History of Meteorology and Physical Oceanography Special Interest Group

Newsletter 3, 2010

Royal Meteorological Society

VIEW FROM THE CHAIR

Here's your 'starter for ten'.[1] Who wrote the following, and when? There are some clues to when, but who is a bit harder.

How little we have done to form a connected story of the study of weather as disclosed by the writings which have come down to us. Men in all ages have been face to face with the problem of the weather. How little do any of us know even of Clement Ley, of Abercromby, of FitzRoy, of Luke Howard, or of Dalton, of Piddington, or Reid, or Capper, or Loomis, or Ferrel, of Hadley, or Halley, or Hooke, or of the still earlier writers on the weather and the early observers before the invention of the barometer and the thermometer? What had the astrologers, who were prepared to forecast everything, to say about the weather? Behind all the fantastic explanations which have been discarded there must have been points of view depending upon experience, which may disclose themselves in the writings which survive. What meteorological knowledge had the discoverers of America? What sort of wind blew the Norsemen to Labrador? If I have any knowledge of the feelings of the Society, it would welcome occasional contributions on the history of the science, recent or remote, not less warmly than an account of personal observations. Mr Bentley has already told us about weather in war, and Mr Inwards has given us the meteorology of proverb and folklore. Will not someone tell us of meteorology in literature? Reculer pour mieux sauter *is as apposite to the progress of science as to any other persistent effort, if by it we may understand that an occasional survey of the past helps us to make sure of the future. Of the 800 of us there must be some who have more leisure and opportunity for retrospective study than the few exponents of meteorology in its modern form, upon whom the Society is accustomed to rely for its subjects of discussion. Some years ago, the Countess of Denbigh presented to the Meteorological Office four volumes of observations taken at Holywell, Flintshire, 1793 to 1835. I wonder how many libraries in country houses possess similar records, and how much information about the salient features of the weather of past years is buried in our parish registers and other local records?*

These words were written by Sir Napier Shaw and formed part of the Presidential Address he delivered before the Royal Meteorological Society on 15 January 1919. They can be found on page 109 of the April 1919 issue of the Society's *Quarterly Journal* (Vol.45, pp.95-111). Do any readers of this newsletter disagree with Shaw's words? I think they should inspire us all to redouble our efforts to swell the membership of our History Group. They also focus our attention on the continuing endeavours of Group member Rob Allan of the Met Office Hadley Centre to obtain historical weather observations for the International Atmospheric Circulation Reconstructions over the Earth (ACRE) initiative which he directs.
See: http://www.met-acre.org/.

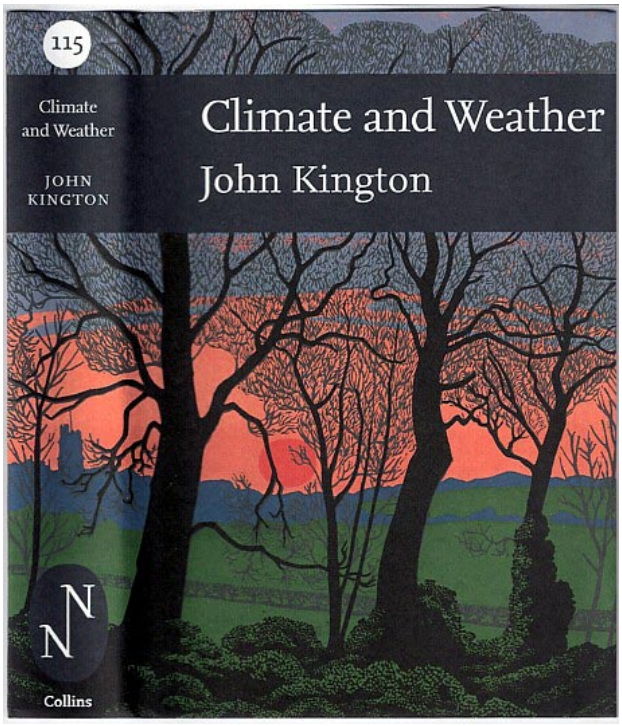
Malcolm Walker
History Group Chairman

[1] 'Starter for ten' is a catchphrase from the British TV quiz show *University Challenge*, ten being the number of points awarded for an opening question.

