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Cover: front– Sir John Murray commemorated on a Christmas Island stamp. (Reproduced with permission of the Australian Postal Corporation. The original work is held in the National Philatelic Collection.)
back– The Challenger Medal designed by John Murray portraying a knight throwing down his gauntlet as a challenge to the ocean to give up its secrets. Awarded to all those who contributed to the 50 volumes of the Challenger Expedition Report (© National Maritime Museum, Greenwich, London).

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THE FORTH NATURALIST AND HISTORIAN

The Forth Naturalist and Historian (FNH) is an informal enterprise of Stirling University. It was set up in 1975 by several University and Central Regional Council staff to provide a focus for interests, activities and publications of environmental, heritage and historical studies for the Forth area, comprising now local authority areas Stirling, Falkirk and Clackmannanshire.

Since then the organisation of an annual environment/heritage symposium called *Man and the Landscape* has been an important feature.

The annual *Forth Naturalist and Historian* has published numerous papers, many being authoritative and significant in their field, and includes annual reports of the weather, and of birds in the locality, plus book reviews and notes. These volumes provide a valuable successor to that basic resource *The Transactions of the Stirling Field and Archaeological Society*, 1878-1939. Four year contents/indexes are available, and selected papers are published in pamphlet form, while others are available as reprints.

In addition a 230 page book *Central Scotland – Land, Wildlife, People,* a natural history and heritage survey, was produced in 1994 and is available in the form of a CD-Rom, *Heart of Scotland's Environment* (HSE).

Other FNH and associated publications still in print include – *Mines and Minerals of the Ochils*, *Airthrey and Bridge of Allan*, *Woollen Mills of the Hillfoots*, *The Ochil Hills* – landscape, wildlife, heritage – an introduction with walks, *Alloa Tower and the Erskines of Mar*, and the *Lure of Loch Lomond* a journey round the shores and islands. Several of these are in association with Clackmannanshire Field Studies Society.

FNH publications are listed on the internet British Library (BLPC) and by booksellers e.g. Amazon, Bol, Barnes and Noble.

Offers of papers/notes for publication, and of presentations for symposia are ever welcome.

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REBIRTH OF A RAILWAY

David Bytheway

The opening of the Stirling-Alloa-Kincardine railway in May, 2008 was a red letter day for the Wee County. For the first time in 40 years passengers trains were running again to Alloa. But the new line, built at a cost of more than £80 million, echoed the struggles of the Victorian promoters who constructed the original Stirling and Dunfermline Railway. The transportation of coal was the life blood of the Stirling and Dunfermline Railway (S&D) and coal is the main reason that line was re-opening in the 21st century. The original railway ran into a bitter legal row at Stirling which pushed up the cost and delayed the final link-up; similarly the new line ran well over budget and was a year late.

The men behind the S&D were speculators, caught up in the dying embers of the railway mania. Their plan was to build the line and, once it was up and running, sell it on to a larger company for profit. Their line was promoted in the late 1840s as a trans-Scotland highway at a time when Fife was almost isolated. Later in that century, both the Forth and the Tay would be bridged, but for the time being the Kingdom relied on ferry services and coastal shipping which made the transportation of goods and passengers slow and difficult.

The new line would link Fife to the Central Belt and then onwards through the expanding railway system to the great ports on the Clyde and to Liverpool. "There is no district in Scotland which more requires or will more certainly repay the benefit of railway communication than that embraced by the above line," said the S&D prospectus which appeared in *The Scotsman* on April 16, 1845.

There was a minor boom in railway promotion during 1836 and 1837 but it was not until the mid 1840s – when there was a return to affluence with good harvests in 1842 and 1843 – that there was a serious move to build a railway from Dunfermline to Stirling. Conditions were right. After a financial crisis in 1837, capital was again available, aided by the Bank Charter Act of 1844 and the Bank of England's increasing intervention in the money market.

The scheme was originally called the Stirling, Dunfermline and Queensferry Railway although Queensferry was dropped from the title to avoid confusion with another company. Branches were also planned from Alloa to Alva and from Alloa to Tillicoultry. It would require capital of £400,000 (£23,412,000 at 2007 prices)[1]. The company was offering 10,000 shares at £25 each, (£1,463.25) and suggested a return of 10 per cent.

In September 1845, James Anstruther, an Edinburgh advocate and Writer to the Signet, was appointed company chairman at a shareholders' meeting in Stirling.

Anstruther came from a landed family which owned 22,500 acres in Caithness and 2,100 in Fife[2]. The son of Col Robert Anstruther, of the Royal Tay Fencibles, he was born in 1803. The family home was at Balcaskie, Pittenweem in Fife.

The Anstruther family owned land in the East Neuk of Fife since the 12th century. They had many links with other landed families of the area, and sent many sons off to war as officers. Others went overseas as servants of the king and later to the British Empire, while others served as Lord Lieutenant or as an MP for Fife.

The engineer for the line was to be John Miller who, with his partner Thomas Grainger, had designed much of the early Scottish railway network. It was Miller who, in his early 30s, had full responsibility for the Edinburgh to Glasgow line, but who, in order to satisfy the English shareholders, was obliged to seek advice from time to time from prominent English engineers, who rubber stamped his plans.

The route of the proposed Stirling to Dunfermline line was across level country which the directors said "presented no engineering difficulties."

It was only intended to build a single line but powers would be taken to increase this to a double line "to accommodate the increase in traffic which may be reasonably calculated upon."

Figure 1. Alloa Station, c 1910. The station was rebuilt in 1885 by the North British Railway Company. It put right all the inconveniences and dangers of the original station. The remains of the derelict station were finally demolished in 1984. The new station was built a few hundred yards to the east of this building located on the old Alloa Brewery site. The new station has one platform and the building is unmanned. *(Picture: Clackmannanshire Council Library Services.)*

One year after Parliament passed the Act authorising the construction of the railway, S&D chairman Anstruther cut the first turf on the Dunfermline section in a field near Milesmark on March 8, 1847. The line was built in stages from the east, where the heaviest work was carried out, to the west where construction was expected to be easier. The first section, from Dunfermline to Oakley, was opened on December 13, 1849. The following summer, the railway reached Alloa and was opened on August 28, 1850. But it took another two years before the line reached Stirling, mainly due to a bitter row between two railway companies which resulted in two bridges being built, side by side, across the River Forth at Stirling.

The terms of the original Act stated that the S&D would be leased to the Edinburgh and Glasgow Railway (E&G) when it was completed. It was the usual practice for small companies to be taken over by larger ones. In fact, the growth of the Scottish railway network owes its origin to more than 200 small companies. In some cases the takeovers and amalgamations went through without a hitch but other companies were swallowed up by predators who were seeking to expand their operations and eliminate competition. At Stirling the S&D suddenly found themselves out of favour with the powerful E&G who used their influence with the local company, the Scottish Central Railway to block the Alloa line entering the royal burgh of Stirling.

The E&G took this action even although the 1846 Act authorising the building of the line gave the S&D running powers to form a junction at the north end of the Scottish Central's bridge over the Forth, and into Stirling Station.

The E&G refused to accept this agreement. Instead, they demanded not only a separate Stirling station but also a separate rail bridge over the Forth next to the one built by the Scottish Central.

Then, to complicate matters further, the E&G informed the S&D that they were not able to provide money to complete the line over the Forth into Stirling. The S&D directors pleaded that both companies would benefit from the savings "of a large sum of money which must otherwise be expended in building a separate bridge and formation of an independent station."[3] But their pleas fell on deaf ears. The S&D had fallen victim to railway politics.

A long and bitter court case followed and it was against this background that the section from Alloa to Stirling was opened on July 1, 1852. But with the access to the key bridge over the Forth denied, the S&D were forced to build their own at a cost of £20,000, which opened in August, 1853. There was no connection with the main line at Stirling and the S&D even had to construct a temporary station although the exact location is not known.

Later that year the E&G finally gave up their battle when the Lords ruled in favour of the Stirling and Dunfermline. Almost immediately, the E&G began to operate the line and within a few days negotiations were opened with the Central to make a junction at Stirling. The S&D now had their physical connection and their temporary station was closed, but the two bridges which

Figure 2. Two railway bridges cross the River Forth at Stirling. The one on the right was built to carry the original Stirling to Dunfermline Railway after the railway company which owned the other bridge refused them access. *(Picture: Author's collection.)*

Figure 3. Old Alloa station looking west. Alloa East Signal Box controlled the junction to the Devon Valley Line which leaves on the right. The main line to Dunfermline leaves Alloa on the lines out of the bottom of the picture while trains headed for Stirling had to pass through the station. At one time five signal boxes controlled the line between Stirling and Alloa. The entire new railway line is controlled by a signalman in Stirling Middle Signal Box watching over the trains using CCTV and other safety devices. *(Picture: Clackmannanshire Council Library Services.)*

still exist today remain a monument to the intense rivalry at the height of the railway mania.

The S&D became part of the E&G, which in turn was amalgamated into the North British, which later was one of the companies making up the LNER before nationalisation.

Alloa sat on the Stirling to Dunfermline line with branches to the harbour and Tillicoultry (both opened 1851). The line from Tillicoultry was later extended to Kinross to become the Devon Valley Railway, (opened 1871). There was also a branch running from Cambus to Alva (1863). Later the Caledonian Railway built the Alloa Swing Bridge at Throsk (opened 1889) which gave them limited access into what was now North British territory. The last piece of the jig saw was when the North British Railway Company opened the Kincardine branch linking Alloa to Dunfermline by the coast route (1906).

The transportation of coal was the lifeblood of the network and the principal mining operation in Clackmannanshire was the privately owned Alloa Coal Company. In the period before the First World War, much of their coal was exported from the docks at Alloa, Methil and Burntisland to Europe. The company also had collieries in the Bannockburn area of Stirlingshire. General Manager James Bain said at the time: "We have collieries at Alloa, Tillicoultry and Clackmannan, all connected with the North British Railway and at Bannockburn connected with the Caledonian Railway company. Our output is 400,000 tons a year from Alloa and 600,000 tons year from Bannockburn. We have 1,500 wagons of our own."

At the time of nationalisation, nine collieries were taken into public ownership. In the 1950s the National Coal Board (NCB) gave the go-ahead for the disastrous Glenochil mine (now the site of a prison) which operated only briefly between 1956 and 1962. There were also new mines at Solsgirth and Castlebridge which along with Castlehill and Bogside, fed into the Longannet Power station, Britain's second largest coal-fired power station.

As late as 1950 a new marshalling yard was built near Cambus and in 1960 there were proposals to modernise Alloa Station, but in the later 1960s the railways became casualties of the national closure of rural lines. The last passenger train ran from Alloa to Stirling on October 5, 1968. The Alloa-Kincardine Junction closed in the 1980 but the coast railway serving Longannet escaped the cuts.

As local supplies became exhausted, an attempt was made to exploit coal under the River Forth near Airth. After experiencing difficult geological conditions, Longannet mine flooded when a dam burst in 2002 and was subsequently closed.[4]

Even when the mine was working the power station had bought in coal from opencast sites in Fife and Ayrshire. Scottish Power had also imported supplies through the Hunterston deep water terminal on the Clyde and trains took the coal across Central Scotland to Longannet. Now, these supplies had to be increased to fill the gap.

The route took the trains through Ayrshire, Paisley, Coatbridge, Polmont and Linlithgow and across the Forth Bridge. At Townhill, the track layout requires the class 66 to perform a run round of the train. This requires the loco to uncouple from the front and then make its way to the rear where it re-couples before taking the train in the direction it has just come for a short distance to join the Longannet line.

Re-opening the Alloa line would allow these trains to decrease the journey time by about 90 minutes to three hours, and avoid the Forth Bridge. The new route would free up slots on the bridge for more passenger trains from Fife, and allow the coal trains to carry a greater payload – about 1300 tons compared with about 856 tons.

Alloa would also get back its passenger services and become reconnected to the national rail network for the first time since 1968. While politicians and railway experts argued at one level, a Back on Track campaign was launched at a local level to get the Wee County re-connected to the rail network. In fact the same arguments that had been put forward in an attempt to prevent the line's closure to passenger traffic in 1968 were now put forward as reasons for it to be re-opened to passenger traffic. Clackmannanshire Council, and its predecessor Clackmannan District Council, had been successful in preventing any development taking place that would have jeopardised the future re-opening

Figure 4. The scene at Alloa on May 15, 2008 as *The Great Marquess* arrives at the head of the special train to take part in the official opening. *(Picture: Ian Lothian.)*

by getting the line safeguarded officially in the 1986 Local Plan.

In July, 2004 the campaigning paid off when the Scottish Parliament gave the go-ahead for the project, estimated to cost £37 million. Legislation to re-open the Stirling-AIloa Kincardine line was the first railway bill to be approved by MSPs and the last bill to be voted at the Parliament's temporary home – the General Assembly of the Church of Scotland – before moving to their new controversial home at the foot of the Royal Mile.

Transport minister Nicol Stephen said then: "The rail link is expected to open around the end of next year, providing enormous benefits for the communities and economy across central Scotland."[5] Although work started in January 2005 Stephen was widely optimistic in both costs and the time taken to complete the task.

The 13 mile line would follow the old S&D route for Stirling to Helensfield, near Clackmannan, and then branch off on to the former North British line to Kincardine and Longannet. It would be single tracked with passing loops. To avoid confusion, it was given a new name, the Stirling-Alloa-Kincardine Railway (SAK).

The main contractors were First Nuttall, a partnership between Edmund Nuttall Ltd, experts in heavy civil earthworks, roads, bridges, etc and First Engineering, responsible for the railway work such as track, signalling and telecommunications. Among the tasks involved were:

- Remediation of old shallow disused mine working around the Kilbagie area. The technique used was called grouting – holes are drilled into the voids and then thousands of gallons of liquid grout are pumped in and allowed to set solid.
- Refurbishment of the three span Forth Viaduct. This was the bridge which the S&D were forced to build to give them access to Stirling.
- Removal of the old bridge deck at Helensfield near the village of Clackmannan and replacing with a new structure.
- Construction of a new railway station for Alloa.
- In addition to the construction of the railway, the project included the construction of the new Alloa Eastern Link Road.

The management structure was multilayer. Clackmannanshire Council, who had been the driving force behind the Bill, were the clients. Management consultants, Transport Initiatives in Edinburgh were brought in to manage the work, First Nuttall did the construction and feeding into this were the views of Network Rail who would eventually take over the line, and the train operators, and other interested bodies.

By June 2007 – two years into the project - it was clear the governing structure was not working and the Scottish Government decided to take over day to day management of the project through Transport Scotland, the national transport agency for Scotland which had been formed in 2006.

The project was severely criticised by Audit Scotland[6] over spiralling costs and poor management although they did note there were significant improvements when Transport Scotland took control.

The spiralling cots and delays have been put down to –

- The cost of remediation of old mine workings was much more than expected.
- The replacement of automatic half barriers with full barriers at Cambus level crossing, at the insistence of Health and Safety, resulting in added costs and a six month delay.
- A six month delay in the demolition of a bonded warehouse which stood in the path of the Eastern Link Road.
- Compensation for land was greater than expected.
- Lack of skills. The last time a railway had been built was in British Rail days and the knowledge base had become diluted.
- The uniqueness of the project which was costed on a design and built basis as many assumptions had to be made.

By the time the project finished, there was an impressive list of key figures:

- 1.3m man hours.
- 22,630 m plain line track and cable troughing.
- 33,846 rail sleepers.
- 79,094 tons of ballast.
- Three public level crossings (Waterside, Blackgrange and Cambus).
- Three private level crossings (Manor Neuk, Manor Powis and Kincardine).
- 29 signals.
- 29 Automatic Warning System units.
- One superstructure (the Forth Viaduct).
- 13 underbridges.
- 19 overbridges.
- Four footbridges.

Thousands of people flocked to the new Alloa station on Thursday, May 15, 2008 for the grand opening. A special train took VIPs and later local people and enthusiasts on trips to Stirling. The train was hauled by K4 class 61994 *The Great Marquess* from Alloa to Stirling, and returned hauled by preserved Deltic diesel 55 022 *Royal Scots Grey*, using carriages from the Scottish Railway Preservation Society.

Scottish Transport minister Stewart Stevenson was among the 300 guests who travelled on the inaugural train. He acknowledged that there had been

difficulties with the re-opening of the line but he said: "This is a vital new link which will provide improved education and employment opportunities for communities across central Scotland, promote inward investment and increase sustainable economic growth to the area. This project has not been without its challenges, but we should celebrate a great day for the people of Alloa who can now look forward to much improved rail connections."

Coal trains are scheduled to use the new route this winter. Transport Scotland said they have worked with English, Welsh and Scottish Railways (the largest rail operator in Britain), and Network Rail to incorporate the Stirling-Alloa-Kincardine railway into a timetable that meets EWS's objectives. The spokesman added: "EWS has now confirmed acceptance for incorporating the SAK route in the winter timetable starting in December and a robust timetable has been agreed."

So the line which earned its living through the unglamorous job of shifting coal has been brought back to life for the modern coal trains. Alloa is also benefiting. New developments have sprung up around the station area and the introduction of a passenger service has given the town a much needed boost. Even although the pits have gone coal once again is king.

• David Bytheway is writing a book, Back on Track, which tells the history of railway network in the Alloa area, from wagon ways to their rebirth. The book is due to be published around Christmas. It is being produced in association with Clackmannanshire Field Studies Society with the financial support of Awards for All.

