing debate, were on show in the exhibition* Testimony of the Rocks: Hugh Miller 1802-1856 *(March-June 2002), on which he worked with Lyall Anderson and Christine Thomson.*

What's in a Name?

Old Norse and Norn Names in Shetland

by Allen Fraser

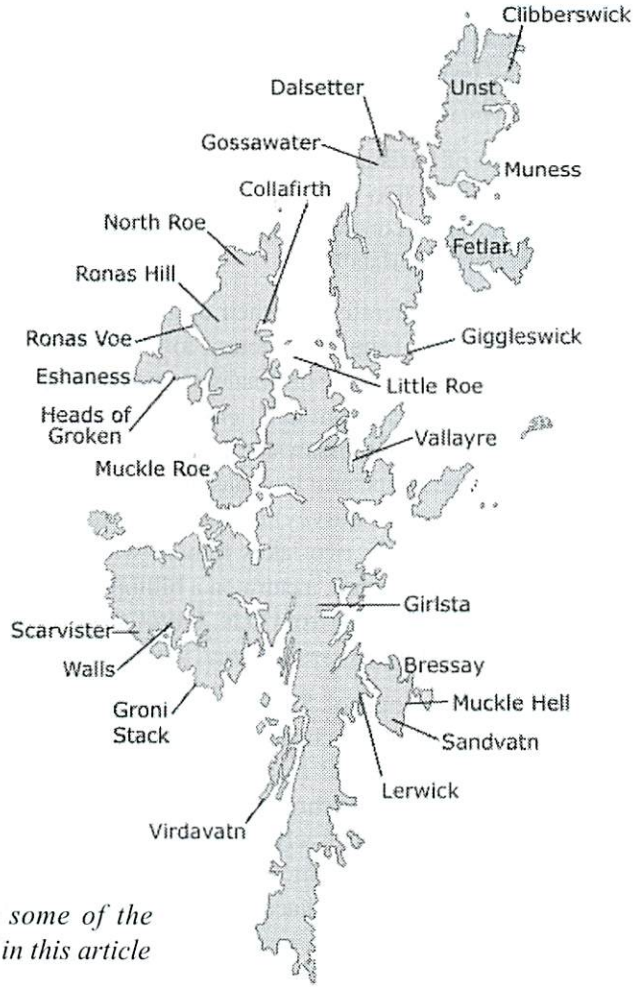
Any visitor to Shetland using Ordnance Survey maps or reading the road-signs could be forgiven for thinking they had landed in a province of Iceland or Scandinavia. Indeed Shetland did belong to Danish-Norse-Swedish Empire until it was mortgaged to Scotland in 1469. Shetland had its own language, Norn, which had evolved from the Old Norse (*Norroena*) language brought by Viking settlers in about AD 800. This language completely replaced the then Pictish language and was the chief medium of oral and written communication from Viking times well into the Middle Ages, in fact Norn was spoken in Shetland through until the mid eighteenth century.

In time immigration from the south and the gradual change from the Norse Udal Laws to the repressive Scots Feudal system led to the replacement of the native Scandinavian idiom by Lowland Scottish, but not completely. Today Norn survives in the place-names of Shetland, although often the English spellings do not reflect the Shetland pronunciation. The place-names of Shetland given by our Scandinavian ancestors have been heavily influenced by the geomorphology and the geology of the islands, far too many in fact to be comprehensively covered by this article. Of his research into the Norn of Shetland Jackob Jakobsen wrote: 'every small hill, point rock, dale, cleft, brook, piece of field or meadow, etc., bears its own name, and these names, with comparatively few exceptions have been handed down in Norn dialect.' The small Isle of Fetlar, scarcely four square miles in area, contains about two thousand place names, and the entire number of place-names of the isles no doubt exceeds fifty thousand.

Shetland gets its name from the relative distribution of its hundred islands having the appearance of a downward pointing sword [N. *Hjaltland, pron. yaltlaand*, from O.N. *hjalt*, the crosspiece between the blade and handgrip]*.

