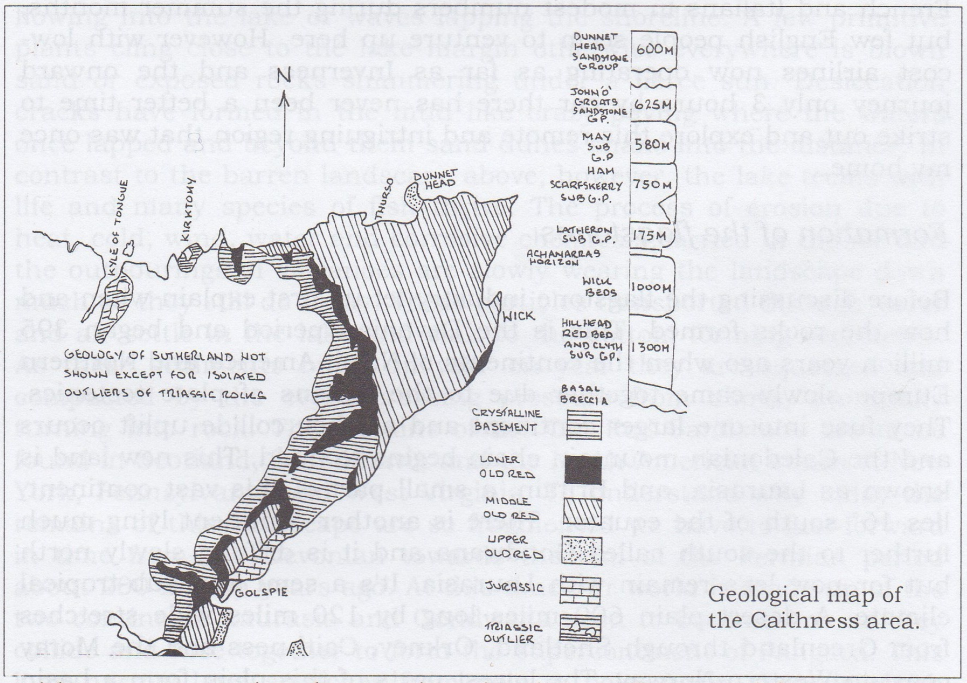
Caithness:

Its Former Flagstone Industry and its Fossil Fish

Alan Saxon

Caithness in the far northeast corner of mainland Britain is a county of many contrasts. It is roughly triangular in shape with the North Sea forming its eastern flank and the Atlantic its northern coastline. The border with Sutherland makes the third side of the triangle and comprises of a series of mountains and hills stretching from coast to coast. This hilly region is mainly made up of the Lower Old Red Sandstone Group. The main road, the A9, initially runs up the east side of Sutherland climbing up to about 800 ft as it crosses the border into Caithness affording fine views out to sea. Looking inland, the majestic mountains of Scaraben and Morven, formed by a granite intrusion, loom large. The scenery is of peat upland covered in heather



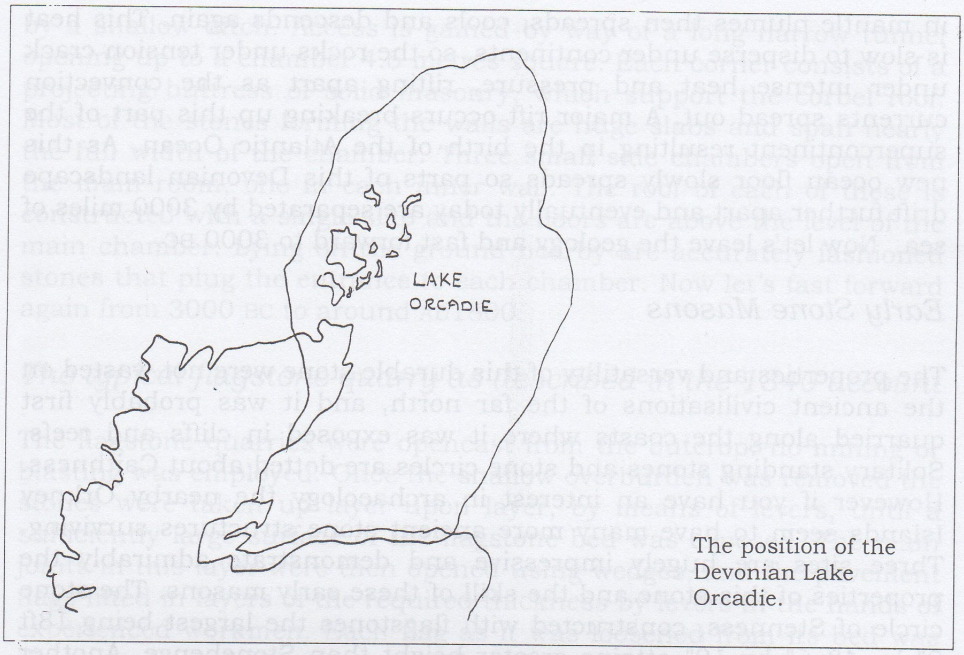
Geological map of the Caithness area.