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SIR JOHN MURRAY OF THE CHALLENGER EXPEDITION: FOUNDER OF OCEANOGRAPHY
People of the Forth (16)

Roy and Cathy Sexton and Ken Mackay

Introduction

In 1986 Stirling officials were lobbied to support a campaign to have Sir John Murray commemorated on a Canadian stamp. Few recognized him as the father of oceanography nor were aware of any local connection. Sir John had been born in Canada in 1841 but came to the Bridge of Allan to complete his education at the home of his maternal grandfather, John Macfarlane. It was the grounding he received at The High School of Stirling and as curator of his grandfather's museum that set him on the path to becoming one of the early twentieth century's most distinguished explorer-scientists. In later life he stated "It is always with emotion that I look down the valley of the Forth from Abbey Craig or the terrace at Coney Hill and see stretched before me the scene of my first explorations, my first scientific observations and my first collections".

Murray (Figure 1) together with Sir Wyville Thomson of Linlithgow guided the destiny of the Challenger expedition (1873-76), the greatest oceanographic exploration of all time. By unlocking the secrets hidden beneath two-thirds of the earth's surface the expedition could justifiably claim to have rivalled the great voyages of da Gama, Magellan and Cook in its contribution to our knowledge of the planet. Murray gave us the term oceanography and established Scotland as the international centre of this new science. He also placed the country at the forefront of world limnology (study of lakes). In this he received invaluable help from his life-long friend Laurence Pullar, the owner of the Bridge of Allan and Ashfield dye works. Their bathymetric study of the Scottish lochs would warrant the authors a place in Scottish history in its own right (Duck, 1990).

Although in 1986 there was an embarrassing lack of local recognition of Murray's contribution to science there was no shortage of international acclaim. Indeed his head had already appeared on a Christmas Island stamp (Figure 2). He was awarded knighthoods in Britain, Prussia and Norway. In Britain he won the prestigious gold medal of the Royal Society and the Founder's medal of the Royal Geographical Society, in France the Cuvier Medal, in Germany the Humboldt medal, in America the Cullum medal and in Australia the Clark medal. He was also awarded honorary degrees by the Universities of Edinburgh, Oxford, Harvard, Jena, Geneva, Christiania (Oslo), Toronto and Liverpool. He had named after him: an expedition, a research vessel, a deep sea trench, a bird, a bat, several fish, a spider crab, an octopus and several protozoa. Murray's acquaintances also claimed to recognize him in Conan Doyle's character Professor Challenger of *The Lost World* and much more recently the *Challenger* spacecraft was named after the expedition.

Belatedly in 1987 Stirling Council acknowledged its famous son naming a road in his honour, yet unfortunately there are still few who have heard of him. The purpose of this article is to enhance local recognition. There has been no comprehensive biography of Murray and this general account has been constructed from secondary sources which have specialized in different aspects of his eventful life.

John Murray's Life in Bridge of Allan

Born in Cobourg, Ontario in March 1841, John was the second son of Robert Murray, an accountant and his wife Elizabeth nee Macfarlane, who had emigrated there in 1834. He was probably named after his grandfather John Macfarlane who was born in Stirling in 1785 and who was to play a pivotal role in his later life. John Macfarlane left to work in Glasgow aged 14 and developed a talent for textile design. Between 1817-1845 he lived in Manchester and made his fortune as a major developer in the commercial heart of the city. He retired to Bridge of Allan in 1848 and while living in what is now the Old Manor established a new settlement in the area around Coneyhill at the eastern end of the village. His plans included twelve villas, a terrace of workers' houses, shops and an impressive museum (Allan, 2006). Macfarlane became a local philanthropist giving money towards the building of the High School of Stirling and providing Stirling's first Free Library. According to his obituaries he was also the first to suggest the erection of a monument to Wallace on Abbey Craig.

John Macfarlane was used to getting his way and family accounts suggest that Robert and Elizabeth Murray emigrated because he disapproved of their marriage. We know little of John Murray's early life except that he received schooling in London, Ontario and at Victoria School in Cobourg. It seems that his father died and his grandfather offered to complete his education in Stirling. In 1858 at the age of 17 he crossed the Atlantic to live in Bridge of Allan, joining many other members of his mother's family including two great aunts and Major John Henderson of the Westerton Estate.

It was the reputation of the High School of Stirling for navigation that determined John Murray's presence there. He learned about the principles of the sextant from an inspirational physics teacher Duncan Macdougall. In an address to the High School in 1899 he related how his courses in physics and geology were to be very influential in his subsequent career. Similarly during an interview with Bridge of Allan's *Spa Magazine* (AWD, 1899) he stated "I commenced my geological studies at the 'Bridge' and became enthusiastically interested in the subject through the exhuming of a whale at Cornton and an Irish Elk at Stirling Bridge. I took great delight in washing the clays of the carse for minute organisms and examining the shell beds in the banks of the Allan". He related how he traced the marks of glaciers over the slopes of the Ochils and from all these observations endeavoured to form a mental picture of conditions in the Forth Valley in bygone ages.

It seems that John Macfarlane always had plans for a museum or art gallery

at Coneyhill both to attract new residents to his development and to act as a tourist attraction for the Spa. As his grandson's interest in natural history developed he saw it could provide a curatorial career for him. The recent discovery of John Macfarlane's 1860-3 letter book at the Natural History Museum in London has provided much new information about the establishment of the Macfarlane's Museum of Natural History as it was called. This it turn resulted in a re-evaluation of the importance it played in Murray's path to a distinguished career (Deacon, 1999).

The construction of a three storey museum was started about 1860 on high ground above Coneyhill terrace. Macfarlane had moved with his grandson from the *Old Manor* into *Edgehill House*, one of his new villas just across the road from the Museum. Murray became the curator with responsibility for purchasing, arranging and cataloguing the exhibits. He also provided some of the shells and birds' eggs from his own local collections. Macfarlane was very much the controlling hand being in weekly correspondence with an old Scots friend Thomas Brown a taxidermist and the curator of the Manchester Natural History Museum. To help provide the background in taxonomy and organisation of exhibits Murray was sent to the British Museum (Natural History) in London and the Jardin des Plantes in Paris. Macfarlane was determined that the museum was to be second only to the British Museum in its collections of quadrupeds, shells and birds. To this end examples of stuffed lions, tigers, leopards, giraffes, elephants, kangaroos, hippos, llamas, flying squirrels, alligators, crocodiles, armadillos etc. were collected. Malcolm Allan's recent entertaining account gives much more detail of the project (Allan, 2006).

At the age of nineteen Murray established a lifelong friendship with Laurence Pullar who eventually lived round the corner at *The Lea*, Kenilworth Road. Pullar had moved to Bridge of Allan from the family company's base in Perth in 1858. As a mechanic he arrived to help his brother John rescue the Bridge of Allan and Ashfield dyeing works which were threatened with closure. After twelve years "unremitting toil" the business proved very successful and Laurence became a wealthy co-owner. Pullar (1910) relates that "during the whole of the sixties there was hardly an evening when he and Murray did not meet for reading and the study of science". It was not all study though and Pullar was the president of Airthrey Spa Bowling Club from 1860-66 and Murray a champion bowler.

At the age of 77 Macfarlane's health began to fail and he found difficulty coping with his youthful grandson. As a consequence John moved to stay with Elizabeth Macfarlane his great aunt who lived next door at *Upperhill House*. Pullar (1910) relates that Murray was "tired of his want of a definite occupation and enrolled at Edinburgh University in 1863 where he studied medicine amongst other things." This only lasted a few terms because "his grandfather objected to his proceeding further with these studies". In his will of 1865 John Macfarlane set out a settlement for his grandson which he thought would provide him with a career and ensure the prosperity of the Macfarlane Museum. Firstly it required John to adopt the surname Murray-Macfarlane.

Then the will's trustees were *Directed to appoint John Murray to be curator of my Museum of Natural History declaring that the said John Murray shall be under their control and be obliged to perform any instructions given by them.* The trustees were charged with visiting the museum to check *that he has been in attendance every lawful day from ten o'clock until six o'clock in the evening*. For this John was to be paid £100 per annum and *Centrehill House*, Coneyhill was to be made over to him together with £150 to furnish it.

Most of Macfarlane's estate was left in trust to run and improve the museum. There is no reference in the will to his daughter Elizabeth Murray though his other Canadian grandson James Murray was included together with many other relatives. The will was subject to twelve changes which has made interpretation difficult for the modern Macfarlane Trust administrators. There was clearly disagreement between John and his grandfather and in 1867 codicil 8 cancelled the requirement to adopt the Macfarlane name. Then in a tenth codicil dated 4th September 1867 Macfarlane annulled the entire clause dealing with John Murray, essentially disinheriting him. This was apparently *in consequence of his having intimated to me that the considerable allowances with house etc. etc. as being too inconsiderable and that he could (do) much better in various other ways and that he intends to leave my service in October.* This left his grandfather's plans for the museum in ruins but as events unravelled Murray's prediction was to prove more correct than he probably imagined.

Freed from the constraints of his grandfather's regime the following February Murray shipped as the surgeon on the whaler *Jan Mayen* presumably on the basis of the medical lectures he had attended. They visited Spitzbergen and Jan Mayen Island eventually reaching 81°N. During the seven month trip he kept a log of the meteorology and made one deep-sea sounding at 160 fathoms (293 metres) measuring temperatures and retrieving mud from the sea floor. These were the first of many such measurements he was to make in his future career. Murray's grandfather's health deteriorated and when John returned to Scotland on 30th August 1868 he found his grandfather had died two days previously. He is buried in the Holy Rude cemetery with his father James Macfarlane, a Stirling merchant.

John Murray was later to become one of the Trustees of the Macfarlane's Trust who built the more elegant replacement Museum Hall on Henderson Street (formerly Macfarlane Street) in 1886. Later the old museum was demolished. Murray also mediated the transfer of books from the free library, firstly to the Smith Institute in 1882 and then subsequently to the Macfarlane Room in the Central Public Library in 1905. It was during the first of these transfers that he negotiated for the Stirling *Field Club* to be renamed *Stirling Natural History and Archaeological Society*.

According to Pullar (1910) "All his grandfather's trustees could promise John was a minute annual allowance for a short number of years". However together with his earnings from the whaler this seems to have allowed him to enrol again as a student at Edinburgh University and resume his informal studies. In his own words "I was sometimes known as a chronic student at

Edinburgh. I attended classes in nearly all the faculties but did not go in for exams and never took a degree. Robert Louis Stevenson … with whom I worked in Professor Tait's laboratory used to say I was a wandering star for whom was reserved the blackness of darkness". At this time *RLS* was training to follow in the footsteps of his father and grandfather as an engineer.

During the next three years he lodged as a *student of science* in Edinburgh and experimented with the development of a deep sea electrical resistance thermometer in Professor Tait's laboratory. Weekends in Bridge of Allan were spent either with his great aunt or with Laurence Pullar. Whenever possible Murray and Pullar used to arrange dredging excursions on the Forth to study its marine biology. In 1870 they hired a 14 ton sailing yacht and sailed from Leith through the Caledonian Canal to Eigg and Skye to investigate the region's geology. During the trip they were invited for dinner aboard the yacht of the famous physicist Lord Kelvin who was obviously impressed by Murray's knowledge and later recommended him for the Challenger expedition.

During the fifteen years he was based in Bridge of Allan Murray fortuitously accumulated the skills that were to make him an ideal member of the forthcoming Challenger expedition. He was a proven seaman with practical experience of oceanography and a background in taxonomy and taxidermy. His experience of preserving, packing and transporting biological samples for his grandfather's Museum must also have been invaluable since wherever *Challenger* docked thousands of precious finds had to be sent back safely to London.

Sir Wyville Thomson and the Challenger Expedition

It was Sir Charles Wyville Thomson from Linlithgow who was to have an immense impact on John Murray's life. As a student at Edinburgh University Thomson became interested in marine biology whilst accompanying Prof Edward Forbes on dredging expeditions in the Firth of Forth. Forbes was one of the first oceanographers and is still remembered for propounding the theory that life could not exist in the *Azoic zone* at depths below 300 fathoms. Despite failing to graduate, Thomson progressed to become Professor of Natural History at Belfast where he took up dredging off the coast of Ireland. In 1866 he decided to visit Professor Michael Sars whose son had brought up a remarkable collection of unknown animals from depths of over 300 fathoms in the Lofoten fjords. One of these, *Rhizocrinus lofotensis,* was a stalked crinoid, a group previously known only as fossils. Thomson was impressed and his suggestion that we could be "still living in the Cretaceous epoch" unsettled the geologists.

As a result of his visit to Norway Thomson and the biologist Dr W. Carpenter persuaded the Royal Society to mount an expedition to explore the ocean deeps around the British Isles. The Navy offered their oldest paddle steamer which was rather inappropriately named *HMS Lightning*. They set sail from Oban in August 1868 and dredged down to 600 fathoms near the Faroes finding considerable life there. The next year a more appropriate survey ship

HMS Porcupine was provided and from it living organisms were retrieved from 2435 fathoms, nearly three miles beneath the surface. The presence of sponges, echinoderms, crustaceans and molluscs below 1000 fathoms should have sounded the death knell of the azoic theory though the topic remained controversial for some years. Many of these organisms were unknown and great excitement was generated amongst creationists by Thomson's prediction that deep sea animals identical to tertiary fossils would probably be discovered. As a result of the success of these expeditions Wyville Thomson was made an FRS and appointed Regius Professor of Natural History at Edinburgh.

This was the age of transoceanic telegraph cable-laying a science which in the UK was pioneered by Lord Kelvin in Glasgow. Much to Carpenter's consternation news had come that the United States, Germany and Sweden were all planning oceanographic surveys to aid cable laying. During a lecture at the Royal Institution in 1871 he called on H.M. Government not to let Britain's lead in marine science to go by default and appealed for them to undertake a thorough scientific study of all the oceans. Consent was given and in April 1872 preparations for the three-year circumnavigation of the globe began in earnest. A three masted, square rigged, steam corvette *HMS Challenger* which had been selected for the voyage (Figure 3) was placed under the command of Capt. George Nares from Aberdeen. Most of *Challenger's* guns were removed and she was refitted with laboratories and steam powered winding gear for deep sea trawls. Amongst the equipment stowed on board were 144 miles of rope for making bottom soundings, thermometers constructed to withstand the massive pressures in the ocean deeps, dredges for sampling bottom-living organisms and equipment for analyzing water chemistry. Wyville Thomson was to head the team of six scientists and he employed John Murray as a naturalist.

After an inspection by the Lords of the Admiralty and the Committee of the Royal Society, *Challenger* set sail on 21st December 1872. During the three and a half years she was away *Challenger* covered 68,890 miles surveying and recording depth, bottom deposits, chemistry, temperature etc. of all the world's oceans with the exception of the Arctic. The expedition revealed the ocean floor was far from flat and had trenches nearly as deep as Everest was high. In addition 4417 new species of marine organisms were discovered of which 715 were representatives of genera new to science.

The Nature of the Ocean Floor

Challenger started to investigate the nature of the deep ocean floor as she travelled from Tenerife across the Atlantic towards the West Indies. The initial bottom samples contained fawn *Globigerina* ooze which had earlier been shown to be principally composed of the remains of foraminifera. These are small (<1 mm) unicellular organisms which have an elaborate perforated shell made of calcium carbonate. Chalk rock was known to be composed of these shells and their discovery led to the proposal that chalk was still being formed on the sea bed. Wyville Thompson held the view that the ooze was composed of bottom-dwelling organisms but just before the expedition left it was claimed by

Major Owen that similar organisms were living in the surface layers of the ocean, suggesting the ooze was composed of their sunken dead remains.

To resolve this debate Murray deployed finely woven silk plankton nets at various depths in the water column. He discovered that the foraminifera in the upper 100 fathoms contained exactly the same species as those found in the ooze at the bottom. Initially Murray's data seemed to confirm Owen's theory but as the ocean got deeper a problem emerged. Sample by sample the ooze became progressively darker and eventually on 26th February 1873 at 3150 fathoms (3.5 miles) it was replaced by red clay with very little evidence of shells or calcium carbonate. Murray was still finding live *Globigerina* on the surface raising the question of why were there no remains on the bottom. As *Challenger* moved further west the ocean floor in the region of the Mid-Atlantic ridge came nearer to the surface and the *Globigerina* ooze reappeared only to be lost on March 7th as the water deepened again. Clearly some chemical process was occurring in water deeper than 3000 fathoms which was removing the shells. Buchanan the chemist pointed out that the concentration of carbonic acid increased with increasing depth which in turn would speed the rate of calcium carbonate dissolution. The depth at which calcium carbonate shells are completely dissolved is now known as the *Carbonate Compensation Depth*. Later Murray and Professor Renard of Ghent University were to demonstrate that the red clays which covered vast areas of the deep ocean floor were principally composed of the hydrated silicates of alumina and iron. They suggested these were derived from the decomposition of the pumice and volcanic ash deposited in the oceans and fine dust blown from the continents. The red clay was mixed with varying amounts of the remains of silicaceous organisms (diatoms and radiolarians) and microscopic particles composed of peroxides of iron and manganese.

The first deep ocean trawl for sea bed organisms at 3150 fathoms was accompanied by great anxiety since the extra hemp line needed to reach this great depth added another half a ton to what had already been strained lifting gear. When trawling at this depth the nets are dragged along the bottom at the end of a rope 8 miles astern. Although the operation was successful it was disappointing that nothing living was found. In March after passing over the mid-Atlantic ridge a second trawl at similar depth brought up sea worms and by the end of the voyage 161 species of animals had been recorded at depths greater 2500 fathoms. This proved a bit of an anticlimax since it had been suggested that organisms like trilobites, belemnites and gastropods which were only known as fossils might still exist in the deep ocean. After the trip had ended Murray concluded that there was no compelling evidence of a relic living fossil fauna, a great disappointment to the creationists. He proposed the less romantic notion that the deep sea had been colonized by migrations of organisms from shallower waters. By contrast with the low numbers of organisms at great depths huge numbers of organisms were recovered from the ocean floor when it was less than 1000 fathoms. For instance a trawl of 600 fathoms off Argentina recovered 500 types of invertebrates and fishes including 103 species new to science.