CONTENTS

HOT OFF THE PRESS

History Group member John Kington has recently (September 2010) published another book, this one called *Climate and Weather*. It is No.115 in the Collins *New Naturalist Library* series and available in
hardback (ISBN 978-0-00-718501-6) and paperback (ISBN 978-0-00-718502-3).
It has 484 pages and costs
£50 for the hardback edition,
£30 for the paperback.



Here is a review of this new book by Howard Oliver:

Professor Gordon Manley's *Climate and the British Scene* was published almost 60 years ago as the 22nd volume in the *New Naturalist* series. The aim of this new publication, as stated by the author, was to present subsequent developments and discoveries made in the study of climate and weather of the British Isles making particular reference to his Climatic Research Unit work.

The reader gets two for the price of one within this almost 500 page book.

The first part is described as "The Principal Acts in the Climate Drama" with chapters on: the general climate and weather of the British Isles; the atmosphere and its circulation; the key processes controlling British weather; seasonal characteristics of the climate; sources of meteorological data; historical weather mapping; cloud study; phenology; climate trends, anomalies and extremes; climate change.

All sections are clear and well illustrated and cover the material in a way which will be ideal for members of our Group to use as a quick and useful reference book. The overall level and detail is certainly well above that of the Manley original. Most of the sections are necessarily relatively brief but cover salient points adequately to provide necessary basic information. Compared with the contents of the original, many of the chapters are either updated or additional topics, but there is now rather little detail on local climates. By far the longest chapter is that on anomalies and extremes, which provides a detailed general summary of the British climate from 12,000BC to the 1990s.

The second part of the book contains a very densely written 260 pages describing the climate history from the 1st century BC to 2000. It brings together information from very many sources into a unified complete whole in great detail. From 1100 onwards there is an increasingly detailed entry for every single year which will make an invaluable reference book for many climatological and historical research purposes. It is now possible to have a "one stop shop" to answer the question "what was the weather like then?".

A glossary of meteorological terms, bibliography and extensive index are also included which complete what is undoubtedly an important book that does excellent justice to the vast amount of research carried out over the years by the author.

At £30 for a paperback copy this still represents good value. I can recommend it to all History Group members as a very useful addition to your library which could usefully replace several of the books that are probably already overflowing your shelves!

NEW PEN PORTRAIT

How much do you know of the Presidents of the Royal Meteorological Society? Pen portraits of them – and Presidents of the two meteorological societies which preceded the present society – have been published in *Weather* since 1992.

The latest pen portrait appeared in *Weather* in September 2010 (Vol.65, pp.250-252), written by History Group member Michael Field.

Pen portraits of all the Presidents pre-1950 have now been published, apart from Thomas Sopwith – and Michael is working on that one.

REQUEST FOR INFORMATION

Can anyone help, please? If so, please contact Storm Dunlop, who writes as follows:

I am compiling a biographical memoir on Cicely M (Mary) Botley for the British Astronomical Association's History Section, the Royal Astronomical Society, and the Royal Meteorological Society's History Group. Miss Botley had encyclopædic interests, and apart from astronomical and meteorological topics (largely historical), where her facts were always correct and given with impeccable references, she submitted letters and other contributions to numerous journals on an extraordinary range of subjects, ranging from the behaviour of dogs to opera.

She was an inveterate correspondent of *The Times* until the outbreak of World War 2, but suddenly went silent. Nothing appeared during the war years and there were only a few letters to other publications. All women of her age (39) were expected to undertake either voluntary or 'directed' work during the war, so it may be assumed that the same applied to her.

Any information as to what she may have done during those years would be of the greatest interest, please.

I am also trying to trace photographs of Miss Botley. The only readily accessible ones are the passport photograph reproduced in Eather's book on the aurora, *Majestic Lights* (1), and the one that accompanied Patrick Moore's obituary (2). Despite enquiries, the exact source and current existence of the latter is unknown. Any photographs, group or individual, in any form (print, transparency or negative) would be of interest.