with streams cutting deep ravines in places. Trees and ferns cling to the sheltered lower flanks here and there and patches of planted pine forest run in regimented rows along the roadside. After a while we turn our backs on the sea and head inland rising up to a plateau. All that can be seen for miles looking back towards the border is a vast expanse of peat bog and the occasional loch. The now distant mountains and hilly ridges form an almost unbroken line as far as the

eye can see. A low range of hills obscures the view on your right, but you can tell that the geology is gradually changing as the acid soils supporting the moorland slowly give way to green fields grazing sheep and cattle. You are now in the Middle Old Red Sandstone and not far beneath your feet lie the flagstones that once made this area famous. You will soon pass through the village of Spittal, a lonely isolated place on the edge of the moor. Here you will pass your first flagstone quarry and one that has been worked almost without a break for 160 years: we will return to it later in this article. As you approach the market town of Thurso, the sea comes back into view again but this time it's the Atlantic. When you descend towards the town above the river valley a long headland comes into view. To the east this is Dunnet head and the most northerly point on the mainland; its distinctive Upper Old Red Sandstone cliffs rise 450 ft out of the sea. Looking to the north the rocky Orkney Island of Hoy stands off some 8 miles away across the Pentland Firth. Here the cliffs reach a vertical height of 1000 ft. Until recently a journey to this part of Scotland was long and tiresome; by train or car it is more than 600 miles from Bath. I believe this has in the past deterred many from visiting the far north but I hope that by the time you have finished reading this some of you will want to see it for yourself. This area attracts Dutch, Germans, French and Italians in modest numbers during the summer months, but few English people seem to venture up here. However with low-cost airlines now operating as far as Inverness and the onward journey only 3 hours by car there has never been a better time to strike out and explore this remote and intriguing region that was once my home.

Formation of the flagstones

Before discussing the flagstone industry let us first explain when and how the rocks formed. This is the Devonian period and began 395 million years ago when the continents of North America and Northern Europe slowly came together due to the actions of plate tectonics. They fuse into one larger continent and as they collide uplift occurs and the Caledonian mountain chain begins to build. This new land is known as Laurasia, and Britain, a small part of this vast continent, lies 16° south of the equator. There is another continent lying much further to the south called Gondwana and it is drifting slowly north but for now let's remain with Laurasia. It's a semi arid sub-tropical climate. A desert plain 600 miles long by 120 miles wide stretches from Greenland through Shetland, Orkney, Caithness and the Moray coast to Western Norway. The lowest parts of this plain form a basin occupied by a large shallow freshwater lake known to geologists as Orcadie. It stretches north from a place we now know as Inverness up to the southern tip of Shetland. Mountains lie to the northwest and a marine Devonian Sea to the south covering what is now southwest England. Although hard for us to comprehend this new land is silent and void of life, the only detectable sound would be of running water



The position of the Devonian Lake Orcadie.

flowing into the lake or waves lapping the shoreline. A few primitive plants cling close to the lake margin otherwise everywhere is blown sand or exposed rocks shimmering under a fierce sun. Desiccation cracks have formed in the mud like crazy paving where the waters once lapped and beyond them sand dunes snake into the distance. In contrast to the barren landscape above, however, the lake teems with life and many species of fish thrive. The process of erosion due to heat, cold, wind, water and corrosive chemicals carried in the air and the outpourings of volcanoes are slowly wearing the landscape down much as they still do today. These particles transported through water and air settle in the lake and sink to the bottom forming sediments. As these sediments build up year on year they are squeezed and compacted by the ever-increasing pressure from above, eventually turning into rock. The remains of the Old Red Sandstone are to be found in Scotland, Scandinavia and the North American states of New York, Pennsylvania and West Virginia. To understand why today the remains of this landscape are so fragmented we have to fast-forward in time from the Devonian towards the end of the Permian period about 200 million years ago. At this time our world is made up of the two continents Laurasia and Gondwana soon to become one as they collide and fuse together to form the supercontinent of Pangaea. This long narrow land stretches from pole to pole. Again there is much uplift forming the mountain chains of the Appalachians, Rockies, Alps and Urals. At the beginning of the Jurassic, 193 million years ago, this supercontinent now begins to break up. The break-up is thought to occur when the upper regions of the Earth's mantle (a plastic zone attached to the more rigid outer crustal rocks) respond to the powerful convection cells from below. The hot magma rises towards the surface

in mantle plumes then spreads, cools and descends again. This heat is slow to disperse under continents, so the rocks under tension crack under intense heat and pressure, rifting apart as the convection currents spread out. A major rift occurs breaking up this part of the supercontinent resulting in the birth of the Atlantic Ocean. As this new ocean floor slowly spreads so parts of this Devonian landscape drift further apart and eventually today are separated by 3000 miles of sea. Now let's leave the geology and fast forward to 3000 BC.