In the 10 months of her voyage *Challenge*r made her way back and forth across both the North and South Atlantic before rounding the Cape of Good Hope and making for Antarctica. The first deep sea sounding in these cold waters was taken on leaving Heard Island (60°S) amidst much speculation amongst officers and naturalists about the likely nature of the deposit. Murray ventured that it would not be *Globigerina* ooze since he had not caught any in his tow nets for several days. Initially when a white coloured deposit was brought on board which resembled the globigerina ooze of the Atlantic it seemed he was wrong. Subsequent microscopic analysis revealed it to be primarily composed of the silicaeous skeletons of diatoms and had very few globigerina shells. It transpired that such deposits were a feature of cold circumpolar waters.

After the completion of the voyage, Murray, with the assistance of Renard divided these deep ocean floor deposits into either red clay or various oozes depending on whether the predominant organismal remains were foraminifera, pteropods (pelagic molluscs), diatoms or radiolarians. This classification has been adopted ever since. They were also able to map the distribution of these deposits since their own data was supplemented by the large numbers of samples (12,000) gathered over the next decade by vessels from United States, Germany, Monaco, Norway, France, Italy, Russia and Britain.

Challenger was the first steam vessel to cross the Antarctic Circle and in doing so she collided with an iceberg which could so easily have brought the trip to a premature end. Fortunately damage was light and the expedition sailed on to Australia, New Zealand and the Pacific Islands before visiting Japan and China.

Although the primary purpose of the expedition was to research the world's great oceans, *Challenger* spent more than half the time at anchor either in port or adjacent to the many remote islands she encountered. Terrestrial expeditions were mounted which also yielded a huge amount of information not only about the geology, fauna and flora but also the ethnology of the native peoples. Besides meeting kings, queens, and emperors they studied the native peoples including some who had only recently given up cannibalism. Both Captain Spry's (1876) and Eric Linklater's (1972) books deal in detail with these aspects of the voyage.

On March 23rd 1875 during the leg of the voyage between New Guinea and Japan *Challenger* made her deepest sounding of 4484 fathoms (5 miles) off the Marianas islands. It took 2.5 hours for the weight to reach the bottom and then to retrieve the line. The expedition was showing the ocean floor was no featureless plain and these trenches were nearly as deep as Everest was high. After leaving Japan *Challenge*r zigzagged across the Pacific stopping at both the Hawaiian islands and Tahiti. The red clay deep ocean deposits found between Tahiti and Juan Fernandez were particularly interesting. One trawl on October 14th from 2385 fathoms brought up two bushels of manganese nodules together with 1500 shark's teeth and 42 cetacean ear bones. These had presumably settled there over countless millennia.

Eventually (much to the relief of the crew) *Challenger* left the Pacific and after navigating through the Magellan Straits during January 1876 made for Port Stanley in the Falklands. After a brief stop she sailed north to Montevideo, then to Ascension Island and St Vincent. The deep water temperature profiles mapped E-W across the southern Atlantic during the early part of the voyage had shown the eastern side was slightly warmer than the west. This led Captain Nares to suggest a ridge down the centre of the Atlantic keeping the two bodies of water separate. As *Challenger* sailed north the soundings showed the mid-Atlantic area was shallower than expected and the daring idea emerged that a continuous submerged mountain range might run down the centre of the Atlantic parallel to the continental outlines.

Challenger finally arrived home at Spithead on May 24th 1876. Queen Victoria conferred a knighthood on Wyville Thomson and by early July he and Murray were back in Edinburgh where their return was celebrated by a civic banquet. They brought with them 563 cases containing greatly in excess of 100,000 specimens which were distributed to 76 international specialists to describe. During the voyage Murray sent all his journals back to Pullar in the Bridge of Allan for safekeeping.

Murrray and the Edinburgh Challenger Commission

Before Thomson had sailed in *Challenger* he had negotiated a five year Treasury grant so that on their return the thousands of samples could be analyzed and reports written. It was agreed that the terrestrial items should be dealt with in London by the British Museum and Kew and the marine collections should be sent to the Challenger Commission Office in Edinburgh. Thomson employed Murray as his assistant for this mammoth task. There was a violent reaction amongst British scientists when it became known that Thomson intended to ship many of the samples to "the best men available irrespective of nationality". Duncan the President of the Geological Society was *howling mad* and an unpleasant public quarrel developed in which Darwin, Huxley and Hooker supported Thomson's position.

Initially everything went well and Edinburgh became the international centre for Marine Sciences visited by large numbers of leading biologists. The first of the expected Challenger Reports was published in 1880 but already serious difficulties were emerging with finance. The wealth of finds meant the authors were reluctant to constrain their publications and the costs of producing charts and illustrations got out of hand. Not all the press coverage was complementary and one newspaper commented that *we had got a lumbering volume of statistics for the monies spent feeding a mob of Germans and other aliens*.

Thomson had been very stressed during this period and suffered an attack of paralysis. It was clear that the work would not be finished in the five years and the Treasury gave no hope of renewal of the grant. Murray gradually began to take over affairs and Thomson died in March 1882. His role as leader of the Challenger expedition was commemorated by a magnificent stained

glass window over the altar in St Michael's Church, next to Linlithgow Palace. It shows *Challenger* amidst a range of whales, sharks, corals and other sea creatures.

Following Thomson's death Murray was appointed to take over the *Challenger* Office and being a much more forceful personality he soon had five more years funding and relentlessly set about completing the task. The volumes of the Challenger Report started appearing more regularly and by the end of the decade all 31 zoological volumes were finished. The 31st volume was shipwrecked on its way from the printers to London prompting the Stationery office to pun hopefully that owners of the recovered volumes would forgive any imperfections *compensated by the knowledge that the polyzoa so beautifully figured in them, have been "drawn" from the bottom of the sea*.

Murray himself worked on with the Belgian geologist Abbe Renard, completing the volume dealing with the deep sea deposits in 1891. It largely confirmed the conclusions reached on the voyage. The hypothesis that the 50 million square miles of red clay on the ocean floor resulted from wind blown volcanic dust and denatured pumice was given additional credibility by the eruption of Krakatoa in 1883. Work on the Challenger Report was completed in 1895 with the final publication and world wide distribution of the 750 sets of the 50 thick quarto volumes (29,552 pages). Murray was responsible for several of them: the general narrative of the expedition, the volumes on deep sea deposits and those summarizing the results. The second five year Treasury grant ran out before this. In the end Murray himself financed the last volumes being reimbursed for their publication only when the final volume appeared. A *Challenger* medal (Figure 4) was struck which was presented to all the authors depicting a knight casting down his gauntlet as a challenge to the waters to give up their secrets.

Charles Darwin and the Great Atoll Controversy.

Seamen and scientists had long been fascinated by the beautiful circular coral reefs or atolls which seemed to spring miraculously from the deepest ocean floors. In the eighteenth century it had shown that the coral rock was principally composed of the accumulated limey remains of colonial sea polyps. These coral forming organisms were known to grow only in relatively warm, shallow (25 fathoms) water, posing the dilemma of how reefs formed where the ocean was thousands of fathoms deep.

Based on observations made during the voyage of the *Beagle* Charles Darwin proposed that fringing reefs initially developed around the shores of the exposed tips of extinct submarine volcanoes. He suggested the greater availability of the coral polyp's planktonic food on the reef's oceanic edge would cause the fringing reef to grow outwards creating a barrier reef with a large internal navigable lagoon. Then in regions where the ocean floor was subsiding the island would slowly disappear beneath the waves while the corals in the barrier reef would be able to grow upwards keeping pace with the

changing sea level. In time a circular atoll would be formed enclosing an internal lagoon.

Although Darwin's theory was widely accepted there were over 400 known atolls and a few sceptics expressed surprise that the subsidence of oceanic floors was so widespread. In 1880 in a lecture to the Royal Society of Edinburgh Murray offered an alternative explanation (Murray 1880). Challenger surveys had revealed numerous extinct volcanic cones rising from the ocean bed some of which reached to within a few hundred fathoms of the surface. These were covered in *Globigerina* ooze and Murray argued that further deposition of foraminifera would slowly raise the submarine elevation to a point where it could be colonized by the reef forming corals. In common with Darwin's theory he proposed that once established the coral would extend seawards increasing the diameter of the reef. He envisaged that the atoll's lagoon would form not by subsidence but by the death of the central corals due to a lack of food, together with the dissolution of their limey remains by the carbonic acid in sea water.

Murray's theory generated little interest until the Duke of Argyll championed it in papers entitled *A Conspiracy of Silence* and *A Great Lesson* (Argyll, 1888). He pointed out that there was a reluctance to discuss the possibility that the great idol of the scientific world might be in error and argued that revered prophets could establish a sort of unconscious *reign of terror* suppressing derogatory opinions. He revealed that Murray had been induced to delay publishing his views for fear it might prejudice *Challenger* Office funding.

In 1896-8 an expedition financed by the Royal Society and the British Association set out to resolve the controversy by drilling a borehole into the reef at Funafuti atoll. The results superficially supported Darwin but were ambiguous. When interviewed for Bridge of Allan's *Spa Magazine* in March 1899 (AWD, 1899) Murray was obviously comfortable that the data verified his theory, as were many other oceanographers.

Britain's First Marine Research Station

While editing the *Challenger* Reports Murray felt the need of a marine station with access to sea water and aquaria etc.. He was helped by the Scottish Meteorological Society which in spite of its name had long been interested in Scottish fisheries. Murray offered to provide and equip the station if the society would donate £300 annually, to which they consented. Murray's friends and supporters raised £3000 in cash as well as apparatus and equipment. A notable donation was the steam yacht *Medusa* which was fitted out for oceanographic work. The boat was purchased with financial help from Murray's Bridge of Allan friend Laurence Pullar with design assistance from D. and W. Henderson's Clydeside boat-yard.

The site chosen was a flooded quarry at Granton on the Forth estuary which had originally been excavated well below sea level to provide stone for the

harbour installations. The narrow wall of rock which kept the sea out was breached during a storm in 1855 flooding the quarry with sea water to a depth of 60 feet. In 1883 Murray took the lease with his friend Robert Irvine a chemist and director of a Granton printing ink company. An old lighter he named the *Ark* was moored in the quarry and converted into a laboratory with pumped sea water. He also took over a tannery, installing aquaria on the ground floor and a museum and laboratory above. Additional rooms in the ruined abbey on Inchcolm were furnished to accomodate any eminent visitors to Britain's first marine station. A staff of young scientists started work in 1884 under Murray's direction, their remit being to survey the fauna and hydrography of the Forth and the life history of food fishes. Murray and Irvine themselves investigated the secretion of calcium carbonate by marine organisms.

In the first summer *Medusa* was employed to investigate the herring shoals off the east coast but she was not sturdy enough for open water and in the autumn she was taken through the Forth and Clyde canal to work on the more sheltered west coast sea lochs (Marshall, 1987). Murray was looking to found a branch station on the west coast. He was persuaded by David Robertson, an eminent amateur naturalist and self made man, that Millport on the Isle of Great Cumbrae was the ideal spot. This proved the case and the *Ark* was soon to join *Medusa* drawn up into a sheltered inlet on the island where she remained for 15 years. As it was realised that the west coast was more fertile scientifically the main focus of station's work shifted to Cumbrae and Granton was closed in 1903. The quarry was filled and is now the site of a public park.

The idea of a permanent Millport Marine Station was pursued by Robertson who managed to raise enough money from Glasgow businessmen to build it. Murray opened the handsome building in 1897 presenting the *Ark* and her contents to the managing committee. The title Scottish Marine Biological Association was adopted in 1914 when a non profit making company was formed to promote research and education in marine biology.

It was also through his association with the Scottish Meteorological Society that Murray became secretary of a committee concerned with the establishment of a manned extreme weather station on the summit of Ben Nevis. The funds to build it were raised by public subscription and the station built to Thomas Stevenson's design was opened in 1883. Provisioned with enough coal and food to survive 9 months isolation the staff kept hourly records for 21 years. The stations' eventual closure, which caused considerable public disquiet, was ultimately delayed by a donation of £500 by Mr Mackay Bernard of Kippenross House, Dunblane.

Plotting the Depths of Scottish Lochs

Anybody who has used a Scottish Ordinance Survey map will be familiar with another of Murray's undertakings. His bathymetric surveys made between 1900-1909 still provide the information upon which the depth contours of most freshwater lochs are based. Apparently he became aware that little was known about the inland bodies of water when sailing through Loch

Ness in *Medusa*. His interest in the subject was further stimulated by Buchanan's finding (which he repeated) that Loch Morar was deeper (175 fathoms) than the ocean over the continental shelf. There had been much debate about the responsibility for surveying inland waters. In answer to a question posed in the House of Lords it was stated that it did not fall within the remits of either the Ordnance Survey nor the Admiralty. Murray wanted to organize systematic charting of all the Scottish lochs arguing that the information was important to water engineers and for the utilization of water power. In spite of support from the Royal Society the Government would not finance the undertaking. Never daunted Murray set about surveying the local lochs in the Teith catchments as a hobby. He had the practical and financial support of Frederick Pullar his old Bridge of Allan friend's son. Frederick designed the depth sounding equipment with which they charted 15 lochs including Katrine, Venachar, Voil and Lubnaig (Murray and Pullar, 1900).

On 15th February 1901 tragedy struck when Frederick Pullar (aged 25) died heroically trying to rescue skaters who had fallen through the ice on Airthrey Loch, now in the grounds of Stirling University (Gracie, 1994). Wishing to see his son's work finished Laurence Pullar offered £10,000 to complete the task and became a co-director of the enterprise. Three salaried officials worked from the Challenger Office supported by over 50 volunteers in the field. By the end of 1909 all 562 Scottish lochs had been surveyed and bathymetric charts produced. The reports which were dedicated to Frederick Pullar were published in six volumes from the Challenger Office. Those lochs that have been resurveyed using sonar show the information was remarkably accurate.

Science pays off. Wealth and the Annexation of Christmas Island

After failing to obtain government funding for so many of his projects it was with considerable satisfaction that Murray was able to announce in 1913 that "His Majesty's Treasury had received in hard cash … a sum greater than the cost to the country of the whole *Challenger* expedition" (Burstyn,1975). He was referring to the rents, royalties and taxes paid by the Christmas Island Phosphate Company which was set up as a direct result of his oceanographic investigations.

This venture arose out of Murray's interest in coral reefs. He wanted to know more about Christmas Island which was situated 190 miles SW of Java in water three miles deep. He had asked ex-Challenger officers Maclear and Aldrich whose vessels were deployed in the area, to gather rock for him. Chemical analysis suggested the island harboured valuable high grade phosphate deposits, which were in great demand as fertiliser to drive the agricultural revolution.

In 1888 Murray asked the government to annex this uninhabited island with the view to securing the exploitation rights for himself. After checking treaty obligations with the Dutch the Foreign Office dispatched Captain May of *HMS Imperieuse* to secure the island as a British possession. While the news of the annexation was awaited Murray had formed a syndicate of friends to defray

the expense of further exploration. Dr Guppy a naval surgeon who had studied the geology the Solomon Islands was persuaded to lead the expedition accompanied by an experienced miner. They left in June 1888 two weeks after the annexation was announced.

The only way to get to Christmas Island was to persuade the owners of the schooner that sailed between Jakarta (Batavia) and the Cocos and Keeling islands to detour as it passed. The shipping company was owned by the Clunies Ross family who were descended from John a one time Shetland sea captain. He and his descendants had settled on the Keeling islands running coconut plantations with the aid of indentured coolies. Having agreed to land Guppy's party the boat sailed from Java to Cocos Keeling and back without dropping them off. While the very frustrated Guppy was on his way back to London, the Ross' attempted to establish a plantation on Christmas Island to reinforce their family's rival claim of ownership. During the next two years the claims on the lease were the subject of intense lobbying of the Colonial Office by both the Ross' agents and Murray. Harold Burstyn's (1975) account of this whole affair provides a fascinating read. Eventually in 1896 a joint company was formed.

Murray's first step before launching this massive mining effort was to commission a study of the island's wildlife by Charles Andrews of the Natural History Museum. To this he later added his own observations made during visits in 1900 and 1908. It transpired that there were several endemic species including a bat later named after Murray. They were also the first to observe the spectacular red crab migrations which are now considered one of the wonders of the natural world.

In 1899 mining began in earnest and eventually the Christmas Island settlement was populated by up to a thousand Chinese labourers. The size of the high grade phosphate deposit was estimated to be 12 million tons with each ton yielding £2 profit after shipment to London. A significant proportion of the rewards of this venture were used by Murray to support marine science. His chemist friend Robert Irvine also left his shares in the company to found the Edinburgh University Chair of Bacteriology.

Fame and a Tragic Death

In 1889 Murray abandoned bachelor life at the Caledonian United Service Club and married Isabel Henderson only daughter of Thomas Henderson owner of the Anchor shipping line. They may well have met when Murray was staying with her uncle John Henderson (1881 census) who helped design *Medusa*. After the *Challenger* office closed in 1895 the couple bought a large villa in Granton near the marine station which was renamed *Challenger Lodge*. Murray's collections were housed on the other side of the road in *Villa Medusa*. They had many important visitors including another enthusiastic oceanographer Prince Albert of Monaco who was able to berth his yacht there. Although his roots were now firmly in Granton Sir John did keep some contact with Stirling. For instance he addressed his old school (Graham, 1900), was

interviewed for Bridge of Allan's *Spa Magazine* (AWD, 1899) and was honorary president of the *Stirling Natural History and Archeological Society* from 1903-14.