If anyone has any anecdotal or other material on Miss Botley, I should be pleased to hear from them. (storm.dunlop@btinternet.com)

1 ▲

2 ►

AN INTRODUCTION TO METSOC, SOME TIME AGO
by Richard Gregory

Having experienced the best – and the worst – of Western European weather from ground level to well over 30,000 feet for about 10 years as a pilot in the Royal Air Force, the appearance of a notice in Air Ministry Orders concerning an extra-mural course on meteorology at Birmingham University seemed to offer an intriguing opportunity much too good to miss to find out rather more than one already knew, which was precious little, really, about weather.

The fact that Wally Wallington and David Pedgley were to be jointly responsible for holding up the lamp of illumination represented a double bonus, since both had the gift of enthusiasm, coupled with clear, precise elucidation of the matter in hand. Wally had already written his *Meteorology for Glider Pilots*, introducing me to the notion that a synoptic chart was more a snapshot of something alive than a post-mortem of an inert body! Luckily, I had already done my own share of gliding, as a sport closely associated with my service flying.

The basic gliders which I had flown up till that time had been comparatively slow, with thick, high-lift wings which were ideal for joining soaring birds in thermal up currents. At that time, open cockpits with rudimentary wind shields were the norm, and this fact very soon sharply reminded me that the air usually cools as it rises. It was a very warm day on the airfield at Gutersloh in western Germany. We were in shirt sleeves, when my turn came round to fly the Grunau Baby. I happily seated myself, strapped in, waggled the controls, and announced myself as ready for launching. The launch was made in much the same way that a small boy launches a kite (by running into wind with the string), the launching wire attached to the glider being rapidly wound on to a drum. On this occasion, I soon met a brisk thermal, rapidly turning and climbing. At 2,500 feet I was immediately below cloud base, with the warming sunlight cut off, but continued turning and climbing until I was almost in the fuzzy stuff. At this point I realised that I was remarkably cold, put out the air brakes to descend rapidly and land. I shivered for 10 minutes afterwards.

On the course itself, on another beautifully sunny day with well-developed cumulus outside, Wally decided to take the group outside the classroom, in order to teach us about the development of a cluster of cumulus which he had observed while speaking. For the next half-

hour I listened attentively as he pointed out the rapidly rising cap on one particular cell on the nearside of the cloud family. This was going up so quickly that it produced a bow wave, a pileus, I believe, which continually formed above this particular part of the cauliflower to gently fall down its sides before warming and evaporating. The base of the cloud cluster was likened to the bottom of a pan full of boiling water – not all rising simultaneously in bubbles, but with the possibility of air descending between the rising columns.

We were also able to *see* how, with the wind increasing with height, a cloud column leant down wind, and *imagine* how, if a column rose high enough, the minute water droplets could collide, coalesce and become heavy enough to fall as rain. This close association of clustering of columns – some producing rain with entrained, descending, air next to others of still gently rising air – could give an extremely bumpy ride to a small fast jet in transit just below cloud base!

We had a most interesting talk from David Limbert, just back from Antarctica and the International Geophysical Year. He presented a series of five slides, the first of a large expanse of near white, the bottom half slightly grey in relation to the upper half. On the next slide, we were invited to view a small black dot, in the middle of the grey and white which, in the next three slides, slowly grew a winding black tail. On the last slide, this proved to be the annual penguin journey to the sea in solemn, snake-like slow shuffling single file. Droll, indeed.

A field day took us out to the hills where, after de-bussing, we were led to a slope overlooking a valley, marked by another slope rising from left to right and ending in an abrupt scarp. Here a couple of smoke discharges were placed about 15 feet below the lip of the scarp and then fired. The two rapidly broadening columns of smoke rose steadily until they met the wind clearing the ridge, at which point they proceeded to give a perfect example of curl-over, precisely resembling the action of a large wave breaking on a gently shelving beach. It was all quite dramatic and a perfect demonstration of the airflow at this well chosen site.

A couple of days before the end of the course, Wally and David Hemming – observing my keen interest in the subject – proposed that I joined the Society. When I uncharacteristically hesitated, Wally produced an application form for Fellowship which he and David signed as proposer and seconder, and the deed was done. The celebratory beer was much enjoyed, with myself feeling distinctly honoured – tho' of course I bought the beer, as was only right and proper.