By and large, the majority of Shetland place-names are descriptive compound names with common endings such as: *-land* [O.N. *land*], *-ness* [O.N. *nes*, a headland], *-voe* [O.N. *vágr*, a long narrow sheltered bay], *-wick* [O.N. *vik*, an open bay with little shelter] and *-firth* [O.N. *fjördr*, a wide bay]. The shape of the land is responsible for some names: examples are the Old Norse words *hár*, high, *breidr*, broad, *mjór*, narrow and *kollr*, a round hill, giving us *Houlland* [N. *Hóland*], high land, *Braehoulland*,

* In this article, Old Norse words are indicated by the initials O.N. and Norn names by the initial N.



Map of Shetland with some of the place-names mentioned in this article

broad high land, *Muness* [N. *Mjóanes*], narrow ness and *Collafirth* [N. *Kollafjördr*], a firth sheltered by round hills. Other places take their names from the Old Norse words for sediments *leir*, clay or mud or *sandr*, sand, for example *Leiraness* [N. *Leirnes*], *Sandvoe* and *Lerwick* [*pron. ler-week*], Shetland's capital, which is situated by a muddy bay.

Norn also survives in the many farm and settlement names as compound names ending in *-setter* [O.N. *setr*, hill pasture], *-sta* [O.N. *stadir*, a farm] and *-bister* [O.N.

bólstadr, an area divided into farms]. Mostly the compounded farm names indicate the name of an original owner but occasionally describe its relative position, the quality of the ground or the topography as in *Scarvister* [O.N. *skarv*, bare rocky ground] and *Dalsetter* [O.N. *dalr*, a valley].

The settlement of Girlsta, originally *Geirhildstadir* was named after Geirhildr, the daughter of Hrafna-Flóki who used Shetland as his base before setting out to colonise Iceland. Geirhildr was drowned in the nearby *Geirhildarvatn* [N. *vatn*, lake or water, *pron. wat-er*], now Girlsta Loch.

Lakes in Shetland generally owe their original names to the streams that flow from them. The addition of the Scots 'burn' to the original Shetland stream names has evolved over time so now the original stream names are mostly preserved in the lake names e.g. Gossawater [from O.N. *gás*, a goose and *á*, a river] the head waters of Gossa, now the Burn of Gossawater. Lake names ending in -water are still common in Shetland but the Scots term loch has gradually replaced water for the larger lakes (thanks to the Ordnance Survey) often making the name nonsensical, e.g. Loch of Gossawater. Today only two lakes remain with the ending -vatn, Sandvatn and Virdavatn [from O.N. *varda*, a cairn on a hilltop] and just a few streams without the burn appendage e.g. Bretto [from O.N. *brattr*, steep]. The *-o* ending comes from the Norn dialect of the Old Norse *á*, a river, which they pronounced *-o*.

The underlying geology of Shetland is often reflected in its place-names. The spectacular red granophyre cliffs of north-west Mainland are reflected in the names Muckle Roe, Little Roe and North Roe [N. *røe*, from O.N. *raudøy*, in turn from *raudr*, red and *øy*, isle]. Røebrekks and Røebregg [O.N. *brekka*, slope] are the red hills and the red hill respectively. Neep and noop [O.N. *gnípa*, high ground with a steep face] is a common name for high sea cliffs, hence Roeneap. Ronas Hill, Shetland's highest, (and its adjacent fjord, Ronas Voe) although of red granophyre, is a stony hill [from O.N. *raun*, stony ground, N. *røni*, a heap of stones]. The red granophyre cliffs meet grey schist at the Heads of Groken [from O.N. *grar*, grey and *kinn*, cheek or steep slope].

Sea level rise since the last glacial period has left numerous shingle spits, bars, beaches and offshore rocks hence many occurrences of -ayre and stack [O.N. *eyrr*, sand, gravel or pebbles beside water, *stakkr*, a high sea rock]. Examples of these are: Vallayre [from O.N. *vadill*, a shallow part in water] and Groni Stack [from O.N. *groenn*, green]. On the island of Bressay [from O.N. *breidr*, broad and *øy*, isle] a flat sheet of rock slopes down to the sea at Muckle Hell [from O.N. *milk*, large and *hella*, a flat rock].