Murray was now a man of fame and influence and travelled all over the world taking his wife and young family (two boys and three girls) with him. In 1910 The New York Times carried a full page illustrated article entitled *John Murray seeks the secrets of the deepest seas. This noted English oceanographer now here tells of the curious and interesting animal and plant life in the ocean depths.* He seems to have been much in demand to deliver lectures, chair meetings and receive the many honours listed in the introduction. Snippets of letters to Sir William Herdman (Herdman, 1923), once a Challenger Office assistant, give an insight: "Tomorrow I deliver the Agassiz address at Harvard, but have been let in for the Lowell lectures (eight) and addresses here at Princeton … there was a dinner in our honour here (Washington) last night the British Ambassador was present … we go to Philadelphia Academy tomorrow then to New York … Osborn is to have 14 millionaires to hear me at the Museum as to what they should do for the study of the Ocean".

As early as 1885 Murray had been promoting a renewal of polar exploration. He judged that there was no great appetite for pure marine investigations but the public interest in the polar regions could be harnessed to provide useful oceanographic information. He was involved in the preparations of the *Scotia* or Scottish National Antarctic Expedition 1902-1904 which made a considerable contribution to marine research. William Bruce who led the expedition had spent time as a volunteer with Murray in the Challenger Office. In 1897 Murray also presented Fridtjof Nansen with a *Challenger* Medal in recognition of the oceanographic work carried out during his famous *Fram* expedition of 1893.

At the age of 69 Sir John's last major contribution to oceanography was an expedition with Johan Hjort round the north Atlantic in the Norwegian Fisheries research vessel the *Michael Sars*. Murray offered to pay all the expenses incurred on the 11,000 mile voyage. The expedition discovered a hundred new species including a massive 2 metre wide moonfish *Saccopharynx hjorti*. It is still the only specimen to have been caught and is preserved in Bergen museum. On their return the pair wrote the highly acclaimed text book *The Depths of the Ocean* (Murray and Hjort, 1912). Murray followed this with his last publication a little book in the Home University Library series *The Ocean; A General Account of the Science of the Sea* (Murray, 1913).

A few days after his 73rd birthday on March 16th 1914 Sir John was killed during the course of an afternoon spin in his new open tourer. The wheel at the time had been taken by his twenty year old daughter Rhoda, the chauffeur being next to her in the passenger seat. While changing gear on a clear straight road near Kirkliston the car skidded, mounted the embankment and rolled over twice. Sir John was killed instantly and Rhoda was knocked unconscious. To add to the tragedy Lady Murray was away at the time visiting their youngest son who was seriously ill at Eton. The funeral at Dean, Edinburgh was attended by representatives of all the scientific societies and public bodies with which he had been associated. Besides the family, the pall bearers

included his lifelong friend Laurence Pullar and Admiral Aldrich from the *Challenger*.

In his will Murray left 1270 phosphate shares for oceanographic research. Initially this kept *Villa Medusa* running but after twenty years it was wound up and the books and records were sent to the British Museum of Natural History. The income was then used to fund the John Murray Expedition to the Indian ocean and after 1948 they financed the John Murray Travelling Studentships which benefited many young marine and freshwater biologists.

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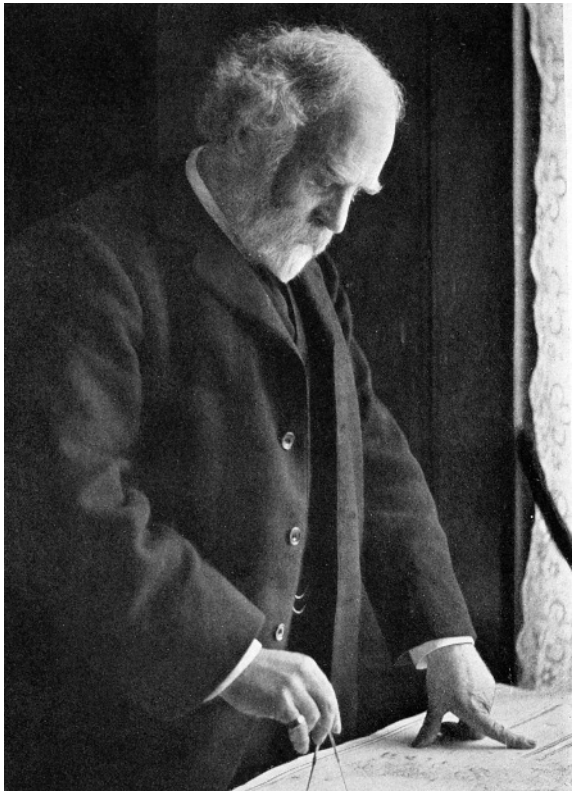

Figure 1. Sir John Murray 1900. *(Courtesy of National Oceanographic and Atmospheric Administration Photo Library.)*

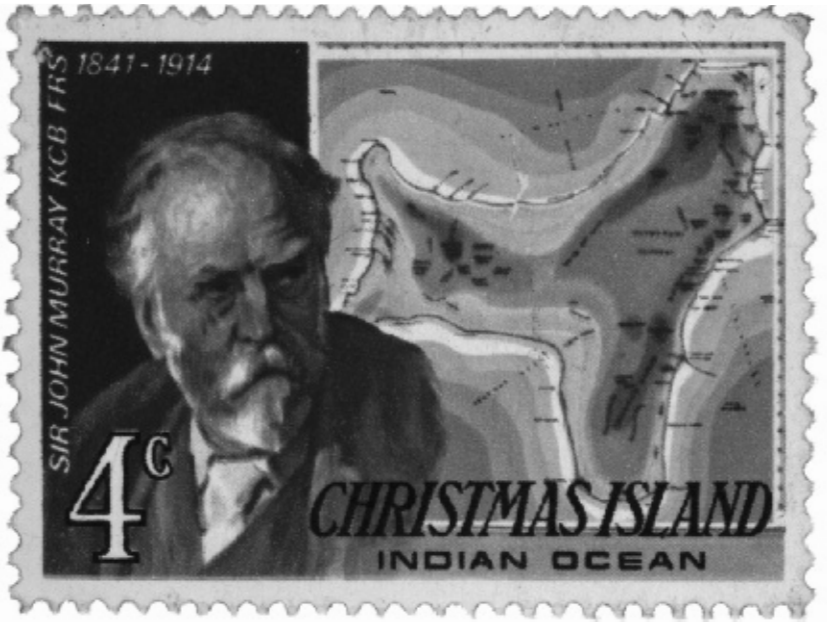

Figure 2. Sir John Murray commemorated on a Christmas Island stamp. *(Reproduced with permission of the Australian Postal Corporation. The original work is held in the National Philatelic Collection.)*

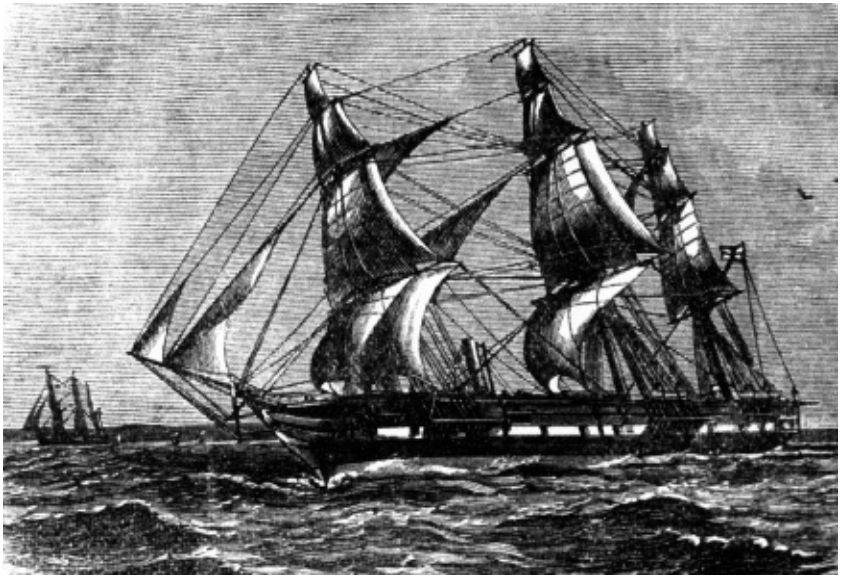

Figure 3. HMS Challenger under sail. *(Courtesy of National Oceanographic and Atmospheric Administration Photo Library.)*

Figure 4. The Challenger Medal designed by John Murray portraying a knight throwing down his gauntlet as a challenge to the ocean to give up its secrets. *(© National Maritime Museum, Greenwich, London.)*

STIRLING, GATEWAY TO THE NORTH: I. ROMAN ROADS AND EARLY ROUTES

Ron Page

Introduction

'To pass in reasonable safety and comfort from southern to northern Scotland a man must cross the Forth within a mile or two of Stirling. Stirling is the brooch that holds together the two parts of the country' (Mitchison, 1970, 1, 2, quoting Alexander Smith, 1856). The head of the Firth of Forth, the area bounded by Stirling, Dunblane and Doune, is therefore the gateway to the north.

Two thousand years ago the land north of the river Forth seemed almost a separate country when viewed from Edinburgh. The estuary to the east of Stirling, called *Bodotria Aestuaria* by the Romans, was a considerable barrier to the boats of those times (Tipping and Tisdall, 2005). To the west were the extensive mosses of the carse land, difficult to cross except by the few trackways to and from the fords of the Forth and Teith. The importance of these ways across the mosses in remote times is shown by the presence of duns and brochs controlling access to them (Main, 1998, 2001). The low-lying carse lands on each side of the Forth are flanked by hills that impede movement. To the south are the Campsies, the Gargunnocks, and the Touch Hills, leaving only a restricted corridor towards the tidal limit of the river and the nearby fords. To the north the River Teith runs close below the hills. North of the Firth of Forth are the Ochil Hills, leaving only a narrow strip of passable land below the Abbey Craig, which then broadens out through Clackmannanshire to lead to the fertile lands which became the Kingdom of Fife.

When the Romans came they were funnelled by the geography of the land towards the river crossings near the site of the future Stirling. They were not penetrating a desolate wilderness. The country was well populated, and had been so for hundreds of years (Tipping and Tisdall, 2005). The remarkable density of Iron Age hill forts in the area, the Bronze Age burial cairns, and the even earlier megalithic standing stones testify to that. Whether the Romans came as conquerors, or came proffering client status to local rulers (Wilson 1997), as they seem to have done to the Votadini in Lothian, and perhaps also to the tribes in Fife, they headed towards the focal point that is now Stirling. Towards that point they built their main road from the south. That road much later became the Great North Road, and served to bring many an invading army to Scotland – William Rufus, son of the Conqueror, Edward I, Hammer of the Scots, and others after them.

When reading the following parts of this article, the reader will find it useful, even for those with intimate knowledge of the district, to have by them the appropriate Ordnance Survey sheets, either the Landranger 1:50 000 scale Sheet 57, or better still, the Pathfinder Series (1:25 000 scale) Sheets 365 and 366.

Roman roads

Two great Roman roads from the south converged on Elginhaugh, south east of Edinburgh (Figure 1). From the Roman Fort at Elginhaugh to the camps at Camelon, near Falkirk, most of the road has been lost, much of it obscured by buildings, or perhaps built over by modern roads. This Roman road predates the Antonine Wall by at least half a century. From Camelon to Stirling the course of the road is well established, much of it clear on the ground, as for

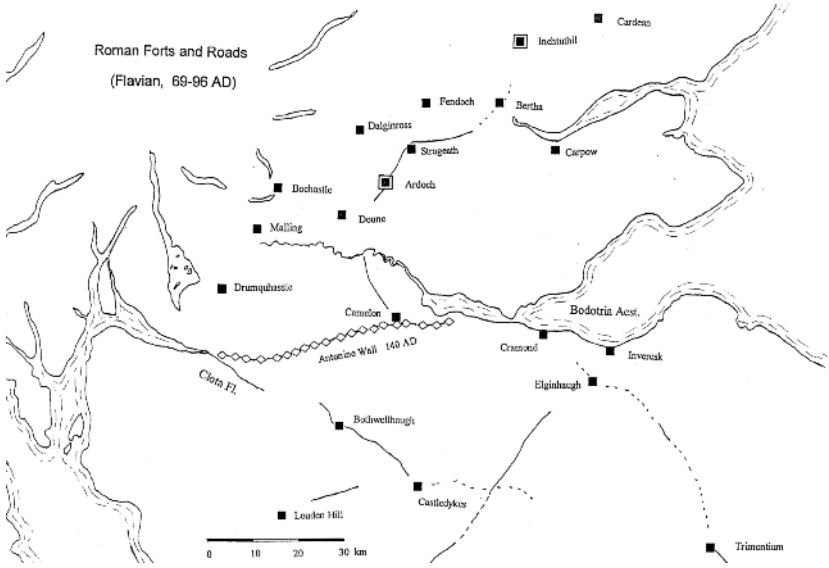

Figure 1. Roman Forts and Roads in Central Scotland (After Breeze, 1982).

example in Torwood, near Tappoch Broch. The Roman road then lies under the modern minor road to West Plean, heading towards the M9 roundabout at Bannockburn, then *via* St Ninians into Stirling: a description of this part of the road is given in the Royal Commission Stirlingshire Inventory (1963, 112-115). In Stirling itself the line of the road was recorded by Crawford (1925). Excavations in 1971, 1972 and 1974 by the Stirling Field and Archaeology Society, reported in *Discovery and Excavation in Scotland* for those years (pp 42, 40 and 65 respectively), confirmed Crawford's discoveries. The excavation in 1972 in the garden of No 6 Drummond Place showed a change of direction of the road 11° westward, and in 1974 a probable further 11° turn was reported.

Beyond Stirling for some distance the course of the Roman road has been lost. In 1792 the Rev. C. Tait read a paper to the Royal Society of Edinburgh *(Trans. iii, pt 2, 1794*) in which he described a road 'supposed to be Roman' (Maxwell, 1989, accepted it as Roman) crossing the Forth at Drip and extending about four miles to near the old Kincardine Church, about 300 metres SE and

across the road from the present church. This may have been a road to Bochastle Roman Fort near Callander (Figure 1). There should in all probability be another road leading to the Ardoch Fort at Braco. A road leading north in that direction through the Keir estate was shown on Edgar's Map of 1745. A possible crossing place of the River Teith may be indicated by the field name of 'Broad Ford', near Ochtertyre. Excavations in the Keir estate by Professor St Joseph in 1975 and by Ron and Cathie Page in 1992 failed to find evidence of a road. Simpson and Allan (2000) probed the farm track 500 m east of Biggins Farm and found evidence of a well-engineered road extending some way south in the direction of 'Broad Ford'. Excavation would be required to show whether or not this is part of the missing Roman road, but it seems possible, even likely. It appears to connect to Baxters Loan, which passes below the Flavian marching camps south-west of Dunblane.

Further north the road was found in Kinbuck Muir and traced for 1.6 km towards Ardoch by J.S. Nicoll, manager of the Clydesdale Bank in Bridge of Allan. (*Discovery and Excavation (DES)* 1971*)* It is very unusual nowadays for a discovery to be made first on the ground, and then to be confirmed later by aerial photography, as this was (Maxwell, 1982).

Figure 2. Trace of pit beside the Roman road at Rough Castle, Bonnybridge. These pits are usually visible only in aerial photographs.

Near Glenbank aerial photographs revealed a series of pits beside the road (Figure 2). These pits are characteristic of Roman roads, dug to provide gravel for surfacing the road. This stretch of the Roman road leading south-westwards from Ardoch (Figure 1) is clearly aimed at the high point at grid reference NN 7805 0366 near Crofts of Cromlix, but has not been traced west of the B 8033 road. Whether it kept east of the river and passed through Dunblane as was believed by Barty (1944, 17), or on the other hand crossed the River

Allan and went either to Doune, where the Roman fort was excavated in 1999, or passed near the Flavian marching camps near Dunblane, remains to be seen. North of Ardoch the route of the road is well known and clearly marked on Ordnance Survey maps. It is particularly clear along the Gask Ridge (Figures 3 & 4, Woolliscroft, 2002), and the sites of the signal stations along the road there are well worth visiting: several are sign-posted and in the care of Historic Scotland.

Figure 3. Roman road, near Ardunie Farm, on Gask Ridge, showing the raised roadway (*aggar*).

Figure 4. Roman road along Gask Ridge, where it becomes the modern road near Gask House.

Historic roads

There was once a widespread misconception (e.g. Moir 1957, 101) that "After the Roman period no roads were made in Scotland until the seventeenth century, except for the occasional 'causeway'", a myth effectively disposed of by Professor Barrow (1984). Among his many examples of medieval routes he quotes the journey in 1304 of two carts carrying money for wages from York to Stirling, at least 83 miles of which were over Scottish roads. The journey took only seven days, a rate of over 30 miles a day. Edward II's baggage train on the way to Bannockburn in 1314 stretched for twenty miles along this road. Certainly this journey was in the main over the previous Roman road, but in the intervening 1000 years it must have been kept in repair, but by whom, and by what arrangements, we have no record.

Elsewhere, including north of the Forth, we read of the 'king's highway' (*via regis*), the 'public road' (*publica via, communis via, communis strata*), or the 'high road' (*magna strata, magna via*). These roads would seem to have been surfaced (metalled) roads capable of bearing wheeled traffic. There were other roads and tracks, often not surfaced, and less well defined. Drove roads, for example, would, at any rate in the hills, be wide and no more than a general direction decided by the topography. They would become more constrained as they entered cultivated country, and later, when enclosures became general, they were confined between stone walls. Many other tracks existed between settlements and key points, like fords across rivers. These tracks would vary in width from narrow footpaths to wider paths for packhorses, and still wider for sleds and carts. All would take account of the lie of the land, and seldom took a straight line between two points. Straight lines were characteristic of Roman roads (though by no means all Roman roads were straight), and later Military roads, but in the intervening period, especially during the time of the enclosures, estate roads laid out by the landowner were often as straight as the topography allowed.