THE BRITISH ANTARCTIC EXPEDITION 1910-1913 – THE METEOROLOGICAL VIEW – PART II by Alan Heasman

As outlined in Part I (Newsletter 2, 2010), George Simpson, the leading meteorologist of the British Antarctic Expedition sailed from Cardiff in the steam yacht *Terra Nova* on 15 June 1910 together with the majority of the scientific team and supporting staff. Captain Scott sailed later (and more comfortably!) to join *Terra Nova* in Cape Town. By 20 June, Simpson and 'Silas' Wright, another physicist, had begun their innovative atmospheric observations. Routine weather observations were left to the Captain and crew. Simpson had a keen interest in atmospheric electricity. Wright concentrated more on magnetic observations but they helped each other. Conditions were far from ideal on an over-laden, leaking ex-whaler. Their 'laboratory' on deck measured just 6 feet by 6 feet. Therein they set up their equipment. This included two Zamboni Piles (quite powerful electrostatic batteries), two electroscopes and radio-activity measuring equipment. Contamination from rain and sea water was a hazard. Later in July, Simpson found that both electroscopes had been contaminated by polonium, a highly radio-active element, which they were carrying to use in the Antarctic. This required three days of meticulous cleaning to overcome. They had a brief stopover in Madeira in late June, crossed the Equator in late July and made a brief visit to South Trinidad. One of their activities was measuring the potential electrical gradient of the atmosphere. On two occasions they maintained readings at one MINUTE intervals for almost 24 hours! They later discovered that the polonium had again affected readings of the ionization of the air and they had to reject all the observations. In addition to this scientific work they had to take their turns at shovelling coal from the ship's bunkers and manning the pumps for hours to try and offset the significant leak which *Terra Nova* suffered until they reached New Zealand in late October! They had a one week break in Cape Town, where Captain Scott joined the ship. They sailed again on 2 September, expecting to make a fast , if stormy, eastward passage to Australia through the 'Roaring Forties' but the weather pattern was very unusual. They had long periods of light

winds and even easterly winds – unheard of by Simpson. [Author's Note: records indicate a significant La Niña episode 1910/11]. Behind schedule, they reached Melbourne on 12 October. There Scott was given the enigmatic telegram sent by Amundsen from Madeira: 'Am going south'.

Whilst in Australia, Simpson met the Commonwealth Meteorologist who donated additional meteorological equipment in exchange for first sight of the weather observations when the BAE returned from the Antarctic, an undertaking later fulfilled. *Terra Nova* sailed for New Zealand arriving on 28 October at Littleton Harbour, Christchurch. At last the ship's significant leak was repaired. Stores were sorted, including meteorological screens, a Dines Anemometer, bulky magnetic equipment and a pendulum for gravity observations. All the equipment was re-calibrated before departure. Everything was stowed along with their 'flat pack' hut, expedition equipment, fresh food, dogs, ponies and all the coal they could carry. The ship, with a total complement of 58, was very heavily laden (probably dangerously so) when it finally departed New Zealand via Dunedin on 29 November 1910 to set sail south for the Antarctic.

Editor's note: *Alan Heasman will be speaking at the meeting of the History Group to be held at Cambridge on Saturday 26 March 2011. For more information, see page 22.*

EXCELLENT NEWS

On page 7 of Newsletter 2, 2009, Howard Oliver reported that a London book dealer was advertising a diary written by the Unitarian minister William Johns between 1810 and 1815, together with his Manchester weather log for the period 1842 to 1845.

Howard has written to say that he has received excellent news from the book dealer who was selling the diary and weather log. They have been acquired by the John Rylands Library in Manchester and so will now be available to the public.

RIME OR REASON?

Alan Heasman found this on a restaurant menu in Spain: 'Fried hoar frost rime or to the plate' as a translation for 'Rosada frito o a la plancha', which is Rosado (a local fish) fried or grilled!!!

NEVER TOO YOUNG TO LEARN!

This eager young student inspecting his first weather book may be in for a shock. He needs to brush up on his spelling.

METEOROLOGICAL ABBREVIATION?

No, the sign writer hasn't misspelled this pointer to a road-side automatic station. It's a place in Shetland.

Both photographs courtesy of David Pedgley

METEOROLOGICAL TERMINOLOGY

Ernest Gold was not only a giant of 20th-century meteorology; he was also a great inventor of meteorological words.