The soft rock talc-magnesite, also known as steatite or soapstone, is referred to in Shetland as *klebber*, [from O.N. *kle*, a loom weight and *berg*, a rock] and has been exploited throughout Shetland's history. Neolithic potters ground down the rock to be used as an ingredient in pottery along with glacial clay, but the greatest exploitation of this material occurred in Norse times. Steatite was extensively quarried by Norse settlers to produce a whole range of functional and decorative objects from loom and fishing weights to cooking utensils to personal ornaments. Objects of Shetland steatite have been found in association with Norse settlements throughout Britain and Ireland suggesting a thriving export trade.

The force of the sea acting on joints and faults in the cliffs have collapsed these in many dozens of places, often to spectacular effect. The resultant narrow inlets known as geos [from O.N. *gjá*, a cleft or chasm], almost all have their own descriptive name. Klebber Geo on north Mainland displays evidence of Viking workings as does Clibberswick [N. *Klebergswik*] on Unst, where talc is still being quarried today. The Kirn o da Slettans [O.N. *slétta*, a level field] is a blow-hole in the flat cliff-tops of the volcanic province of Eshaness [O.N. *esja*, partly soft stone and partly a hard flaky stone]. It is interesting to note that thick band of soft and heavily weathered material lies within the lava flows on Eshaness. Is this evidence for Viking geologists?

Anglicisation of Shetland's place names has gathered pace since the end of the eighteenth century. In many cases the Ordnance Survey have assumed that local pronunciations of place-names were in mis-pronounced English rather than in a dialect of Norn and this has led to anglicised spellings on their maps. Mis-spelling has led to some amusing and contrary place-names (I will leave out the rude ones): Soond [N. *sund*, a channel] became Sound, Waas [O.N. *vágr*, a bay] became Walls and Moosehol [N. *Móshol*, from O.N. *mór*, heath and *hola*, a hollow] became Mousehole. And who would think twice about sailing into Giggleswick – not as funny as it sounds; it comes from the Old Norse word *geigr*, meaning danger.

In preparation of this article I have made use of the following references:

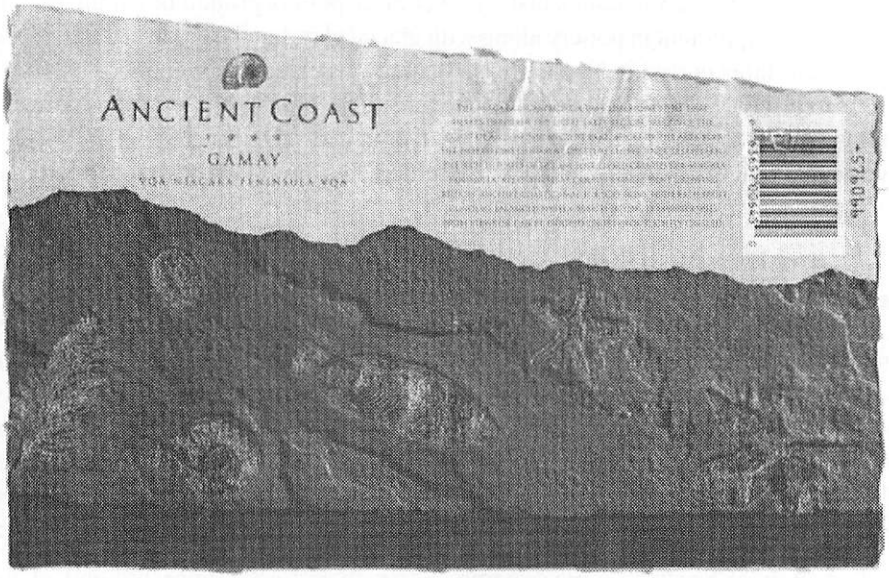
Jakob Jakobsen *The Place-names of Shetland*

Jakob Jakobsen *An Etymological Dictionary of the Norn Language in Shetland*

John Stewart *Shetland Place-names*

Allen Fraser is a native Shetlander. He is a meteorologist and currently works as a weather forecaster at Sullm Voe, but he also has an interest in Shetland's history and geology. In 1994, he graduated with a BSc in geology from the Open University and has led field trips for the Open University Geological Society in Shetland.