Early Stone Masons

The properties and versatility of this durable stone were not wasted on the ancient civilisations of the far north, and it was probably first quarried along the coasts where it was exposed in cliffs and reefs. Solitary standing stones and stone circles are dotted about Caithness. However if you have an interest in archaeology the nearby Orkney Islands seem to have many more ancient stone structures surviving. Three sites are hugely impressive and demonstrate admirably the properties of this stone and the skill of these early masons. The stone circle of Stenness, constructed with flagstones the largest being 18ft 9" by 4ft 6" by 10" attains greater height than Stonehenge. Another good example is the Late Neolithic village of Skara Brae where houses were fitted out with stone beds and cupboards and a complex drainage system laid between the interconnected dwellings. Without any doubt the most spectacular is the burial chamber of Maze Howe. This structure appears half-spherical externally and is now covered in grass, resembling a small version of Silbury Hill. It is surrounded

Maze Howe.

by a shallow ditch. Access is gained by way of a long narrow tunnel opening up to a chamber 4.6 metres square. Each corner consists of a projecting buttress of solid masonry, which support the corbel roof. Most of the stones forming the walls are huge slabs and span nearly the full width of the chamber. Three small side chambers open from the main room, one in each inner wall. The roof of each of these is constructed with a single slab and the floors are above the level of the main chamber. Lying on the ground nearby are accurately fashioned stones that plug the entrance to each chamber. Now let's fast forward again from 3000 BC to around AD1800.

The typical flagstone quarry as described in the 1840 account

The flagstone quarries were opencast from the outcrop: no mining or blasting was employed. Once the shallow overburden was removed the stones were taken up layer upon layer, by means of levers, until a sufficiently large surface of the flagstone bed was exposed. The main joints in this layer were then opened using wedges, and the pavement flags lifted in layers of the required thickness by levers in the hands of experienced workmen. Each flag as it was loosened from its bed was then taken away from the scene by means of a crane and subject to preliminary squaring. As the working face advanced, in the larger quarries that have been worked for long periods, a perfectly smooth surface which forms the bed of the pavement layer is left as the floor of the quarry. In certain cases where the dip is very gentle and the slope of the ground is in the same direction, the working faces were driven against the dip, and the floor of the quarry kept dry by natural drainage. In some cases pumping was required to keep the quarries working.

Utilisation and grades of stone

The very best quality stones were selected for paving. Their fitness depended on their perfectly smooth bedding planes and how easily they would split to the required thickness. Such a rock usually had widely spaced joints allowing large sizes of flags to be obtained of a regular shape. Other local uses include walls, roofing, internal flooring, the lining of drains, field boundaries, and road metal. When used for fencing individual flagstones were placed edge on into the ground and overlapped to form a continuous barrier: cheaper and quicker than the traditional stone walling and very low maintenance. You will also find the more familiar dry stone walling in many areas.

- First quality flagstones pavements (thickly bedded from ¾ inch upwards).
- Second quality rough flags fencing (as above but less even bedding plane).
- Roofing flags (thin bedding plane).
- Building stone (selected as required dependant on status of buildings).
- Road metal (no reliable bedding plane).

Finishing of stone

When the rough-cut flags arrived at the pavement works they would be sawn to the required sizes, usually from 2 to 6ft in length and 1 to 4ft in breadth although much larger sizes could be supplied. At the Thurso East flagstone works, the engine and main driving shaft, with gear and belting were covered by a long central shed having on either side an open yard where the cutting machines were arranged at regular intervals. The saws used had no teeth. The flags were placed on tables. These tables were in fact wheeled vehicles running on rails. Sturdy rectangular frames straddled the rails and each carried two saws. The tables were wheeled under the saws and a long sand trough with water pipes attached to the frames assisted the cutting. The cut was not carried out completely through the flags, but after a certain depth of cut was achieved the saw was stopped and the table drawn back. The flags were then trimmed by knocking off the edge of the stone beyond the cut with a hammer from below and the edge finished with a double-sided axe. Sometimes the surface of the flags would be polished for special uses indoors. This work was carried out inside a second shed. The polishing tables moved on wheels like those used for cutting, but were wider and had splashboards fitted. The polished surface was obtained by means of flat concentric iron rings, slightly spaced in a horizontal plane, and given an eccentric rotation.