He is credited with inventing the word 'baratic', for 'barometric pressure distribution over the Atlantic', and 'okta', for eighths of sky obscured by cloud'. Did he also invent 'uconal', which appears on page 163 of 'Weather forecasts', a paper he published in 1947 in the *Quarterly Journal of the Royal Meteorological Society* (Vol.73, pp.151-185)? In his words, "the charts of contour lines in the construction of which actual observations are used are called 'uconals', a word coined from 'upper contours' based on 'actuals'". He also says in the same paper that he coined 'brechotherm', for a line of equal wet-bulb temperature, and 'anemolapse', for 'vertical change of wind'.

SOURCES OF NORTH ATLANTIC DATA USED BY GERMAN METEOROLOGISTS, 1940-1945
by Brian Booth

In his interesting articles “Right for the wrong reason? A new look at the D-day forecast” and “More on the D-day forecast” in the History of Meteorology and Physical Oceanography Group Newsletters No.3 for 2009 and No.1 for 2010, Anders Persson raised a number of questions as to how German forecasters obtained the information on which they based their North Atlantic analyses, and suggested it might have come from deciphered Allied meteorological broadcasts.

The Allied ciphers used to encrypt weather messages were very robust and, apart from some very minor German successes during the early months of the war, were *never* broken. Thus, the Germans were never able to read enciphered weather reports transmitted by wireless telegraphy. In the final analysis, the German decryption experts considered any attempt to break the codes was a hopeless task (Benkendorff, 1946).

It was because of this that Germany had to rely on its own ingenuity to obtain meteorological data from the North Atlantic and beyond, and one approach was the use of observations made by the German meteorological reconnaissance squadrons (Wekustas) during daily sorties to the west of the UK for four years from the late summer of 1940 (Kington and Selinger, 2006). However, sea level observations from these were not normally made beyond 56°N 14°W (Benkendorff, 1946).

For much of the war, the main source of data that German meteorologists received for the North Atlantic was the supply of meteorological reports from U-boats. A small number of U-boats were ordered to sea as Wetterboote (weather boats) at various times from the late summer of 1940 (Wynn, 1997), usually reporting from between 20°W and 25°W. However, during the early years there was only ever one Wetterboot (weather boat) on patrol at any one time and the weather watch during any patrol was never continuous.

Initially, U-boat operations were concentrated in the Western Approaches to the UK but the sphere of U-boat operations gradually extended to cover the whole of the North Atlantic and the Norwegian and Baffin Seas (to say nothing of the South Atlantic and Indian Ocean). Despite the large number of U-boats deployed to cover such a vast area the number of weather reports normally ranged from just 2 or 3 to 10 to 12 a day. The reports were in a shortened code and not always of the highest quality (Benkendorff, 1946).

In fact, there appear to have been no arrangements for U-boats to make regular weather reports; instead, they were made either when so ordered by U-boat Command – often for the benefit of U-boat operations in a particular area – or at the discretion of a U-boat’s captain (Syrett, 1985). This is not surprising, for weather reports were very much subordinate to a U-boat’s *raison d’être*, the destruction of Allied shipping, and the transmission of a weather report could easily compromise a U-boat’s security or reveal its position and course.

The areas of U-boat activity varied greatly during the war, being so concentrated in particular areas at times according to operational necessity that sometimes there were no submarines elsewhere in vast areas of the North Atlantic. U-boat activity reached its peak during 1943, but as the Allies gained the upper hand in the Battle of the Atlantic so it slowly declined.

This largely random nature of reporting continued until January 1944, when the German command, recognising that knowledge of the weather greatly aided its long-term military considerations, established three weather reporting areas in mid-Atlantic between longitudes 25°W and 35°W, and latitudes 44°N and 61°N. Identified as the Northern, Central and Southern Areas by U-Boat Command, these were constantly patrolled by three Wetterboote during 1944, but during the final months of the war only one U-boat could be released for the task at any one time. The normal procedure was for each Wetterboot to gradually move south into the next area, the southernmost returning to its base whilst a new Wetterboot moved into the Northern Area. If, for some reason, a Wetterboot could not continue its patrol another U-boat was ordered to take over the weather reporting duties until it could be relieved. Weather reports were made twice daily around 00:00 GMT and 12:00 GMT, but the number of reports undoubtedly varied as U-boat Command often had to remind the submarines to make a greater effort to transmit reports – one such signal on 4 May 1944 read