Geo-vineyards



The label notes say:

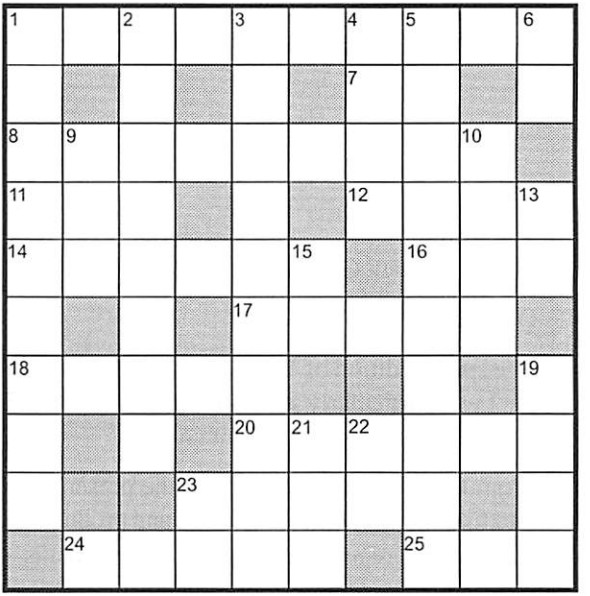
The Niagara Escarpment, a vast limestone spine that snakes through the Great Lakes region, was once the coast of an immense ancient lake. Rocks in the area bear the impressions of marine creatures long since disappeared. the rich deposits of the ancient sea bed created the Niagara Peninsula, recognized as Canada's finest wine-growing region. Ancient Coast Gamay is a soft wine with rich fruit flavours balanced with a touch of oak. It marries well with stews or can be enjoyed on its own slightly chilled.

Thanks to Cliff Porteous, who sent me this spectacular label. Apologies to any readers who might miss the usual tongue-in-cheek Tasting Notes, but I felt that the real label notes were so geological that it was better to tell the truth for once.

I would be grateful for any similarly geological wine labels... my cellar is empty!

Rocksword Puzzle No. 8

compiled by Angela Anderson



Clues across

1. Sundial ate $Al_2O_3SiO_2$ polymorph from Spain (10 letters)
7. Initially United Nations (2)
8. A claim the copper mineral makes (9)
11. Wager in time (3)
12. Get rammed into old vehicle (4)
14. Right in or maladroit fault (6)
16. Put us ever in work (3)
17. Lying or seated in, it covers the hills with thorns (5)
18. Not extra (5)
20. Tore in to can raw stuff (3,3)
23. Return no Vedic philosophy into old English county (5)
24. Plainly gaseous (5)
25. Backed us in soap (3)

Clues down

1. Mailed Nan about a variety of garnet (9)
2. Toe riled up in 5 down (8)
3. Act age over sale of semi-precious stones (4,6)
4. Back us, it seems, in clothing (4)
5. Suitors inn rearranged underground igneous phenomena (10)
6. Formerly extra without tar (2)
9. In saga gone past (3)
10. Relax in grease (4)
13. Myself and I (2)
15. Look less OK (2)
19. Conduct heavy metal (4)
21. A clinging sort of lass (3)
22. Turn on negative (2)
23. Initially deep sea (2)

This is Angela's eighth puzzle, and another cracker with a fair sprinkling of geological clues! For those who need help, the answers can be found inside the back cover of this issue.

Letters: proustite postscript

from Peter Dryburgh

I am always pleased to receive letters. The following came from the President

32 Newbattle Terrace
Edinburgh EH10 4RT
10th May 2002

The Editor
The Edinburgh Geologist

Dear Alan

The spring edition of The Edinburgh Geologist was full of interesting things but I was particularly struck by Brian Jackson's fine photograph of a proustite crystal that adorned the front cover.