In the medieval period upkeep of roads was a duty laid upon his lieges by the king, and we have little or no information about how this was devolved, as it must have been, to their tenants. After Royal power passed to Parliament the upkeep of roads (and suggestions to the Council for any new ones) was made the responsibility of the Justices of the Peace (*Acts of the Parliaments of Scotland,* 1617, 1641, and 1655). In 1669 an Act was passed extending the Statute Labour measures for upkeep of the roads, requiring heritors and cottars to provide labour on the roads (Harrison, 2005): later this service could be commuted to a money payment that could then be spent on waged workers. But the activities of the Justices of the Peace were insufficient, and even bringing in the Commissioners of Supply of the Counties in 1686 did not greatly improve matters. The condition of the roads continued to deteriorate, probably exacerbated by the increased use of those times. In the 1790s in the *Old Statistical Account* parish after parish registered complaints about the appalling state of the roads. In winter most roads were practically impassable, though this was being remedied by the institution of Toll Roads, each of which

required a specific Act of Parliament. The scale of dues payable at the Toll was fixed, but the Toll Keeper had to bid at public roup for the right to collect them and he then retained the money collected. Locally, for example, on the road to Perth there was a Toll at Balhaldie, and another at Greenloaning. The Toll Keeper usually had a house with a projecting bay with side windows that allowed him to keep an eye out on each direction and on a joining road. Local examples have survived at Kilmahog, where the road to Brig o' Turk and the Trossachs meets the A84, and another may be seen at Port of Menteith where the road from Arnprior joins the A81. Tolls were abolished in 1879 (Roads and Bridges Act, 1878), and Local Authorities assumed responsibility for roads and bridges.

From Stirling north across the River Forth

In very early times the river was crossed only by fords. One at Stirling was between the present A9 road-bridge and the Old Bridge, and could only be crossed at low tide when the river flow itself was low. Another was 2 km upstream at Kildean, near the tidal limit of the estuary. This could be used much more often, provided that the river flow was moderate. The next crossing was at the Fords of Frew, 12 km west, but to cross here on the way north meant that the Teith also had to be crossed at Doune.

A bridge was built at Stirling at some unknown date, but certainly before the end of the reign of William the Lion (1165 to 1214): it was proudly depicted on the Old Burgh Seal (1296). This ancient bridge was destroyed after the Battle of Stirling Bridge in 1297, and although it was repaired in 1305 and 1336 it was replaced eventually by a ferry. In turn the ferry was replaced when the bridge now known as the Old Bridge was built in about 1415. It has been modified considerably since that time, but remains in its original position. Just upstream from the Old Bridge some massive masonry piers have been located under water and under the sandbank in the river. These appear to be the remains of the preceding ancient bridge (Page, 2001). From the Old Bridge, as before from the ancient bridge, the Causeway led north across what was swampy ground.

From the head of the Causeway a track led to the east along the flat land below Abbey Craig to Cambuskenneth and to Fife *via* Alloa. Another track climbed straight ahead up the steep slope towards Logie Old Kirk and Airthrey (Ethra was the early spelling) to the north (Mackay and Angus 1984: Figure 5). In earliest times the preferred route from Stirling to Dunblane would probably have been *via* Cornton. It is doubtful whether a road led west from Causewayhead towards Bridge of Allan because there was a swampy area near the present main entrance to the University, known as the 'Floris', created by an alluvial fan descending from a stream, the 'Rough Burn', which now feeds Airthrey Loch. A military road was taken that way in 1748 (see below), but that was after the bridge over the River Allan was built.

There was certainly an east-west road along the foot of the Ochil Hills: Logie Old Kirk occupies a very ancient site. There is reference to it in a charter of about 1178, but the presence in the graveyard of hog back tombstones of 10th-

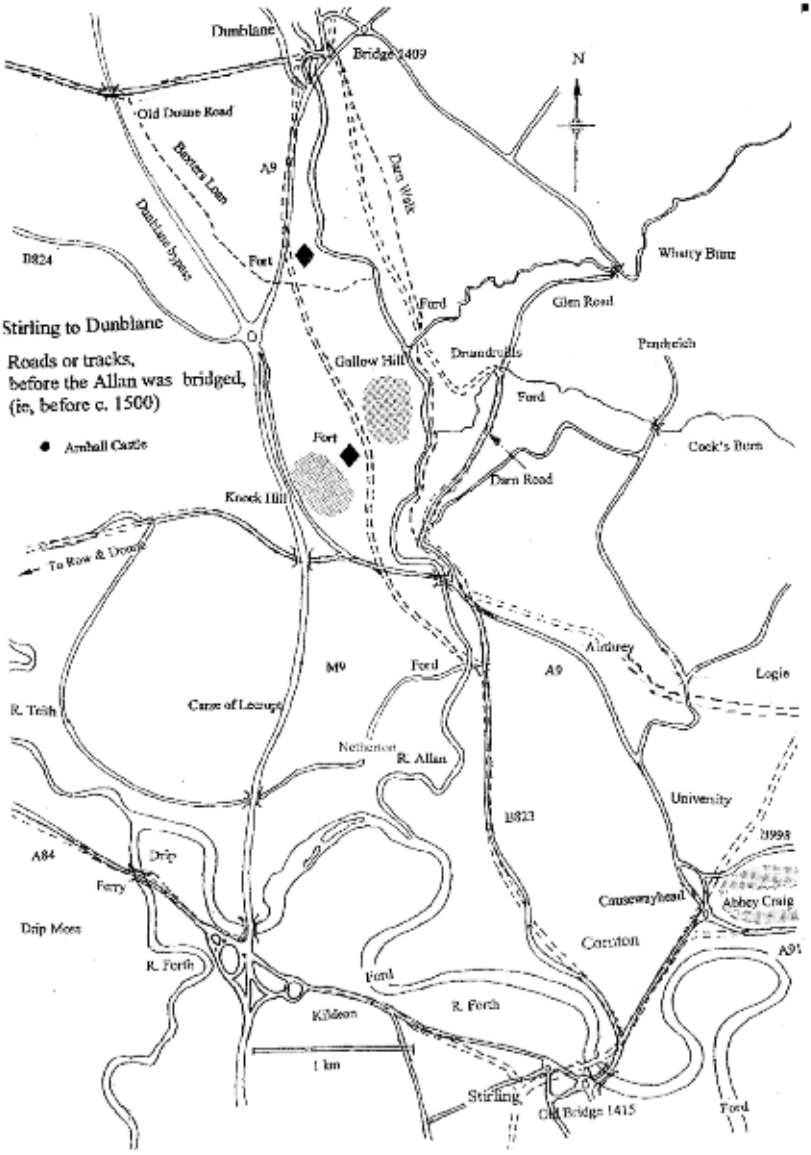

Figure 5. Old roads, shown as dashed tracks, on either side of the River Forth in relation to the modern road system.

11th century date (Figure 6) is evidence of an even earlier date (RCAHMS 1963, p 118).

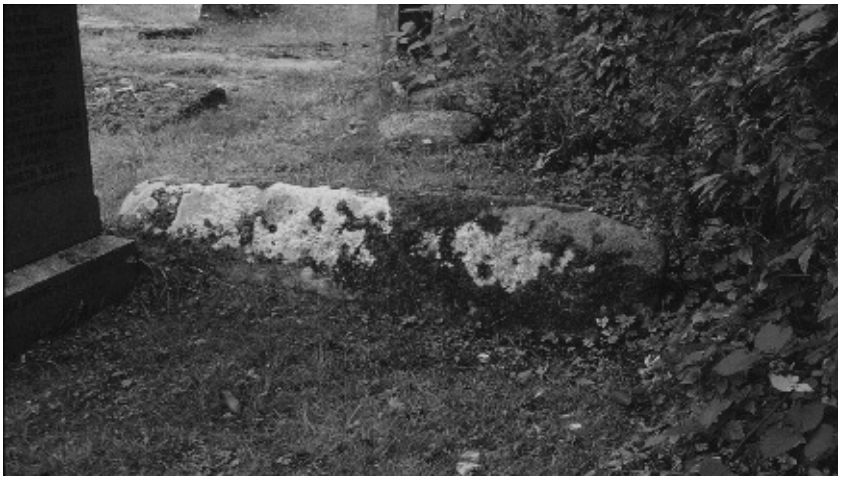

Figure 6. Hogback gravestone (10th-11th century) in Logie Old Kirkyard.

Figure 7. Logie Old Kirkyard, showing sunken ancient lane below.

Eastward the track passed through Blairlogie and Menstrie, westward it went *via* the settlements of Airthrey and Westerton of Airthrey. This westward road through Airthrey originally ran to the south of the present narrow track between the Hermitage Wood and the wall around the University campus. Ralph Dundas, who owned the Airthrey estate before the Haldanes, diverted the road to the north from its earlier route, and greatly reduced its width, at some time after 1718 (Mackay and Angus, 1984). The early track passed from the Airthrey estate through Pathfoot village, then by Blawlowan more or less straight on to near the top of the present Coneyhill Road. All traces of the early road in this vicinity have been lost beneath houses erected there. It then formed the road leading to the bridge, before Henderson Street was set out. The road is preserved as the footpath that runs behind the property boundaries on the north side of Henderson Street (Figure 8). The plots have encroached quite some way on the original road width. The remnant of the road leading to the original bridge is now preserved by Albert Place. Before the bridge over the Allan was built, the road joined the Darn Road to Dunblane. These routes were typical of many, running along the lower edge of a slope above flat ground. It was therefore well drained, in contrast to the swampy ground below. Many other examples can be found in the district, a particularly clear example is on the north side of Flanders Moss.

Stirling to Dunblane before the River Allan was bridged (i.e., before *c*. 1500).

The town of Bridge of Allan obviously takes its name from the bridge. Before that bridge was built the area on which the present town stands was

Figure 8. Old road, now a footpath, above Henderson Street in Bridge of Allan.

known as 'Inneralloune' or 'Inveralloun' (spelling varied somewhat). It belonged to the Crown, and hence the rents of the cultivators were paid into the Treasury and recorded in the *Exchequer Rolls.* Inneralloun figured regularly in the *Exchequer Rolls* before 1523 as paying rent to the King: there are no references in the *Rolls* to Inneralloune after 1522. The village itself developed after the first bridge was built. Ella Maclean (1970, 7) suggests the bridge was built in 1520 but gives no source: the exact date remains obscure. The *Exchequer Rolls* give no indication that a bridge might have existed. In 1506 the *Rolls* (p. 719) record a Sasine of Inneralloun to Alexander Home. A Sasine was a record of property transfer, in this case a gift of land from the king to an individual. This would not mean the expulsion of existing farmers from their holdings, merely that rents would be paid to the new landowner. Fraser (1958) records several references to the 'lands of Inneraloun' (pp. 295, 296, 300, 310, 311, 366, 412, and 419). An involved dispute about ownership appears to have been resolved only in 1570 when the Stirling family acquired the whole of the lands (*Notarial Instrument of J Striuiling against Alexander Lord Hume*; p. 421), confirmed by the Testament of Sir James Striuiling of Keir, 9 December 1591. It seems likely that the bridge was built during this period, and some document giving the precise date may yet come to light.

In the early 19th century the discovery by Sir Robert Abercromby of a mineral well in his estate led to the development of the village of Bridge of Allan as a spa town (Maclean 1970). The Darn Walk was developed at some time in the second half of this century to add to the town's amenities. The relationship between the Darn Walk and the Darn Road is shown in Figure 9. The Darn Walk now leaves Blairforkie Drive and passes houses on the site of a paper mill, demolished in 1966. The paper mill had replaced a woollen mill and a saw mill. Beyond the houses the remains of a massive dam, now broken through, lie across the river. The start of the lade that led from the dam to the mill is still visible, though overgrown. Further along the path a small bridge crosses over the adit, or entrance shaft, to an old copper mine. There is a similar adit on the opposite bank of the river, and spoil heaps from the mine can be seen on the right in the field. (The main copper mine of Bridge of Allan is, of course, in Copper Mine Wood).

In the 16th century a journey from Stirling to Dunblane had the choice of two routes (Figure 5). A track branched from the beginning of the Causeway near Stirling bridge and passed westward through Cornton to Inneralloun, at that time open country. A ford near the present Bridge of Allan Fire Station allowed crossing of the Allan. From this ford one track led to Doune via Row (Figure 5 shows one possibility *via* Lecropt; another is *via* Netherton and Westleys: perhaps both existed). From the ford another track led north near the present A9 to Dunblane, probably passing through what is now the Closures and Plastics Factory, then by what would become the railway station, approximately along the present Station Road. It continued between Gallow Hill and the Iron Age fort that lies between Gallow Hill and Knock Hill (Figure 5). The route is marked on the 1:10 000 Ordnance Survey Sheet NS 79 NE as 'Old Military Road', but this is probably an error. It has not the appearance of

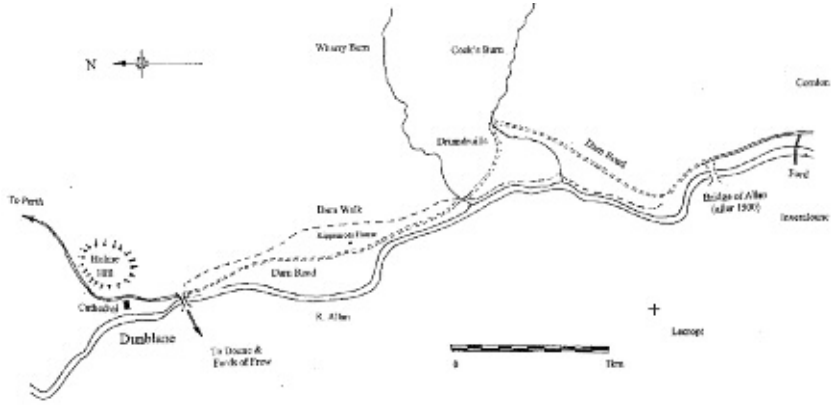

Figure 9. Darn Road and Darn Walk, Bridge of Allan.

a military road and seems to be much older. Near the Keir roundabout, Ordnance Survey mapping does not show its course but an aerial photograph taken by Dr David Woolliscroft in 2001 shows by a crop mark that it continues, to meet the A9 about 300 m north of the centre of the Keir roundabout. From there the earliest road, the military road and the A9 coincide, continuing past another Iron Age fort towards Dunblane. The early road, however, remained on the western side of the River Allan until it was able to cross a ford a little upstream from the present Dunblane bridge. That bridge has developed from one built in 1409 by Bishop Finlay Dermoch. (In medieval times it was usual for bridges to be built on the initiative of Bishops: other local examples are the packhorse bridge over the Knaik at Braco, and the bridge over the Machany Water, known as the Bishop's Bridge, on the way to Crieff, both built by Bishop Ochiltree in the early 15th century). Often the money to build such bridges was raised by the sale of indulgencies: one was promised a period of remission of the time to be spent in purgatory as punishment for one's sins).

Before the bridges existed over the Rivers Allan and Teith the preferred way to Dunblane from Stirling avoided the two fords by following the east bank of the Allan. It went along the Darn Road, past the Mill of Airthrey, more or less along Blairforkie Drive, along Glen Road until it reached the Cock's Burn where it swung west past Drumdruills and passing the Wharry Burn at the place where the present Darn Walk crosses this stream by the footbridge. The Meal Mill of Kippenross was beside the Burn near here, and the Darn Road went by this mill, following the east bank of the River Allan to pass in front of Kippenross House on the way to Dunblane. In 1858 the 'road called the Darring Road', by this time regarded as merely a footpath, was diverted by John Stirling of Kippendavie. Closing the road caused great local resentment. A wall was built across the road, but the work done by day was knocked down each night, allegedly by the same workmen (Barty, 1944, 269).

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STIRLING, GATEWAY TO THE NORTH: II. ANCIENT, DROVE AND MILITARY ROADS

Ron Page

Dunblane to Doune and from Doune to the west

Before the Dunblane bridge over the Allan was built in 1409 by Bishop Finlay Dermoch, the river was crossed by a ford a little to the north of the site of the bridge. The old Doune road left Dunblane through what is now Bridgend. Part of the road is now lost where its route is replaced by the footbridge over the Dunblane bypass. It continues across a bridge at *Murdoch's Ford*, commemorating Murdoch, Duke of Albany, Earl of Menteith and Fife, beheaded in Stirling for treason in 1425 by James I. The road passes between Glenhead and Greenyards Farms as a road passable for farm traffic, though rough for cars. The old road then continues towards Dunblane as a well-defined track, now signposted as a footpath, with hedges on each side denoting its earlier width, until it meets the A820. A short distance west the remains of a bridge can be found. The old road then continued along the field boundaries and follows the northern boundary of the trees beside the B824. It crosses that road at the sharp bend, and on the far side of the road its track across the fields can be seen in favourable circumstances, after ploughing, as a stone scatter. The route then passes south of Old Newton House, and leads to where, before the Ardoch Bridge was built, there was a ford across the Ardoch Burn. A plaque on the bridge reads 'Built upon the Publick Expense of the Shire AD 1735' (Figure 2).