The beginnings of the fledgling industry 1824

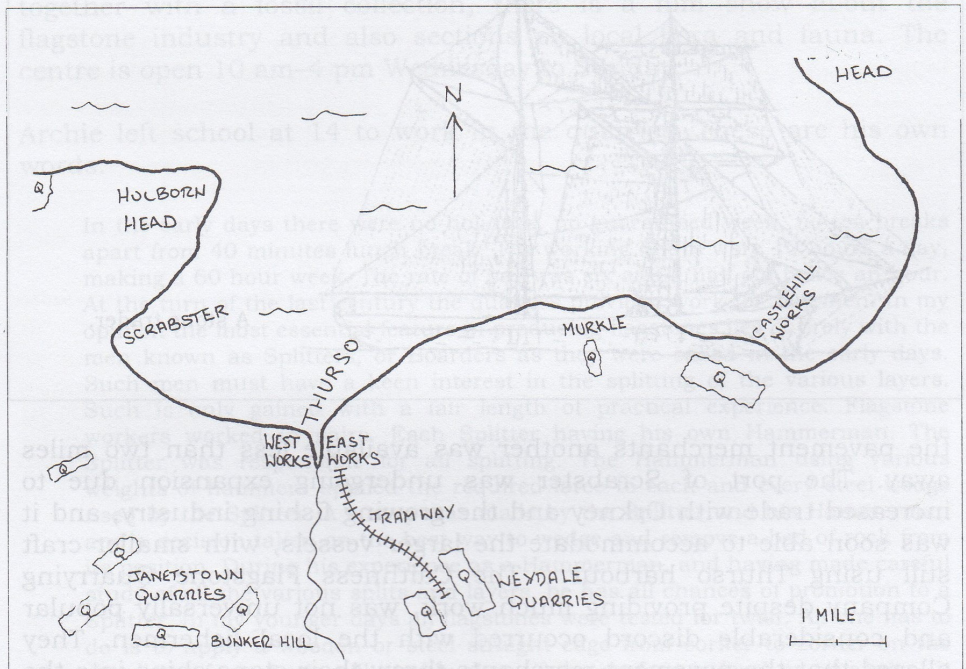
A Mr Scott opened the first quarry for exporting pavement in the neighbourhood of Murkle, and soon after the nearby Castlehill quarry was opened by a Mr Trail in 1824; the first shipment of flagstones occurred in 1825. The following appeared in the statistical accounts of Caithness-shire 1825.

> 'In the raising of stone for pavement much has been done for some years back. The finest quality of this is found on the property of Mr Trail of Ratter, the stratification being so very regular and plane that it answers admirably for streets, without any surface dressing. The layers are from three-quarters of an inch to five inches thick and upwards in the quarry; the colour of the stone from a smokey-grey to blue. This stone is very hard, and exceedingly strong and durable. Some of the oldest houses in Caithness are roofed with it, and it has been employed with advantage for granary floors being laid on joists at the ordinary distance, in the upper as well as the lower flats of buildings. The inhabitants of London, Newcastle, Edinburgh, Glasgow and other towns are now reaping the benefit of pavement exported from this parish. At Castlehill machinery is employed in sawing the edges and polishing the surface of the stone, which is used in this prepared form for lobby floors, tables, hearthstones, and mantle pieces, and other purposes within doors. Upwards of 100 labourers are constantly employed, and numerous cargoes of this useful commodity are exported every season; the proprietor having erected a neat and commodious harbour for his own use, has now the pleasure and advantage of seeing his own and other vessels coming in and going out in safety in the immediate neighbourhood of his mansion house. The tonnage required being

from 3,000 to 4,000 and the annual shipment of pavement alone being from 300,000 to 400,000 square feet'.

The Heyday

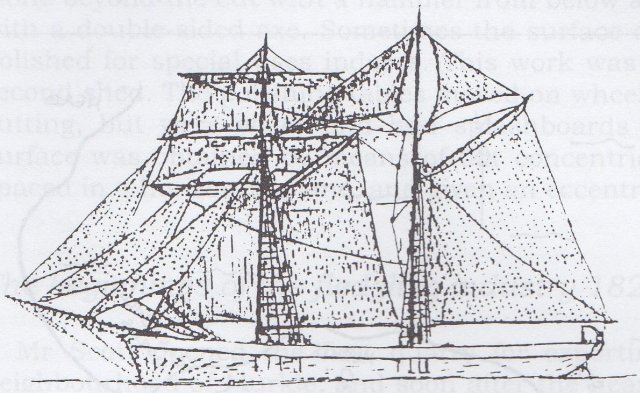
As time passed quarries sprang up all over the county to tap into this lucrative business. Three main centres emerged to finish and ship the flagstone to its customers. The first at Castlehill was augmented by another pavement works at the county's principal town of Wick and at Thurso. The later had two pavement works, one on the east and another on the west bank of the river mouth and tidal harbour. Thurso would soon emerge as the main centre for the blossoming flagstone industry. It employed 1000 men until steam engines were brought in to cut the stone and then numbers fell back to around 500. It was said that the whole town buzzed from dawn to dusk to the sound of stone cutting. Numerous quarries were opened in the close vicinity to feed the relentless increase in demand and employed many



Position of the main quarries around Thurso.