From the nineteen sixties up to the present, there has been much research into finding new optical materials and producing highly perfect single crystals of them. There are two principal requirements, one for crystals suitable for the production of new lasers and the other for optical components that allow the manipulation of light emitted from lasers.

Proustite was identified as a useful material by Hulme *et al.* in 1967 and later grown in the form of optical quality crystals several centimetres in length. Proustite has a large range of transparency in the infrared part of the spectrum (0.6 - 13μm) and, like its close relative pyrargyrite, has favourable symmetry for frequency doubling and mixing.

The application of this rare mineral to laser optics makes me wonder how many mineralogists realise the extent to which minerals, both common and rare, are synthesized and grown as large, high-quality crystals for applications in modern technology, far removed from mineralogy.

The growth of corundum, quartz and ruby are long established and generally familiar, but readers may be interested to know about others. A comprehensive list would be extremely difficult to compile – and would occupy an intolerable amount of space here, but a small random selection is given below to illustrate the point. Large crystals of the following minerals, among many others, have been grown for applications which depend upon their individual electrical, optical or magnetic properties:

greenockite	CdS	zincite	ZnO
zincblende	ZnS	periclase	MgO
chrysoberyl	Al_2BeO_4	alexandrite	$[Al,Cr]_2BeO_4$
rutile	TiO_2	spinel	$MgAl_2O_4$
berlinite	$AlPO_4$	beryllia	BeO
fluorspar	CaF_2	galena	PbS
magnetite	Fe_3O_4	diamond	C

In addition to naturally occurring minerals, there are many important analogues which do not occur naturally but which find important uses in magnetic, electronic and optical technology, prime examples being the garnets containing no silicon, such as yttrium iron garnet and gadolinium gallium garnet.

Yours sincerely

Peter Dryburgh

References and further reading

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...and the following letter was sent to the President

23 New Causeway, Barkestone, Notts, NG13 0HA

30th July 2002

Thoemmes Dictionary of Nineteenth Century British Scientists

Dear Colleague

You probably know that adictionary of British nineteenth-century scientists is in preparation, and that Dr. A Bowdoin and I are the editors responsible for the geological part of it. Contributors are still needed for the following list of geologists in the half of the list for which I have editorial resposibility. I'd be very grateful for your advice and help in finding contributors willing to write the entries for these persons:

Boase, Henry Samuel (1799-1883)
Clough, Charles Thomas (1852-1916)
Hicks, Henry (1837-1899)
Hudleston, William (1828-1909)
Lonsdale, William (1794-1871)
Newton, Edwin Tulley (1840-1930)
Nicol, William (1768-1851)
O'Kelly, Joseph (1832-1883)
Ormerod, George Wareing (1810-1891)
Rose, Caleb (1790-1872)
Sanders, William (1799-1875)
Seeley, Harry Govier (1839-1909)
Sharp, Samuel (1814-1882)
Shore, Thomas William (1840-1905)
Tennant, James (1808-1881)
Ward, James Clifton (1843-1891)
Wilkinson, Charles Smith (1843-1891)
Woods, J.E.T. (1832-1889)
Woodward, Henry (1832-1921)

Please be in touch with me if you would lilke to write entries for any of these geologists, or if you know anyone I might approach. the payment for a 600 word entry on any of them would be £35.

Yours sincerely,

Michael Collie, Professor Emeritus

Solution to Rocksword Puzzle No. 8

Clues across

1. ANDALUSITE
7. UN
8. MALACHITE
11. AGE
12. TRAM
14. NORMAL
16. USE
17. GORSE
18. INTRA
20. ORE
23. DEVON
24. GASSY
25. SUD

Clues down

1. ALMANDINE
2. DOLERTITE
3. LACE AGATES
4. SUIT
5. INTRUSIONS
6. EX
9. AGO
10. EASE
13. ME
15. LO
19. LEAD
21. IVY
22. NO
23. DS

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