

**The Royal Society of Edinburgh
RSE @ Lochaber**

The Weathermen of Ben Nevis 1883–1904

Marjory Roy

Lochaber High School
Wednesday 27 February 2013

Report by Kate Kennedy

Meteorology expert, Marjory Roy, told the story of why the weather observatory was set up on Ben Nevis by the Scottish Meteorological Society, what it was like to work there and what the observations tell us about mountain weather.

Ben Nevis, the highest mountain in the British Isles, is located 50 kilometres from the west coast of Scotland in the Lochaber region. It overlooks the long sea-loch of Loch Linnhe and is surrounded by mountains. The mountain itself comprises cliffs to the north and steep slopes to the south into Glen Nevis; the summit plateau is extremely narrow. Today, the ruins of the Ben Nevis Observatory can be seen on the summit plateau, where the plaque inscription describes how hourly meteorological data was observed on the 'Ben' between 1883 and 1904.

The Ben Nevis Observatory was established at a time when meteorologists wanted to gain a better understanding of weather systems in order to improve forecasting. A good network of land observations existed throughout Europe, with data exchanged daily via telegraph; however, prior to the development of radio, it was virtually impossible to get real-time observations from ships at sea or from higher up in the atmosphere. In 1877, aged 73, David Milne Home, Chairman of the Council of the Scottish Meteorological Society (SMS), climbed the Ben and, confirming it would be possible, proposed the establishment of the Ben Nevis Observatory. Ben Nevis was considered particularly well suited to house a mountain-top observatory as it is situated in the track of Atlantic storms. The SMS tried to garner government support with little success, although the Meteorological Council offered £100 a year towards the Observatory's running costs. It was not until 1883, however, that the funds required to build the Observatory were finally secured.

Prior to the building of the Observatory, having heard about the SMS's plans for Ben Nevis, a gentleman named Clement Wragge offered to climb Ben Nevis daily during the summer of 1881 to record meteorological observations. His offer was accepted and he duly carried out his duties between June and October 1881. At this time there was no formal path to the Ben summit and his route took him, partly on horseback, north of Meall an t'Suidhe to the lochan then straight up Ben Nevis beside the Red Burn. He left home each morning just after 4.30 am and made timetabled observations at various locations as he climbed. He then spent two hours on the summit before returning at 3.30 pm. Meanwhile, his wife made simultaneous observations at near sea-level in Fort William. His equipment on the summit, including thermometers, was housed in a purpose-built 'cage', the remains of which can still be seen. He also had a stone hut to provide some protection and house his barometer. Wragge climbed the Ben in all weather conditions, leading to his inevitable nickname 'inclement rag', since he frequently returned soaked to the skin.

Wragge's observation books, stored in the Ben Nevis Observatory collection at the National Records of Scotland, show a flamboyant but very conscientious character. Wragge continued his observations in 1882, but this time he had two assistants named Whyte and Rankin, who also carried on the observations in the summer of 1883. Rankin's observations from June 1883, stating he was blown off his feet on the plateau in a force ten easterly wind, depict how severe the weather on the Ben can be, even in the summer months. Wragge and his assistants' experience over their three years on Ben Nevis showed that the weather at the summit could be more severe than the SMS had expected and that a more substantial building would be required for the Observatory. They also realised that automatic instruments would probably not work in such conditions and a manned observatory with a larger staff would be required. SMS launched a public appeal and £4000 was raised in a few months, allowing building work to commence. The Ben Nevis Observatory building was opened on 17 October 1883 by Mrs Cameron Campbell, proprietor of the Ben Nevis Estate, who made the ascent on a pony using the newly-constructed pony track which followed a route suggested by the local schoolmaster.

Alexander Buchan, the distinguished meteorologist, drew up the schedules of observation, instructed the observers and analysed the data. Wragge had expected to be appointed to the position of First Superintendent of the Observatory. However, twenty-one applications were received for the post and the Directors unanimously decided to appoint Robert Traill Omond, a far less flamboyant character, considered to be better suited to the cramped conditions in the Observatory. Following this, Wragge departed to Australia and continued an interesting meteorological career. Angus Rankin, one of Wragge's original assistants, did, however, continue to work at the Ben Nevis Observatory.

The building was completed in 1884 with the addition of a tower and the enlargement of the observatory room. The tower provided an alternative exit when snow blocked the main entrance; this had caused major problems during the first winter. The tower also housed the anemometer, wind vane and lightning conductor. The inside of the Observatory was quite cosy, except during the autumn storms and in early winter before the snow provided an insulating blanket. Meteorological records show the frequency of hill fog on the Ben (80% of the time in November, December and January); it was common for the summit to be capped in fog when surrounding summits remained clear. Additionally, sunshine totals were low despite an unobstructed horizon. Severe icing meant that the anemometer could not be used for much of the year. However, on these occasions wind force was measured by the assistants standing on the roof and making scientific estimations; calibrating themselves against each other and the anemometer when it was working. They found that when compared with anemometer readings, the actual speed for a given force is considerably higher on the Ben Nevis scale than the Beaufort scale.

Records from the early Ben Nevis data have been compared with more recent wind direction data from Cairngorm and show an unusual topographic effect. Ben Nevis has a low frequency of north-westerlies and a very high frequency of northerlies compared with Cairngorm. It is unlikely that the climate has changed dramatically over c. 100 years and as such it is considered that on Ben Nevis the north-westerly winds are being deflected round the flank of Carn Dearg into Coire Leis between Ben Nevis and Carn Mor Dearg and are appearing as very gusty northerlies at the summit. The original weathermen of Ben Nevis at the time did not appreciate that this was a local effect and thought that the rapid veering of the wind with height was a characteristic of depressions. The meteorological reports were sent daily by telegraph to the Scottish newspapers but the Met Office turned down the offer of daily telegrams on the grounds of costs; asking only to be sent telegrams on

occasions of special interest and indeed, a few years later asked for no more telegrams. They still received monthly copies of the observations by post, but there is no evidence that they ever studied these.