more labours and quarrymen. At nearby Weydale a horse-drawn tramway was constructed to transport the rough-cut stone to the pavement works. A large complex of quarries opened up at Janetstown. Here the rough-cut stones were assembled into large piles known as bunkers. They were collected as and when required by the pavement works. There were so many of these large piles of stones

that the area was affectionately known as Bunker Hill. Thurso harbour such as it was proved unpopular with the sea captains and their crews as it was only accessible to them a few days either side of a spring tide. If they missed these tides it would necessitate a long wait riding out at anchor in the bay. Also when the wind was directly downstream, tacking up wind was impossible due to the narrow approach channel. Under these circumstances lines were thrown ashore and whatever casual labour was available would haul the brigs and schooners up to their berths for a small fee. Although some improvements to the harbour were carried out, the major work required was often debated but never materialised due to lack of funds. These small sailing ships known as stone traders were ideal vessels to handle European markets but as word spread to far off lands it became clear that larger ocean going vessels would be required and this harbour could not accommodate them. Luckily for



A stone trader.

the pavement merchants another was available less than two miles away. The port of Scrabster was undergoing expansion due to increased trade with Orkney and the growing fishing industry, and it was soon able to accommodate the larger vessels, with smaller craft still using Thurso harbour. The Caithness Flagstone Quarrying Company despite providing much work, was not universally popular and considerable discord occurred with the local fishermen. They alleged that the pavement merchants threw their stone chips into the river causing it to silt up and furthermore monopolised the available space preventing the landing of catches and putting out to sea. The simmering row reached new heights when the pavement merchants began construction of a wall jutting out 30 to 40ft into the river channel and occupying it as their own private property. The local council found themselves caught in the middle of an increasingly ugly dispute and word reached the ears of the Board of Trade in London. Government inquiries followed but by this time the wall was nearly complete and it would appear that no action was taken. The company was not renowned for its generosity towards its workers either, and

managed to avoid giving them a pay rise for thirty years until the men went on strike.

The life of a Quarryman

The following facts and figures were provided by the late Archibald Banks Sinclair born in 1909 in a quarry house at Spittal, and published by the Spittal action centre with assistance from the Wick Society.

About the author: Archie was always interested in geology and archaeology and had collected fossils since 1947 from Spittal and Achannaras. Many of his specimens are in the Royal Scottish Museum and in London. He had a love of his immediate environment and a desire to see it protected. He had considerable respect for his heritage and wanted it recorded for prosperity. This has resulted in the Archie Sinclair Fossil Centre located in the old school at Spittal, where together with a fossil collection, there is a film show about the flagstone industry and also sections on local flora and fauna. The centre is open 10 am–4 pm Wednesday to Sunday.

Archie left school at 14 to work in the quarries. These are his own words.

> In the early days there were no holidays, no guaranteed week, no tea breaks apart from 40 minutes lunch break. The working hours were 10 hours a day, making a 60 hour week. The rate of pay was six and a half old pence an hour. At the turn of the last century the quarries provided work for 100 men. In my opinion the most essential feature in producing flagstones lies entirely with the men known as Splitters, or Boarders as they were called in the early days. Such men must have a keen interest in the splitting of the various layers. Such is only gained with a fair length of practical experience. Flagstone workers worked in pairs. Each Splitter having his own Hammerman. The Splitter was responsible for all splitting. The Hammerman using various weights of hammers applied the required force to each and every steel wedge used by the Splitter. A survey was made by the Splitter and his Hammerman and a decision taken on the best way to wedge and remove a bed of rock from its position. During his experience as a Hammerman, and having made careful study of all the various splits and layers, he has all chances of promotion to a Splitter. In my younger days all flagstones were tested for twist. All one has to do is to apply a wooden or steel straight edge from corner to corner on the stones surface. Such will readily show if the surface is level or otherwise. It was then the job of the Scuffer to chip and axe down the area causing the twist. The area under flagstone in and around Spittal is, approximately 2 miles from north to south and 1 mile from east to west, at a depth of 10 ft flagstone rock producing when split approximately 60 flagstones. The thickness ranging from half an inch to three and an eighth inches. In most cases the flagstone rock does not exceed a depth of eight feet three. The reason being that the bottom layer known as the black rock, suddenly becomes fractured also jointing changes so much that the time spent on quarrying renders it uneconomic.