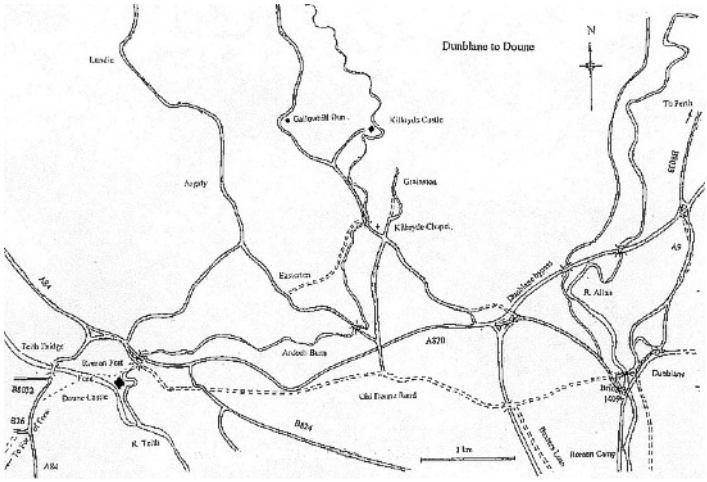

Figure 1. Old roads, shown as dashed tracks between Dunblane and Doune relative to the modern road structure.

Figure 2. Bridge over the Ardoch Burn at Doune.

Before 1535, when the bridge (Figure 3) over the River Teith south of Doune was built (by Robert Spittal, tailor to King James V) there was a ford near the Castle (Figure 1). This ford, immediately below the Roman Fort, would most probably have been used by Roman forces, and would have been an important factor in locating the Fort. From the ford a track led past the Castle: cars exiting from the Castle car park still use a part of it. The parish boundary along the Ashmill Burn leads directly to the ford, a sign of the antiquity of the route.

Figure 3. The Teith Bridge, south of Doune.

The now disused straight stretch of road leading from the junction of the B826 and the A84 towards Coldoch is part of an ancient route (Figure 1). It was shown on Taylor and Skinner's map of 1776 and was open until the 1920s: the late Mr Roy MacFarlane, whose childhood was spent in Doune, remembered being taken as a very young child along that road in a pony trap. This route south from Doune to the Fords of Frew would have been used by drovers heading south and seeking to avoid paying the toll at Stirling Bridge.

Figure 4. Road, now abandoned, leading south from Doune *via* Coldoch to the Fords of Frew.

Figure 5. Superbly constructed culvert under the abandoned road from Doune to the Fords of Frew.

The Glasgow to Perth route, from the Fords of Frew to Doune, passing Dunblane, is of great antiquity, suggested by the position of the Iron Age Coldoch Broch beside it. To control this vital route the Castle of Doune was sited beside it. The present Castle was built in the fourteenth century by Robert Stewart, Duke of Albany, but there was probably an earlier castle on the same site. There may indeed even have been an early medieval or dark-age fortification (a *dun*) there: the name Doune probably derives from this. The *Old Statistical Account* (1797) of Kilmadock or Doune by Alexander Macgibbon describes how 'The great roads from Edinburgh to Fort William, and from Glasgow to Perth, pass through this parish, crossing each other at the town of Doune. These roads are far from being in good order, but application is being made for making them turnpike. … Except these two roads, there are no other roads, public or private, passable in bad weather'.

South of the old Doune road, beside the present Dunblane bypass, Baxter's Loan leads past the site of the Flavian marching camps to one of the mills on the River Allan (Figure 1). The name probably reflects the use of the track to take corn to the mill, but the track may be much older than the mill, and may even have served the Roman camps.

A road led west from Doune to Callander, subsequently upgraded to become part of the great Stirling to Fort William military road. Another went to the site of Old Kilmadock, with its ancient graveyard and church of St. Aedh, the focal point of the parish: Doune is in Kilmadock Parish and Doune was a dependent, a later development. The track joining Doune to its parent leaves the A84 just outside the village and its approximate direction can be followed beside the disused railway line and past Clarkton Farm. The last few hundred metres of track have been lost through ploughing so that the best way now to Old Kilmadock is by the path beside the Annet Burn, leaving the A84 opposite Burn of Cambus Lodge.

Several roads and tracks diverged to the north from the old Doune road. One went *via* Argaty and Lundie to the Braes of Doune. Two roads led to Kilbryde, meeting near Kilbryde Chapel. These roads, or their approximate modern equivalents, are still in use. A track that went from near Easterton Farm along the west bank of the Ardoch Burn, crossing the Burn at the site of the modern bridge by the Chapel, has fallen out of use but can still be followed, though with some difficulty. From the Chapel a road leads north to Grainston and used to extend further. Crossing the Burn, the road goes to Kilbryde Castle, a branch continuing past the recently discovered Gallow Hill Dun, past Nether Glastry, Dalbrack, the Judges Cairn (a Bronze Age burial mound), the Bows Farms, and so to the Braes of Doune. These roads were probably originally tracks used to gain access to shielings, summer grazing grounds for cattle. The remains of a large number (210) of these were discovered recently (RCAHMS, 1994). Some of these tracks may have extended through the hills to become drove roads, though they are not listed by Haldane (1997). The *Old Statistical Account* for Doune states 'The 2 (of six annual fairs) at Michaelmas and Martinmas are large cattle markets, little inferior to the famous trysts of Falkirk'.

Drove Roads heading towards Stirling Bridge

Cattle from the north and west, perhaps from as far away as Skye, crossed the Sheriff Muir on the way to Stirling Bridge and on to the tryst at Falkirk (Haldane, 1997). Drove routes can often be picked out by place names, such as Greenloaning, indicating where grazing was available, or Cauldhame, signifying a place of lodging, though rather primitive! The Sheriffmuir Inn represented superior accommodation. From the Inn there was a choice of routes to Stirling Bridge. One went south, close to the line of the present road, crossing the Wharry Burn near the present small bridge, itself quite old, and later dividing to allow descent either east by Logie Old Kirk or continuing south to Pathfoot. These routes are existing roads. An alternative *via* Pendreich remains as a track from the road between Stonehill Farm and The Linns to Pendreich Farm (Figure 6) where it continues as a made road dropping to Pathfoot.

This track was used by the fleeing left wing of the Government troops retreating from the Battle of Sheriffmuir. On their way to Stirling they used a bridge over the Cocks Burn built in 1708, just in time for their use.

Figure 6. Drove road across Sheriffmuir, from Pendreich Farm.

Drove roads were originally not clearly defined for most of their length, but as 18th century agricultural improvement extended enclosure walls, they became more and more confined. The track across the muir north of Pendreich Farm has been 'improved', and surfaced with stones. It is very straight and might be mistaken for a Roman road save that beside it at irregular intervals are roadstone quarries quite unlike the small pits found beside Roman roads.

Military roads

The London Government had been much concerned since 1688 over Jacobite support in Scotland, and continuing lawlessness in the Highlands. Matters came to a head with the Earl of Mar's rebellion of 1715. One consequence of the Battle of Sheriffmuir was the decision in 1717 to build a series of garrisons in Scotland, linked by military roads.

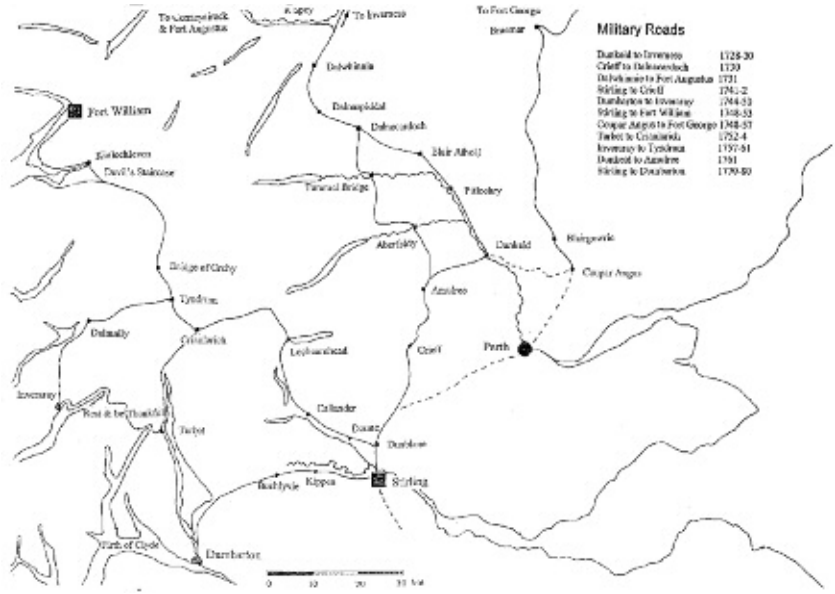

Figure 7. Military Roads leading from Stirling.

The initial plan was for four garrisons: Kilwhimen (later named Fort Augustus), Bernera, Ruthven, and our nearest example, Inversnaid. A road, planned by James Smith, 'Surveyor … in North Britain', was to run from Inversnaid *via* Glengyle, Balquidder, and Loch Tay to join, near Pitlochry, the Dunkeld to Inverness road, passing close by Rob Roy McGregor's stronghold at Inverlochlarig. The Chief Overseer at Inversnaid was Major Gordon, and Lieutenants Dumaresque and Bastide were in charge of the work on the road, which began in 1718. It was not completed, and is not traceable beyond Stronachlachar on the way to Glengyle. The Garrison itself was erected by 1719, in spite of a party of eight masons and quarriers being carried off by armed Highlanders (presumably McGregors) in August 1718. A plan of the garrison buildings is in the *Stirlingshire Inventory* (RCAHMS 1963, No. 112). The garrison buildings at Inversnaid can still be visited, though partly ruinous and partly incorporated into the buildings of Garrison Farm. The garrison at Ruthven, of similar plan, is preserved by Historic Scotland. The road towards Glengyle lies above and parallel to the modern road along Glen Arklet (Figure 8).

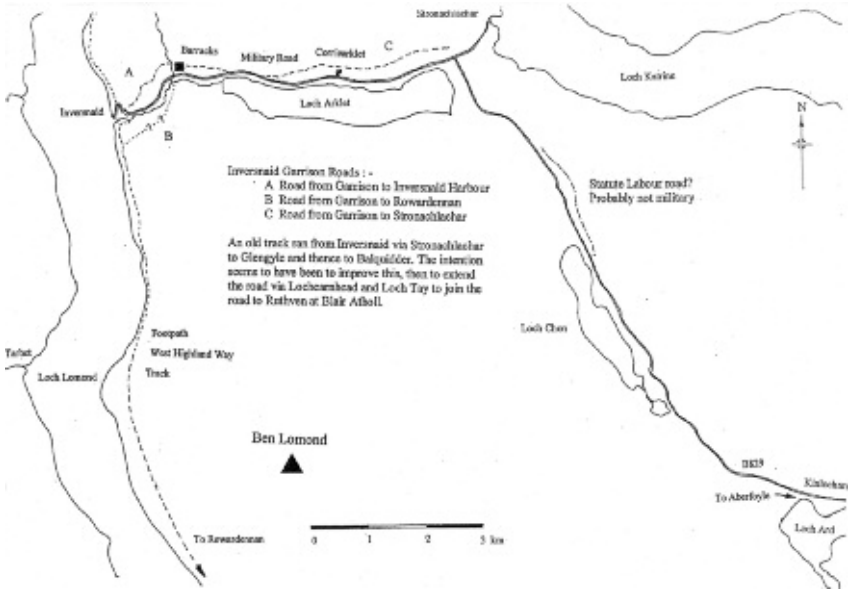

Figure 8. Roads to Inversnaid Garrison, part of the earliest military road system planned in Scotland after the 1715 rebellion.

From the garrison to the harbour the road is traceable over the hillside above the modern road descending to the Inversnaid Hotel. Presumably the garrison was supplied by boats. There is said to be a road from Rowardennan along the side of the Loch, along the line of the West Highland Way, but it seems likely that this was never completed: no trace of it is to be found. The present B829 road from Aberfoyle to Stronachlachar and Inversnaid is modern. Traces of an earlier road can be seen above the present road after passing Loch Chon (Figure 8). This seems to have been a Statute Labour road, but no record has been found to show exactly when it was built or when it was replaced by the present road.

The Inversnaid roads are not mentioned by Taylor (1976) because they predate what is known as the 'Wade era' from 1724 to 1740. The Glenshiel affair of 1719, an abortive attempt at a rising, was crushed by General Wightman when he captured three hundred Spanish soldiers who had landed. This alarm, coupled with a memorial sent by Lord Lovat to King George I in 1724 describing the unsatisfactory situation of lawlessness in the Highlands, gave rise to a Government Enquiry. As a result Major General Wade, MP for Bath, was sent to Scotland to look into 'the disarming of the Highlanders' and to suggest other remedies for 'good settlement of that part of the Kingdom'. General Wade stressed, among other proposals, 'the want of roads and bridges' to enable movement of troops and equipment to strong points such as Fort

William and Fort Augustus. He came to Scotland in 1725 as Commander in Chief, North Britain, armed with appropriate powers to bring about improvements. Wade began work on the military road system with the road from Fort William to Inverness. He realised that for access to the Highlands the two key towns were Perth and Stirling. But Perth had to be reached from Stirling, that 'brooch' bonding the north of Scotland to the south. For more than a century before Wade the Bridge of Allan had provided that vital link (see Part I: *Roman Roads and Early Routes*).

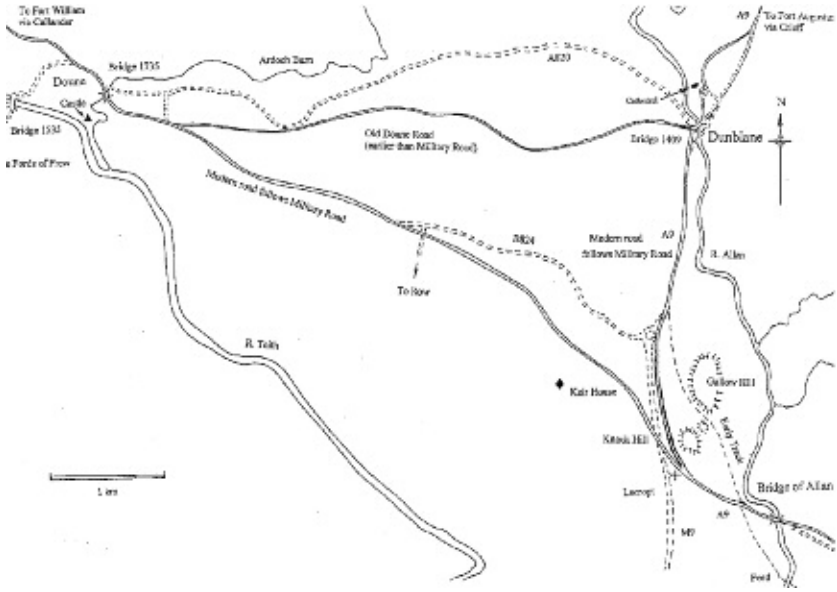

Figure 9. Military Roads through Bridge of Allan.

The early track from Causewayhead to Broad Loan and Logie (see Part I) was on too steep a slope for military traffic. Accordingly the military road was taken westward along the line of the present A9. Dunblane and Perth were already linked by an ancient road, the Roman road running along the Gask Ridge. It was used in 1715 by the troops of the Earl of Mar before the Battle of Sheriffmuir, resting the night before the battle at Naggyfauld by Kinbuck Muir. But this road was too rough and unsatisfactory for Wade, as was that from Perth to Dunkeld. Wade proposed first to link Dunkeld to Inverness, then to meet this road at Dalnacardoch by a road from Crieff, which could already be reached from Stirling (Figure 7).

Stirling to Crieff: 1741-2

The first efforts to build military roads were often unsatisfactory. Realignments and improvements to the Fort William to Inverness road, for example, had to be carried out in 1732. The existing Stirling-Crieff road had been assumed to be able to take military traffic but it was soon found, according to General Clayton, Wade's successor, to be 'in so bad a condition as to be in a manner impassable, and should there be occasion to march troops or carry artillery it would be impossible to do either'. As a result in 1741 the Commissioners of Supply for Perthshire received a petition from 'Major William Cawfeild' to be reimbursed because '… to make the road straight and more Commodious' he had had to pay £3 14s 6½d 'to the private parties'. The payment was evidence of the co-operation on road building between civil and military authorities in the Lowlands.

The Military Road to Crieff and then to Inverness had to go from Stirling over the Bridge of Allan. Both were upgraded from the existing Kings Highway. Stevenson (1723) in 'Macfarlane's Geographical Collections' (pp. 310-11): 'The Kings highway divides a little after passing the bridge of Allan, through this paroch one by Dunblain to Strathearn and Perth, the other by Doun to Menteth and the West Highlands'. It seems most likely that this division took place a short distance north of the present Lecropt church, close to where the A9 runs just above the M9: a track leads north off the A9 above the railway line which I believe to be an early track, a relic of the route from the ford across the River Allan (see Part I). The military road would most likely have run along the line of the present A9 into Dunblane: whether it passed through the town after crossing the bridge is not known. Caulfeild's road from Dunblane, ruler-straight like the previous Roman road lying between it and the River Allan, has now become the A9. At Greenloaning it turns across the river to Braco, then crosses the River Knaik at the Ardoch Bridge, heading straight to Muthill, diverging from the A822 as a minor road about 2 km from Braco. From Muthill it continues, again very straight, as the A822 to Crieff.

By 1742 Stirling was connected the whole way to Inverness by military roads. It was perhaps ironic that the first military use of these roads was by Jacobite troops retreating in 1746 to Culloden. Wade left Scotland in 1740. Caulfeild had served under Wade on road building and maintenance from 1732, and in that year he was promoted Major and appointed Baggage Master and Inspector of Roads. After the '45, in which he was Quartermaster to Sir John Cope, he became Deputy Governor of Inverness Castle, and usually then was addressed as Governor Caulfeild.

Military Road, Stirling to Fort William, 1748-53.