In addition to those made on Ben Nevis, the local schoolmaster originally made observations in Fort William five times a day. When the Edinburgh International Exhibition of 1886 presented SMS with surplus funds amounting to £1000, it was decided to use this money to build a low-level observatory in Fort William which would provide continuous records for comparison with those taken from the summit. The Meteorological Council provided the instruments and the low-level observatory was completed in the summer of 1890. Temperature comparisons from the two observatories showed that the average fall in temperature between Fort William and the Ben was 8.5°C, equivalent to a change of 6.4°C in 1000 metres. The mean annual temperature at the summit was -0.3°C and that at the low level observatory was 8.4°C. However, during inversions (rise of temperature with height), the Ben Nevis Observatory could be warmer than Fort William. Rainfall comparisons show an annual rainfall at the summit of just over four metres, approximately double that in Fort William. The Ben Nevis weathermen also experienced problems with the accurate measure of precipitation at the summit since much fell as snow.

In the early years, the observers spent ten months of the year at the summit, but following the construction of the low-level observatory, the duties were shared between the observatories, with staff changing locations every three months. Alexander Drysdale acted as a relief observer for extended periods at the summit and bequeathed his slides, photos and lecture notes to the Edinburgh Meteorological Office and these are now in National Records of Scotland archives. His notes give a vivid picture of life at the summit of Britain. The normal hourly observation routine took only five to ten minutes, but when there was a storm it could be very a different story; making observations during a winter storm could be very dangerous, especially with a southerly wind, as the Observatory was situated very close to the cliffs to the north of the Ben. On occasions when it was considered too dangerous to go out, the observers used thermometers exposed in a screen attached to the outside of the tower, which could be read from inside. The observers frequently had to dig out the Observatory doors and windows following blizzards. They also used a potentially treacherous 'gardyloo' system to dispose of their rubbish into a gully.

CTR Wilson, Scotland's only recipient of the Nobel Prize in Physics, acted as a relief observer on Ben Nevis for two weeks from 8 September to 22 September 1894 and in an article published in *Weather* magazine in 1954, he described his experience there and the effect it had on all his future scientific work. The log book during Wilson's time at the Observatory contains four pages of daily notes relating to weather conditions and describes an unusual period of exceptionally fine weather with very low rainfall, where anticyclonic conditions prevailed throughout the north. Wilson's interest in glories and corona was aroused during his short stay on the Ben. Glories are optical phenomena, resembling a halo or rainbow, seen around shadows when the observer is directly between the sun and a cloud of refracting water droplets. Following his visit to Ben Nevis, Wilson started laboratory experiments on clouds formed by the expansion of moist air. These eventually led to his invention of the Cloud Chamber, one of the most important instruments used in particle physics research.

Omond, the first Superintendent of the Ben Nevis Observatory, stopped working at the summit in 1895 due to health issues, but continued to supervise the work from Edinburgh. Rankin, first assistant from the beginning, was appointed Superintendent in November 1897. Another observer, named Mossman, worked as a volunteer on

the Ben for a long period from 1889 and showed great potential. He was taken under Alexander Buchan's wing and subsequently, around 1897, published a monumental work on the climate of Edinburgh. He was also appointed the meteorologist on the Scottish Antarctic expedition of 1902–04; during which his experience on Ben Nevis stood him in good stead when making meteorological observations in the polar region. The leader of the Antarctic expedition was another Scot, W S Bruce, who also had experience of meteorological observations at Ben Nevis in 1895 and 1896. During the expedition, the men were stationed in the South Orkney Islands and set up a meteorological station there, naming it 'Omond House'. This station was taken over by Argentine meteorologists and remains the longest-running meteorological record in the Antarctic area.

Despite the relatively low set-up cost and modest salaries, the Ben Nevis Observatory was continually faced with financial problems. The government funding remained at £350 per year for the two observatories; yet, the annual running costs were near to £1000. Income from other sources and donations kept things running for some time. However, in 1902 the Meteorological Council announced that the annual grant would cease to be paid. Questions were asked in Parliament and an enquiry set up; but when it reported back in 1904 it only recommended that the £350, should continue. As the observatories would not be able to continue on the original funding of £350 the Directors had to make the decision to close them in 1904. The Fort William low-level Observatory building was put up for sale and today is a guest house. The Ben Nevis Observatory building and the bridle path to the summit were made over to the proprietors of the ground. The data from the Observatories was prepared and published in full, along with extracts from the log books, in the *Transactions of the Royal Society of Edinburgh*. The Observatory employees continued their careers in meteorology in alternative locations, including the Argentine Meteorological Service. Today, the Ben Nevis Observatory lies in ruin and the current land owner, the John Muir Trust, has pledged to look after it and maintain the pony track.

Mountain observations continue to be in great demand in modern times. Now, rather than manned observatories, many areas, such as Aonach Mor, use automatic weather stations. There are continued issues with keeping these operating in severe environments.

A Vote of Thanks was offered by Professor Jan McDonald FRSE

Opinions expressed here do not necessarily represent the views of the RSE, nor of its Fellows

The Royal Society of Edinburgh, Scotland's National Academy, is Scottish Charity No. SC000470