Guide to the Number of Layers and Flagstones Produced

Name of Layer	*Description*	*Total Thickness (inches)*	*Quantity*
Topie	First layer generally loose	2¼	1
Sheds	Splits into three, 1 @ ⅞, 1 @ 1¾, 1 @ 2¼"	3½	3
Big One	Does not split	3	1
Two's	Splits into 4, 1 @ 2⅝, 1 @ 2⅞ , 2 @ 2¼	7¾	4
4" layer	1 @ 2⅛, 1 @ 1⅞	4	2
Top Swirl	1 @ 2⅛, 1 @1⅞,1 @ 2¼, and 1 which splits 1 @ 1⅝, 1 @ 1½	9⅜	6
Strippers	splits into two layers, 1 @ 2", 1 @ 2½	4 ½	2
One and Three	1 @ 2", 2 @ 2½	7	3
Shed and Four	2 @ 2", 1 @1⅞,latter splits 1 @ 1", 1 @ 1⅞	5⅞	5
Bottom Swirl	2 @ 3", 1 @ 2½, 1 @ 3", 1 @ 3⅛,2 @ 2½	9⅝	7
Dingle	1 @ 2¾ usually loose	2¾	1
Ironie	1 @2¾, 1 @ 2⅛, 1 @ 1¼,1 @ 2", 1 @ 3½ latter splits	11⅝	7
*Greenback	1@ 1¾, 1 @ 2½, 1 @ 1½, 1 @ 2", 2 @ 1¾"	11¼	6
4" layer	1 @ 2⅛,1 @ 1⅞"	4	2
Big One	1 @ 3"	3	1
Slate	1 @ ¾"	¾	1
Black rock	22" which should yield another 10 flagstones		

*Above greenback lies ½" of slate

The quality of the flagstones in Spittal are considered to be the best in Caithness. Archie and his colleagues produced flagstones that can be seen in France, Germany, Bermuda, Canada, America, and Australia as well as all over England and Scotland.

Boom to bust

The industry continued to expand year on year until the early nineteen hundreds then declined steeply due to the popularity of new versatile building materials c cement and concrete, being less expensive quick to lay and simple to repair. Soon many quarries were abandoned some slowly flooded providing new habitats for wild creatures and plants, and as the spoil heaps gradually blended back in and their edges softened with the passage of time many all but faded from sight.

As for the Thurso pavement works, it was still cutting and finishing a few stones up until the early sixties and then went over to producing concrete building blocks before fading into obscurity. All that can be

seen today is a couple of shabby single-storey buildings and that contentious wall, the cause of so much animosity, ironically now stands abandoned since the decline in the fishing industry.

Heritage

As well as the Archie Sinclair Fossil Centre, at the former Castlehill quarry where it all began, a heritage trail has been set up. The site retains the ruins of many of its original features and given sufficient funds could be largely restored. In the early days a pair of overshoot water wheels supplied from a reservoir drove the stone saws and polishing equipment, and a windmill was employed to pump the water back up again from the sump. At some later date the water wheels were abandoned and steam engines took over.

The remains of the windmill, the reservoir, and the harbour pilots house are still very much in evidence and the tiny harbour constructed to dispatch Mr Trail's flagstone pavements is still intact and used today by a few lobster boats. Sadly Mr Trail's mansion house has not fared so well. It fell into disuse and became very dilapidated, but was intact until about thirty years ago when, soon after being bought by three local businessmen intent on converting it into a hotel, it caught fire and was completely gutted. It is perhaps wishful thinking, but maybe one day funds will be available to restore some of this site's original features. Perhaps the windmill, water wheels and saws will work again one day: who knows? It would certainly make an interesting tourist attraction.

Cyclothems: More Geology

In equatorial environments, evaporation is high and rainfall seasonal and extensive. Sand dunes and mudflats were produced at the margins of the lake as the water receded during dry periods. During wet periods extensive fresh sediments would accumulate in the lakebed. Superimposed on this cycle of dry and wet periods were longer climatic cycles lasting 100,000 years. These started with a relatively wet period with the lake lapping up the edges of the western mountains, and were followed by a drier period with the lake margin retreating towards the centre of the basin. This long-term cycle is now thought to be controlled by the eccentricity of the Earth's orbit around the Sun (the Milankovitch Cycle). It changes from near circular to elliptical and back again every 100,000 years. To study how the lake environment developed over the Devonian period we will leave Caithness for some very interesting data provided on the Orkney Islands, and take a short sea journey some 12 miles from Scrabster across the Pentland Firth to Stromness on Orkney Island mainland. On this short sea crossing you will pass close by the cliffs of Hoy that rise up a sheer 1000 ft: an unforgettable experience. In springtime

huge colonies of sea birds are to be found around these cliffs. The cyclothems can easily be traced in the sea cliffs and shores around the islands. Major cycles are represented by deposits 15–50 ft thick. Each cycle starts with a finely laminated dark grey to black muddy flagstone with fossil fish fragments and ends with lake margin sediments consisting of sands, silts and light grey mud with occasional thin bands of wind blown desert sand.

Before burial by the Devonian sediments the basement rocks of granite/gneiss formed a range of small steep-sided hills running north to northwest. These hills eventually stood out as islands within the lake and were surrounded by locally derived beach deposits of sands, conglomerates and breccias.