Like the military road to Crieff and then to Inverness, the Fort William road also had to pass from Stirling over the Bridge of Allan. A surveyor preparing for this military road noted 'From Edr. to Stirling and Down, to Kilmahug in Monteith is already carte road … Kilmahug begins the road, which is to be mended …' (Ruddock, 1974, 68). The road passed first through the Keir Estate,

about 400 m north of Keir House, where its line is indicated on the Ordnance Survey maps. It converged towards the present B824, cutting across the road to Row 100m south of the B824, where a small trace of the military road remains as an entrance to the field (Figure 9). Soon after this the modern road and the military road coincide. At the sharp bend of the modern road, the military road met the old Doune road.

The military road continued to Callander, crossing the bridges over the Burn of Cambus, west of Buchany, and the Water of Keltie a mile before Callander. Beyond Kilmahog the route became more difficult. In July 1748 a warrant was issued 'upon the Storekeeper of Stirling Castle to Maj^{r} Caulfeild or Mr Jas Campbell for such quantities of Powder as they may require for Carry^{g} on the Road to Down' (Taylor 1976, 70). That summer thirteen miles of road were built from Stirling, but it seems unlikely that the gunpowder was needed for this stretch. In 1749, 300 men from Pulteney's regiment worked from Lochearnhead towards the Pass of Leny, and 300 of Sackville's regiment worked from the Pass of Leny towards them, work that would have found need for gunpowder to blast away rocky obstructions. Fifteen miles of road were made in that year, and the road was completed in 1753. In the main the modern road follows the course of the military road through the Pass of Leny and beside Loch Lubnaig, the military road diverging at Anie, traceable around the edge of the field and over the rising ground to rejoin the present road some distance beyond St. Bride's Chapel. Just beyond the chapel, above the modern road are the remains of an original, though partly collapsed, military bridge (Figure 10).

Figure 10. Bridge carrying the Military Road to Fort William, north of St. Bride's Chapel, Anie.

Stirling to Dumbarton, 1770-80

The earliest military roads in what is now Stirlingshire, as elsewhere in the lowlands, were built or improved from existing roads. This county also has the last of the military roads, that leading to Dumbarton. Major Caulfeild died in 1767 and work on the road was begun by parties of soldiers responsible to the Duke of Argyle (1771 to 1778) and continued under Lt. General Oughton (1779 to 1780). Slender details of its route are given by Taylor (1976, 69-70). The road left Stirling and passed through Cambusbarron, probably following the present Touch Road to join the A811 (Figure 11). About a kilometre further along the A811 its course can be seen to diverge behind Redhall Farm (Figure 12) and to join the minor road by Mains of Gargunnock into the village.

The military road continues to the west, crossing the Leckie Burn near Watson House. At Burntown there is a dogleg where the military road is crossed by the Glinns Road from Inch of Leckie Farm. Further west it goes over Boquhan Bridge, through Glentirranmuir to Kippen, and follows the B road from Kippen to meet again the A811 at Laraben. Through Arnprior the A811 displays the typical straight character of a classical military road. About a kilometre beyond Arnprior, near Garden, the military road diverges from the A811, continuing straight ahead, following the hedge line, being crossed at a dogleg by the minor road to Badenkep before passing behind Oxhill Farm into Buchlyvie. This section of the road apparently was scarcely used except by farm carts (revealed by excavation in 1989: Page and Page 1994). Soon after it

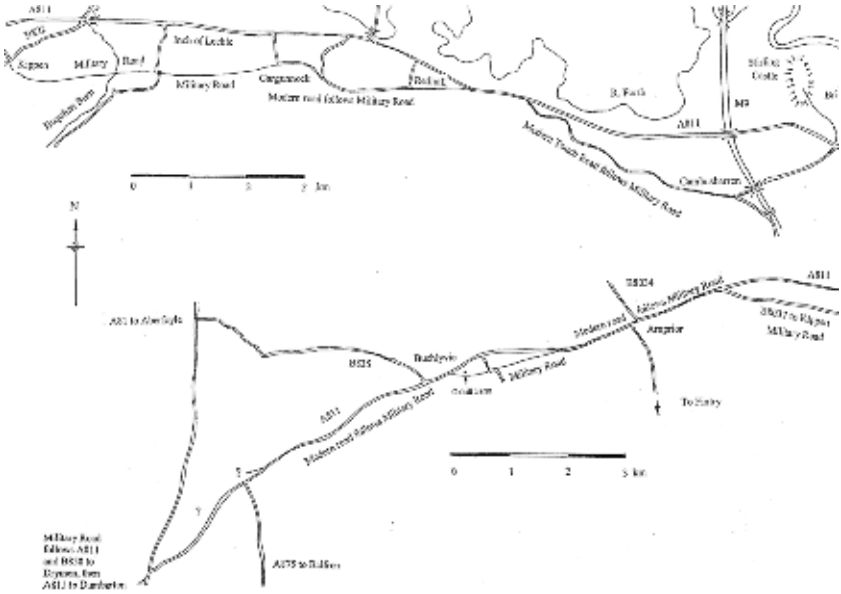

Figure 11. Military Road, Stirling to Dumbarton, 1770-80.

Figure 12. Military Road, now disused, near Redhall Farm.

was finished it was abandoned. Local users reverted to an earlier road, shown on Roy's Survey (1747-1755), that now forms the A811.

Conclusion

The maps in Parts I and II of this paper show how communications maintain continuity through the ages. Roman roads sometimes follow prehistoric tracks, and remain the foundations of many modern roads. Medieval tracks become drove roads or turnpike roads, and so on. Usually only Military Roads, Roman or post-1715, estate roads and modern bypasses break new ground.

Part I of this article *(Roman Roads and Early Routes)* drew the reader's attention to the use of Ordnance Survey mapping as a way of seeing the past. Throughout the two parts, emphasis has been on seeing the past on the ground, following and tracing these ancient roads across the landscape. Sometimes these old roads are now lost, sometimes they are seen only in favourable conditions or in particular lights. These and other roads remain to be explored, and new discoveries made.

Acknowledgements

I thank all those, too numerous to mention, who over the years have given advice and their opinions on these matters. I am particularly grateful to Malcolm Allan who made available to me a transcript of the Bryce Manuscript (1888), describing the roads and paths of Bridge of Allan, held by the Dr Welsh Trust. But in particular I must express my appreciation of the part played in this

by my wife Cathie, who has walked these roads and paths with me, looked at the maps, and discussed the problems until we have reached these conclusions.

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A NEW CHAMBERED CAIRN IN THE UPPER FORTH VALLEY

Angela Gannon

A new chambered cairn has come to light in the course of tree-felling operations in a plantation to the north-east of Loch Lomond. It was one of a number of monuments visited by officers of the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) in the autumn of 2006 in response to a request from Lorna Main, Stirling Council archaeologist. Another was an unusual group of prehistoric carvings cut into an outcrop, including cups, a rosette and large ring-markings. The cairn was first discovered by Jim Ferrall, the Harvesting Work Supervisor with the Cowal and Trossachs Forest District of the Forestry Commission, whose attention had been drawn by two large capstones exposed after the area was cleared of trees. He had been searching for a covered well or spring that was known locally to supply the farm at Creityhall on the Buchanan Estates, owned by the Duke of Montrose. Having located this in the gully of the burn a short distance to the south-west, he realised that another explanation would have to be found for the two large slabs. Such was the importance of his discovery that a two-person team from RCAHMS revisited the cairn on a cold but bright November's day later that year, recording it by measured plan at a scale of 1:100 (Figure 1). This find is described and considered within its local and wider context.

Figure 1. Ian Parker (RCAHMS) undertaking a measured survey of the chambered cairn by plane table and alidade. One of the upright slabs is visible centre right, alongside the two capstones.

The cairn is situated in Garadh Ban Wood, an area previously planted with conifers, only a short distance from the Drymen to Balmaha section of West Highland Way. It lies towards the leading edge of a broad flat terrace between two burn gullies at about 170 m OD (NS 4522 9189), and commands fine views to the south-west over Loch Lomond and the row of islands that marks the line of the Highland Boundary Fault. The cairn is now reduced to little more than a low stony mound measuring 15 m from N to S by 12 m transversely and up to 0.5 m in height. The remains of the chamber lie off-centre to the south-west and comprise of two upright stones and two displaced capstones. Its overall plan, however, can no longer be determined, and the two upright stones are set splayed to one another; that on the W measures 0.53 m by 0.25 m and 0.15 m in height, and that on the E, which is heavily laminated, 1 m by 0.18 m and 0.8 m in height. The first of the capstones, its SE corner resting on the smaller of the two uprights, measures 2.1 m by 2.03 m and up to 0.3 m in thickness; two fragments are broken off at its NE corner. The second capstone lies immediately adjacent to the N, flush with the surface of the cairn, and measures 2.3 m by 1.7 m and 0.17 m in thickness. Small pieces of quartz lie scattered across the surface of the cairn (Figure 2).

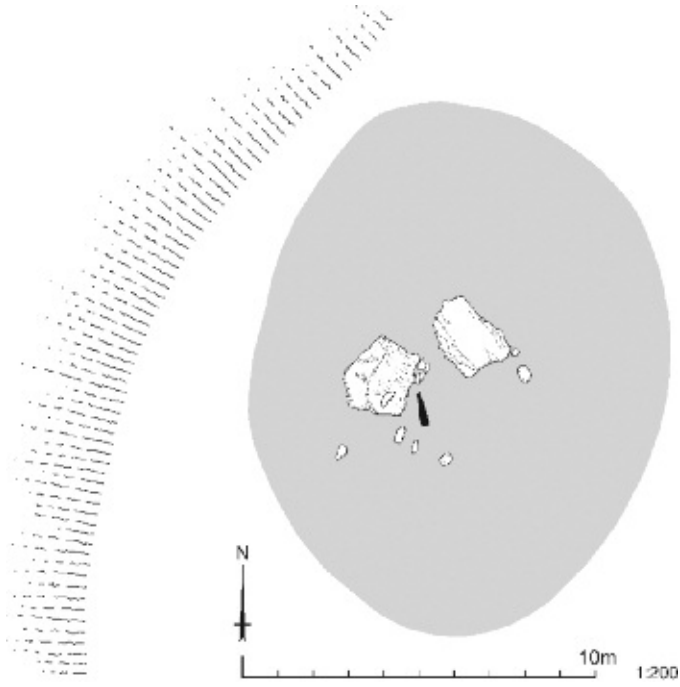

Figure 2. Plan of the chambered cairn.

The identification of the monument as a cairn is beyond question, and the size of the two large capstones argue for a chamber of Neolithic date rather than a cist of the Early Bronze Age. Geographically, the majority of Neolithic chambered cairns in the area belong to the Clyde tradition of megalithic building, a regional grouping that covers Argyll, the islands of Arran and Bute, much of south-west Scotland and up into Perthshire. Cairns of the Clyde group typically comprise a chamber defined by large stone slabs set on edge, often overlapping, sometimes subdivided into smaller compartments by septal slabs, and covered by a mound of stones and earth. In simple examples the covering cairn may be circular or oval, with access into the chamber only available from the body of the cairn and by the removal of a capstone, but in more developed forms, often of more than one period of construction, a series of large upright stones, arranged in a shallow semi-circle, define the façade of a forecourt in front of the entrance leading into the main chamber. Cairns elaborated in this manner tend to be trapezoidal on plan. Associated artefacts and the few radiocarbon dates that are available for this type of tomb, suggest that the Clyde cairns belong to the earliest phase of Neolithic monument building in Scotland (fourth millennium BC).

So where does the cairn in Garadh Ban Wood fit into this overall pattern? In terms of its surviving architectural detail, there is perhaps not enough visible evidence to place the cairn within the Clyde grouping, and only excavation can really provide the answer. Nevertheless, with capstones of such size, the monument is much more than a simple cist, and its oval shape and central chamber defined by thin edge-set slabs, slightly splaying and suggestive of an overlap, are in keeping with the more simple examples of Clyde-type tombs. As such, it provides us with a very welcome addition to the otherwise thin distribution of Neolithic funerary monuments in Stirlingshire, but one that has seen significant additions over the last thirty or so years.

The first of these new discoveries emerged in 1980 with the identification of a hitherto unrecorded long cairn at Edinchip, near Lochearnhead in Perthshire (Davidson and Henshall, 1984). This was followed in 1991 by the recognition of a chambered cairn at Auchenlaich near Callander, incorporated into the south-south-east end of an exceptionally long stony mound (*DES 1991*, 9). Then, in 1992, during the RCAHMS field survey of the area around the Braes of Doune, another four were found, three of which were identified as Clyde-type tombs (RCAHMS 1994, 6-8). More recently, in 2000, another Clyde-type chambered cairn was discovered at Carie during the RCAHMS Ben Lawers survey, undertaken in partnership with the National Trust for Scotland. In terms of the overall distribution of Neolithic funerary monuments, this steady trickle of new discoveries has helped to bridge the gap between the outlying group of cairns previously recorded in the glens of Perthshire and those examples in Argyll and the south-west. More tantalizingly, it holds the promise of yet more to come, particularly in areas covered by extensive forestry plantations that are now reaching maturity (Figure 3).

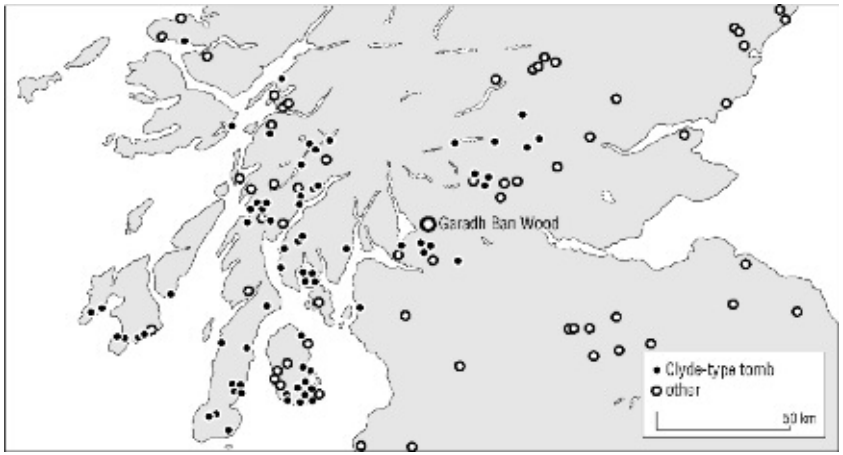

Figure 3. Distribution map showing the cairn in relation to Clyde-type tombs and other Neolithic funerary monuments.

A common feature of these cairns is their location on the fringes of the uplands, and in the case of the cairn in Garadh Ban Wood, its geographical position provides extensive and truly stunning views to Loch Lomond and further to the south-west. The paucity of comparative sites in the lower-lying ground can in part be explained by the intensity of later land use, reducing sites to little or no surface traces, but aerial photography is helping to extend the distribution of Neolithic burial monuments, supplementing the archaeological record with the discovery of at least two long barrows. One of these lies at Glenhead on the edge of a terrace to the south-east of the Ardoch Burn in Kilmadock parish, Stirlingshire, and while the barrow itself has been levelled by ploughing, the cropmarks of its flanking ditches are visible on aerial photographs. At Craighead, just across the border into Perthshire, a comparable pair of narrow ditches has also been revealed by aerial photography. No trace of a chamber can be detected on the aerial photographs of either, so it is not possible to claim that these are ploughed-out chambered cairns. It is perhaps more likely that these are unchambered long barrows, which are traditionally regarded as the typical funerary monuments of the eastern seaboard. When excavated, such barrows as that at Dalladies, Kincardineshire (Piggott, 1974), and more recently at Eweford West, East Lothian (Lelong and MacGregor, 2007), these have been found to cover timber mortuary structures, rather than stone-built chambers. Another timber mortuary structure was also found beneath the unchambered round mound at Pitnacree in Strath Tay, Perthshire (Coles and Simpson, 1965).

While fieldwork has been able to enhance the record of Neolithic funerary monuments in the fringes of the uplands, aerial photography is providing the equivalent for the adjacent lowlands. The RCAHMS programme of aerial

survey, however, is contributing much more than this, for it has added significantly to the repertoire of Neolithic monuments in the lowlands, revealing mixed assemblages of round and long mounds, timber halls, mortuary enclosures and cursus monuments. Examples of all of these monuments are now known sweeping up into the Forth Valley. The two long barrows have already been mentioned, while the large circular mound at Tulloch Knowe, near Doune, may well turn out to be a round barrow of Neolithic date (RCAHMS 1979, 9, No. 29). A timber hall has now been excavated at Claish just outside Callander (Barclay, Brophy and MacGregor, 2002), while a pit-defined cursus monument has been excavated at Bannockburn (Rideout, 1997). What was once considered a rather barren area in Neolithic Scotland has been shown to contain a diverse range of circular, long and very long monuments. This contrasts with the uplands, where the monuments are largely limited to chambered tombs and decorated stones.

Geographically, central Scotland sits at the seam between these two zones. On the face of it this appears to reinforce the long-standing view that stone built monuments occur to the west and timber built monuments to the east. However, nothing is ever as simple and clear-cut, and the excavations in advance of an extension to a sand and gravel quarry at Upper Largie, near Kilmartin in Argyll, led to the chance discovery of a pit-defined cursus and a pit-defined enclosure, both monuments more typically associated with lowland Scotland (*DES 1997*, 19-21). In effect, we should anticipate that the lowland repertoire extends throughout the uplands. In this sense, the monument at Auchenlaich (see above), three times as long as any other known long barrow, is more readily interpreted as a bank barrow or cursus, providing an upland expression of a type of linear monument more commonly found in the lowlands.