Stratigraphy of the Orkney Islands

The original investigations into the sedimentary rocks of Caithness and Orkney by Roderick Murchison (1859) led to a simple three-fold classification into Lower, Middle and Upper Old Red Sandstone and is in essence still shown in many current publications. However the most up to date interpretation by R. J. Berry of Orkney Nature is divided into five sub-divisions. Our understanding of the Orcadian Devonian sedimentary rocks is currently being investigated further, in part spurred on by economic interest from the oil industry and it is likely that revisions will take place following the completion of new research.

1. Precambrian Basement Complex. These rocks exposed at Graemsay, Stromness, and South Yesnaby consist of a pinkish grey granite-gneiss complex including various schists interleaved with unfoliated migmatite granites. The age is uncertain but believed to be in the order of 1500 million years.

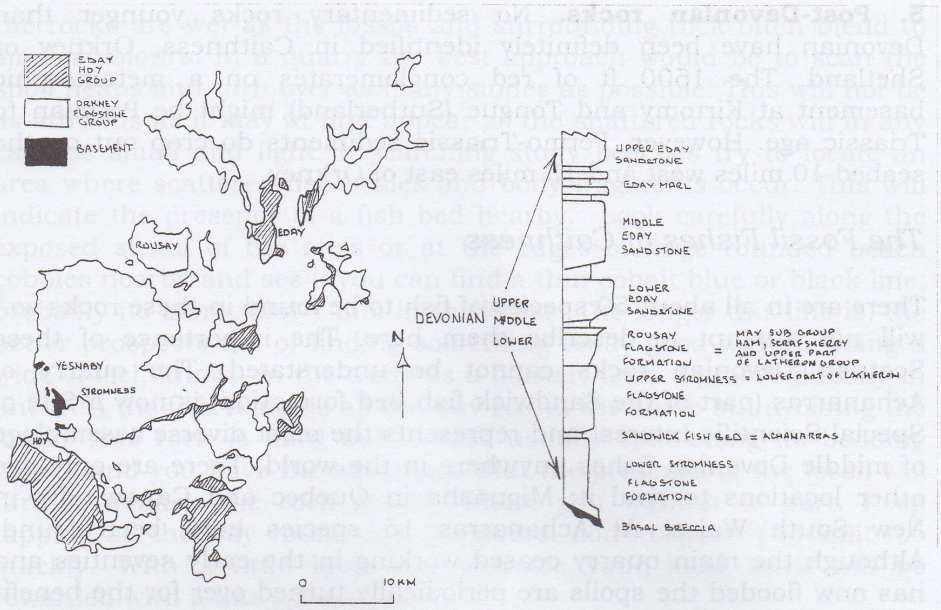
2. Lower Devonian Sediments. the oldest rocks are known as the Hara Ebb formation and occur east of Yesnaby they consist of breccias, conglomerates, sands and muds on an uneven surface of eroded basement gneiss.

3. Lower Middle Devonian Sediments. The Orkney flagstone group is 2200 ft thick, and consists of grey and black thinly bedded flagstones in three distinct parts.

Lower Stromness Flagstone Formation consists of basal breccia beach deposits and sand dunes gradually giving way to 700 ft (43 cycles) of lake flagstones. The top of the formation is marked by the distinctive Sandwick fish bed 30–100 ft thick exposed on the coast and at several quarries on west mainland.

Upper Stromness Flagstone Formation 750 ft thick (25 cycles) of lake deposits with a higher content of fluvial river sands and sheet flood deposits coming from the northwest.

Rousay Flagstone Formation 500–600 ft (18 cycles) of lake deposits.



Geological map of the Orkneys.

4. Upper Middle to Upper Devonian Sediments

The Eday Group including the Hoy sandstones (up to 2500 ft thick) is composed largely of yellow and red sandstones with intervening grey flagstones and red/green marls. It comes from two major river systems flowing into the lake basin, one south east over Eday and a second much larger one northwest over Dunnet head (Caithness), Hoy and the south isles.

Lower Eday beds formed during an arid period where local faulting and folding occurred it varies in thickness from 100 ft to 600 ft in the core of the Eday syncline.

Eday flagstones. These mark the establishment of wetter conditions of up to 12 lake cycles. These lakes were best developed in eastern Orkney where they rapidly transgressed to alluvial plain. The lakes formed during this phase were local in extent probably linked through streams and river systems allowing migration of fish between them.

Middle Eday beds. In Eday the alluvial sands related to the northern river system returned after only 4 lake cycles. The middle Eday sand is confined to the northern part of Orkney and thins towards the southeast. The sandstone disappears at Deerness passing into the Marls.

Eday marls. This is a distinctive unit of green and red mud subject to extensive turbulence, desiccation and oxidation. The recent discovery of large halite pseudomorphs, beds of saddle dolomite, anhydrite altered to limestone and beds with worm burrows and casts on ripple surfaces indicate a marginal marine salt flat environment.

Upper Eday marls. These represents a return to sandy river deposits forming a wide alluvial plain.

5. Post-Devonian rocks. No sedimentary rocks younger than Devonian have been definitely identified in Caithness, Orkney or Shetland. The 1500 ft of red conglomerates on a metamorphic basement at Kirtomy and Tongue (Sutherland) might be Permian to Triassic age. However, Permo-Triassic sediments do crop out on the seabed 10 miles west and 15 miles east of Orkney.

The Fossil Fishes of Caithness

There are in all about 50 species of fish to be found in these rocks so I will not attempt to describe them here. The importance of these Scottish Devonian rocks cannot be understated. The quarry of Achanarras (part of the Sandwick fish bed formation) is now a Site of Special Scientific Interest and represents the most diverse assemblage of middle Devonian fishes anywhere in the world. There are only two other locations to rival it: Miguasha in Quebec and Canowindre in New South Wales. At Achanarras 15 species have been found. Although the main quarry ceased working in the early seventies and has now flooded the spoils are periodically turned over for the benefit of those interested in collecting and good specimens can still be found with a little patience. The site is owned by Scottish National Heritage who operate a permit system, detail of which are given at the end of this article. This site together with a number of other localities can present fossils remains in an incredibly well-preserved state. It is surprising that so many complete fish can be found: sometimes 2, 3 or more lying fossilised close together. Fish living in the lake sometimes suffered local fish kills, possibly caused by algal blooms or changes in the salinity of the lake waters. It is thought that dead fish may have sank rapidly into deeper waters where no oxygen existed to support life and therefore not scavenged so allowing the intact bodies to rest on the lake bed and be gently covered with mud and silts and thus preserved.

Collecting Technique

If after reading this article you are tempted to visit the region perhaps you may want to collect a few specimens. If so the following tips will considerably increase your chances of a good find. It is extremely rare to find fossils in those quarries where the high-quality pavement flagstones are found. The fossiliferous beds are sometimes described as laminites because of their alternating dark and light layers. In truth it is difficult to tell them apart. So don't waste your time looking in these quarries. Achanarras was exploited for its attractive green and brown stones and roofing slates and did not contain high-quality pavement beds. The lighter layers of the laminites are the sediments brought down in the summer whilst the darker beds were the result of blue-green algae dying off. The fossil remains vary in colour from a cobalt blue when weathered to dull black and at some sites beautiful black resembling polished ebony. Great difficulty will be experienced if

the rocks are wet as the fossils and surrounding rock often blend to similar colours. In a quarry the best approach would be to scan the spoil heaps and turn over as many stones as possible. This will not be as arduous as it may at first appear as the shattered rocks will in any case be small and light. If searching stony beaches try to locate an area where scattered fish scales and body fragments occur. This will indicate the presence of a fish bed nearby. Look carefully along the exposed strata of the reefs or at the edges of large rounded beach cobbles nearby and see if you can find a thin cobalt blue or black line, probably no more than 1 mm in thickness. The longer this line is, the better prospects are of finding something really good within. Using a wide chisel, known in the trade as a bolster, form a groove directly in line with the fish remains all the way round the stone but avoiding the fossil. This rock is hard but it does usually split along its bedding planes and you have the advantage that the presence of the fossil will further weaken the rock exactly where you want it to part. Keep tapping all the way round and persevere: don't expect it to split too quickly. With a little luck and patience your hard work will be rewarded with a fine specimen.

The Future

Of the once proud industry that laid its native stone on the pavements of many of Britain's finest city streets and even reached across the seas to America, India and Australia only one quarry was to work on sporadically. Spittal has continued to provide small quantities of high-quality stone, finished to order on site. In recent years demand has slowly risen and other quarries previously abandoned, such as Weydale, and Achscrabster, have started up again on a supply and demand basis. Considerable use has been made of the best Caithness flagstone in the new Scottish Assembly building in Edinburgh and interest is growing overseas too,and it now commands a high price. It seems that this almost forgotten natural treasure may perhaps once again rise out of obscurity to be held in highest esteem.

I believe this stone deserves a higher profile than history has afforded it and hope this modest article gives it due credit. Its relative obscurity was probably due in no small part to the more mundane purposes to which it is so admirably suited. We are all familiar with Bath and Portland stone and these adorn many of our major buildings in our capital city. But next time you are in London admiring one of these great buildings pause for a moment and cast your eyes down, take a good look at the pavement under your feet. It will probably be smoky grey to blue providing a strong and pleasing contrast to the warm yellows and creamy whites of the buildings above and yes more than likely it will be Caithness flagstone.

Thanks to my father Jack Saxon for his support and encouragement in the writing of this article, also to Alan McIvor local historian for his help in researching the Flagstone industry.

Permits to collect fossils from Achanarras quarry are available from Scottish National Heritage, North Highlands Area, Main Street, Golspie Sutherland KW10-6TG

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