The cairn in Garadh Ban Wood has not only added to the number of Neolithic funerary monuments within this part of central Scotland, but has also contributed towards a greater understanding of the early prehistoric settlement. That so many new monuments have been identified in an area that can hardly be described as remote, must surely beg the question of what others yet await discovery.

Acknowledgements

I would like to thank Jim Ferrall, Lorna Main and David Easton for bringing site to my attention and for an enjoyable day out together in the field; Ian Parker for planning the site with me and providing the illustrations; and Strat Halliday for his endless encouragement, help and advice.

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SCOTLAND'S RURAL PAST IN THE FORTH VALLEY

Tertia Barnett

Introduction

While many parts of the Scottish countryside are sparsely inhabited today, this pattern was established only within the last two centuries. Until the mid 19th century, and later in some areas, the vast majority of the population lived and worked close to the land. Thousands of abandoned buildings, overgrown walls, old field systems and enclosures litter the countryside and present eloquent reminders of this rural past. The wealth of archaeological material, especially that dating from the 18th and 19th centuries, is unparalleled in northern Europe and encapsulates a vital period of social change during the agricultural and industrial revolutions.

Despite the frequency of physical remains and documentary evidence for rural occupation during the later historic period, little is known about these settlements or the lives of the people that occupied them. Until recently, they have been considered of limited archaeological significance and have rarely formed the focus of serious academic study. The vast majority of sites are unprotected, and this marvellous material resource is deteriorating through neglect, the impact of construction work and the changing demands of modern land-use. There is now growing concern over the urgent need to locate, identify and document abandoned rural settlements across the country if we are to better understand this important part of Scotland's past, make it available for further study and help preserve it for the future.

The Forth Valley in later history

These concerns are no less true for the Forth Valley, which was extensively settled and farmed into the later historical period. The First Statistical Accounts record, for example, populations of 1865 for Port of Menteith parish in 1755 and of 1777 for Kippen parish in 1793. While a small proportion of the population was occupied as merchants, craftsmen or physicians, most people were farmers or farm labourers, working rented land to nurture a relatively meagre crop of oats, barley, potatoes and beans. Although industrialisation, especially in the weaving industry, had an early grip on this region (Shaw 1984), the farming way of life was slow to change. In the late 18th and early 19th century, improvements to the system of agriculture, such as more effective crop rotations, tree planting and the enclosing of fields, enabled many farmers to prosper (Devine, 1994). These developments, combined with the draining of the carse (Cadell, 1913) to reclaim rich soils for crops from beneath the mosses, raised the standard of living for some land-owners and farmers, at least temporarily. However, despite the relative affluence and longevity of farming in this area, very few of the farmsteads, townships or related structures such as kilns, grain mills and enclosures have been researched or documented in any

detail, if at all. Again as an example, for the parish of Kippen there are no records of townships, and only six farmsteads and two mills documented in the national database of ancient and historic monuments, the National Monuments Record (NMR) curated by the Royal Commission on the Ancient and Historic Monuments of Scotland (RCAHMS). This seems unlikely to be a true representation of the density or distribution of settlement documented in the First Statistical Accounts (RCAHMS/Historic Scotland 2000).

Furthermore, the records in the RCAHMS database are brief in the extreme and provide only a cursory view of the evidence for and patterns of historic rural settlement. All the records in the NMR of farmsteads in Kippen were created in the years between 1995 and 2001 during recording by the RCAHMS for the First Edition Survey Project (FESP) (2002). The FESP project was developed to address the dearth of evidence on the ground for medieval and later rural settlements in Scotland. Information on all structures (for instance, farm buildings) depicted on the First Edition six-inch Ordnance Survey maps of Scotland as being unroofed, and features associated with these unroofed structures, was added to the RCAHMS database. As the First Edition Ordnance Survey maps were created between 1843 and 1878, they provide a crucial snapshot of a dramatically changing landscape and way of life. Over 25,000 townships and farmsteads with abandoned buildings were recorded across Scotland by FESP, representing over a fifth of all known archaeological sites in Scotland. Although their locations and cursory information drawn from the First Edition maps have been added to the RCAHMS database, very few such sites have actually been visited to check if the locations and brief records are accurate, and only a handful have been archaeologically surveyed in any detail. Many more rural settlements remain undocumented, either because they were abandoned after the creation of the First Edition Ordnance Survey maps, or because they were already in an advanced state of ruin when the area was mapped during the 19th century, and were not thought worthy of record.

A typical entry (this one for Arngibbon farmstead in Kippen, NMRS number NS69SW 29) reads:

> *Arngibbon*
> A farmstead, comprising one unroofed L-shaped building and one structure is depicted on the First Edition of the OS six-inch map (Perthshire 1866, sheet cxxxvi & cxxxvii), but it is not shown on the current edition of the OS 1:10000 map (1979).

Entries such as these add valuable data to the distribution map of rural settlement (Figure 1), but tell us little about the history of the farmstead or the varied fortunes of its inhabitants. Because many farms in the Forth Valley appear to have been relatively prosperous as a result of the 18th and 19th century improvements, it is perhaps likely that few buildings were unroofed or abandoned at the time of the First Edition mapping programme (Figure 2), and so were not identified and added to the RCAHMS database during the FESP project, thus lacking even cursory entries. Consequently, we lack even very brief records for many of the rural settlements in this region.

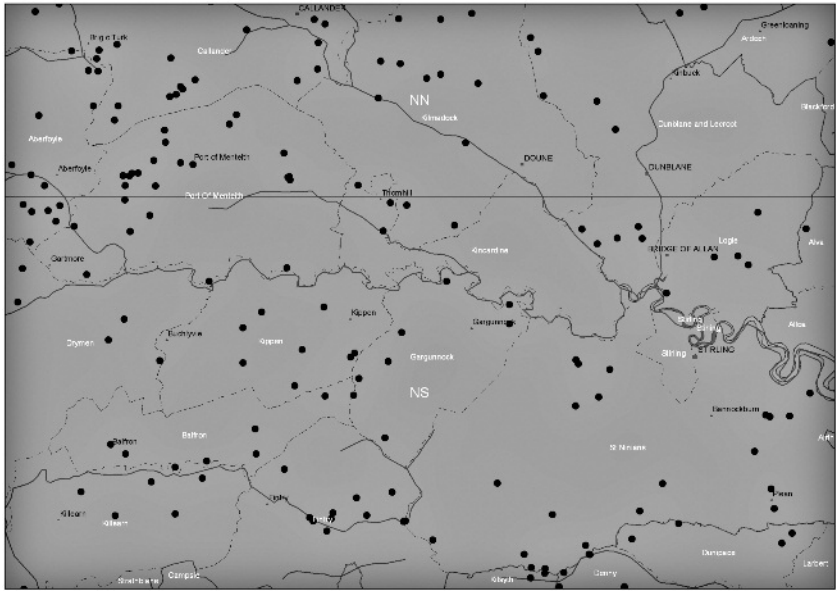

Figure 1. Map of part of the Forth Valley, including Kippen and Port of Menteith parishes, showing the distribution of FESP sites i.e. settlements that were recorded as being partially or wholly abandoned on the First Edition six-inch Ordnance Survey maps of Scotland dating between 1843 and 1878. (RCAHMS ArcGIS plot of FESP sites)

Scotland's Rural Past project

Building on the results of the FESP project and following the initiative of the Historic Rural Settlement Group, a research organisation comprised of academics and heritage agency representatives, a partnership between RCAHMS, the Heritage Lottery Fund, Historic Scotland, the National Trust for Scotland, and Highlands and Islands Enterprise launched the Scotland's Rural Past project (SRP) in October 2006 to address this gap in our knowledge.

Based at RCAHMS in Edinburgh, a team of four staff has been recruited to run the SRP project until September 2011. The aims of the SRP project are chiefly to work with local people of all ages to investigate, record and raise awareness of medieval and later rural settlements across Scotland and so improve our current knowledge of rural history and elevate the conservation value of the archaeological remains.

Through a programme of training and support, the team enables groups and individuals to develop their own projects which focus on investigating and recording local sites of interest to them, and researching the history of the area and the lives of past rural communities. The majority of projects are fieldwork based, but volunteers are also encouraged to explore historical

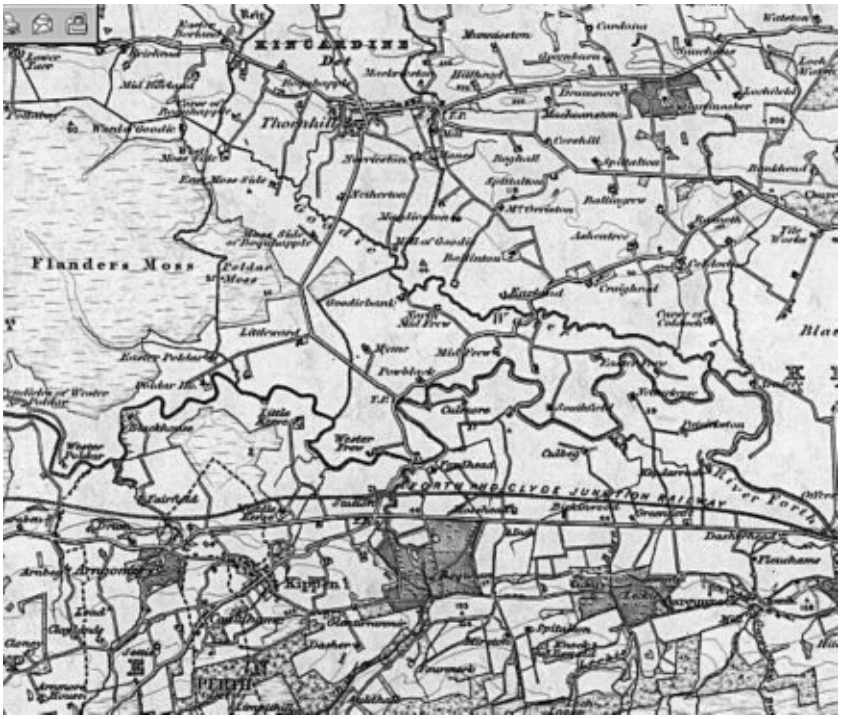

Figure 2. The First Edition six-inch Ordnance Survey map for the Forth Valley (1860-1863) depicts a more densely populated, ordered and improved landscape around Kippen, with scattered settlements interconnected by a complex of roads and the Forth and Clyde Junction railway. (National Library of Scotland)

documentary evidence, and to raise awareness of their findings more widely through publication and interpretation initiatives. In tandem with adult members of the community, the SRP team also runs an education programme with schools and Young Archaeologists Clubs across Scotland. The SRP project aims to develop and complete at least 40 projects with local communities and 15 projects with young people by September 2011.

Sharing ideas and forging partnerships

The SRP team has enjoyed a very busy time since the project was launched in October 2006. The popularity of the project with local communities across Scotland has far exceeded expectations, and is still gathering momentum in 2008 as it becomes more widely publicised. It provides an exciting opportunity for people to develop their interests with the benefit of expert support and advice, and a context for sharing their ideas and results with other like-minded people. As the number of projects grows, new links between groups and

communities are being forged, and valuable new partnerships are taking shape. This can be true for local communities in the Forth valley.

The end of the first year of SRP was celebrated in October 2007 with the launch of the project website www.scotlandsruralpast.org.uk. The website has been designed to be a valuable resource for anyone wanting to find out how to get involved with the SRP project, and contains extensive practical advice and guidance on how to set up a project, carry out historic research and undertake archaeological survey of rural settlement remains. The website enables all volunteers who are participating in SRP projects to publicise and discuss their findings online. A specially designed electronic form, accessed through the website, allows trained volunteers to submit their digital records, photographs, site sketches and detailed plans directly to the RCAHMS database after validation by the SRP team. These records in turn become publicly accessible through *Canmore*, the RCAHMS web-based database.

Sharing skills and expertise

Fieldwork to survey and record rural settlement remains lies at the heart of SRP. To encourage all communities and individuals to develop fieldwork programmes, the SRP project provides training for all volunteers. The SRP team is able to draw on the immense depth of expertise within RCHAMS in order to build skills and confidence with local groups (e.g. Figure 3). The demand for training has been overwhelming since the project started. The original target of completing 19 training courses during the five years of the project has been exceeded within the first two years. At the time of writing this article, the team have completed 25 two-day courses, and one week-long course on Arran in partnership with the National Trust for Scotland. In total, over 400 volunteers have so far received training.

The majority of SRP training courses are fieldwork based, covering a range of survey and recording techniques from identifying and interpreting rural settlement remains, to creating detailed site plans and records. In most cases, the training provides exactly the right catalyst for groups and individuals with an existing interest to develop their own fieldwork projects. Following volunteer demand, the SRP team has also developed a new two-day course focusing entirely on research into historical documents. This course helps volunteers to learn where to access archives, old maps and aerial photographs, and how to use them effectively to interpret the fluctuating history of rural settlements. This course is now being run twice a year and has had a very enthusiastic response. At present, it is run from RCAHMS in Edinburgh, but the intention is to work with local libraries and archives in other regions.

Breaking new ground

At the time of writing in September 2008, 40 separate local projects have been initiated, of which seven have been completed. Further projects are due to start by the spring of 2009. Volunteer projects are spread across Scotland and vary in size and ambition. At one end of the spectrum, dedicated amateurs

Figure 3. A group of volunteers explore a crofting township overlying a pre-improvement settlement at Naast in Wester Ross with experts from RCAHMS as part of a typical SRP two-day training course (copyright RCAHMS).

with considerable archaeological experience from the North of Scotland Archaeology Society (NOSAS) are making a detailed record of all the rural settlement remains along the length of Strathconon. When completed, this project will have researched and made detailed records of over 60 previously undocumented archaeological sites and will have rewritten the history of an entire glen. At the other end of the spectrum there are a number of smaller groups with more limited archaeological experience, but with boundless enthusiasm and aptitude. Many of these groups have taken on more modest projects, at least initially, such as researching and recording the histories of single farmsteads and townships. To develop a better understanding of and regard for land-use and settlement history over time, volunteers are encouraged to be aware of all aspects and traces of rural life. This can result in unexpected and exciting spin-offs from rural settlement – one SRP group on Mull recently identified the remains of an early Christian chapel near Tobermory, entirely unknown until their work. Staff from RCAHMS are working with the group in October 2008 to make a detailed record of the site, which will also feature in a forthcoming BBC Radio Scotland broadcast.

SRP has had particular interest from groups in and around the Cairngorms National Park. Here, projects have been set up investigating settlements in Glen Clova, Strathavon, Glen Clunie and Glen Feardar. Another is under development with the Balmoral Estate ranger service to record and interpret a township at Spittal of Glenmuick and shielings in the surrounding hills.

Several projects are also underway in Argyll and Bute and in the Highlands, and a number of projects have recently begun in the Lowlands, especially in Dumfries and Galloway. This year interest in SRP is spreading even further and projects are already established on Skye and in the Western Isles, while in 2009 the SRP team hopes to work with volunteers on Shetland and Orkney in partnership with local organisations.

Given the historical and archaeological potential of the Forth Valley, there are many valuable opportunities here for detailed study. Two projects only are currently running in the whole of Perthshire and Stirlingshire, and there is ample scope for a further project, or projects, aimed at improving our understanding of rural settlement in this area. Archaeological fieldwork and research by local historian John Harrison and the RCAHMS (2001) in Menstrie Glen in the Ochils, and by the RCAHMS in the Braes of Doune (1994) both demonstrate what can be achieved through such an approach. Surveys of these areas identified a considerable number of prehistoric to post-Medieval structures for which no previous record existed: the identification of the rare remains of possible medieval homesteads in the Braes of Doune was a particularly exciting result of this work. The surveys also provided the opportunity to study the history and morphology of the pre- and post-Improvement steadings and shieling sites, of which little was known previously. Such studies change our perceptions and drive research forward; SRP provides the means for wider contributions to this process.

Raising awareness

The Scotland's Rural Past project is not just about building an accurate and well-researched record of rural settlement. Inspiring more people to take an interest in local history is key to improving understanding and appreciation in both the short-term and the long-term. A number of SRP volunteer groups are encouraging other members of their communities to learn more about their rural heritage through local events based on their projects, including guided walks, 'hands-on' days, talks and exhibitions. For example, the Heights Heritage – a community-led project on the Heights of Keppoch between Dingwall and Strathpeffer – held an event in September 2007 during which over 60 adults and children worked together to create a drawn record of a deserted croft settlement which had been researched in detail by members of the group. The results of their work were put on display in the village hall alongside photographs and anecdotal records of what life had been like on the Heights in the past. This successful idea has now been adopted by other SRP groups. Elsewhere, some groups, such as the newly formed Strachur Local History Society, have even started running their own training sessions for other members of the community, based on the skills they acquired during the SRP training.

Looking forward

As the SRP project takes shape, the team is developing new ideas for training and expanding local skills. A partnership with woodland experts is

raising exciting opportunities for exploring the landscape legacy of historic woodland management, while partnership with the Forestry Commission aims to improve access to sites on the Forestry Estate as part of the Year of the Homecoming in 2009. In November 2008, the SRP team is holding its first annual conference at the Birnam Arts and Conference Centre in Dunkeld. This promises to be an exciting opportunity for volunteers and professionals from across the country to get together and share their results through talks, discussions and displays, and to talk more informally during the conference dinner and site visits.

As the SRP team becomes more involved with volunteer groups across the country, it is clear that the real aims of the SRP project are being achieved – a high standard of work being submitted to the RCAHMS database, often from people who have little or no previous experience; real enthusiasm and growing capacity in the community; new initiatives emerging to raise awareness more widely; and engagement of the younger generation. Further details about the Scotland's Rural Past project can be found on our website or by contacting the team at srp@rcahms.gov.uk. We would be delighted to hear from readers of the *Forth Naturalist & Historian*.

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