“*Reports are of utmost importance for the entire conduct of the war – judgment as to air situation, invasion etc*.” (Syrett, 2002),[1]

Even for Wetterboote, weather reporting was still secondary to a U-boat's normal role, that of sinking Allied shipping, and as a result they were never granted freedom by the Allies to make observations, as is often supposed by virtue of the importance of the reports to Allied forecasters, but were hunted ruthlessly. U-342 was sunk in April 1944, almost certainly whilst preparing to make an observation, and U-765 was sunk by depth-charges on 6 May after having been detected transmitting weather reports the previous day. A third, U-853, was attacked by aircraft minutes after transmitting a weather report on 17 June 1944. With her captain killed and many casualties, U-853 had to abandon its patrol. U-955, homeward bound after completing a Wetterboot patrol, was sunk shortly after reaching Biscay on 7 June (Wynn, 1997 and 1998).

During the spring of 1944, U-boat Command started to withdraw U-boats to their French and Norwegian bases in anticipation of an invasion during the summer months. These formed two Groups waiting to sail against the invasion force. Consequently, by the beginning of June there were just nine U-boats in mid and east Atlantic, of which three were Wetterboote (Figure 1).[2]

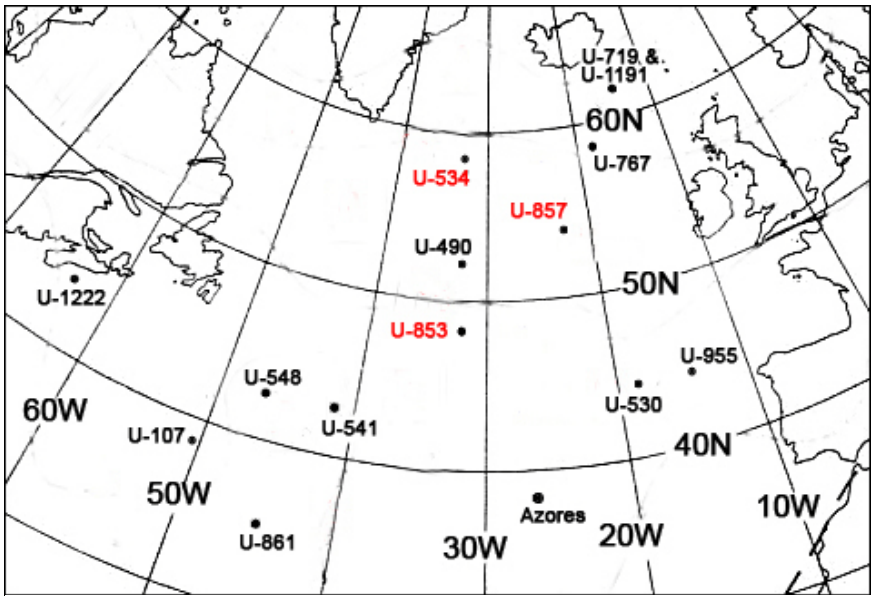


Figure 1. *Positions of U-boats on 3 June 1944; those in red were Wetterboote. U-955 had been relieved by U-853 about ten days previously and was returning to its base in France when it was sunk on 7 June.*

The only other data of a purely Germanic origin were reports of pressure and temperature from weather buoys which the U-boats began deploying in 1942. Although the operational life of the buoys is unclear, it is believed their batteries had an operational life of nine months (Benkendorff, 1946 and Kington and Selinger, 2006). Included in the U-boat programme was the erection of an automatic weather station (AWS) on the northern tip of Labrador. The station, known as Kurt, was delivered and commissioned by U-537, but it worked for only a short period before falling silent. Almost a year later, in September 1944, U-867 was tasked with setting up a second AWS, but was sunk before completing its task.[3]

For all that the Allies employed unbreakable ciphers; their meteorological arrangements had an Achilles heel that was exploited to the full by the Germans. The German listening and deciphering service maintained a listening watch for voice communications between Allied aircraft and Air Traffic Controls when either landing or *en route*. This applied to airfields around the rim of the North Atlantic – Greenland, Iceland and the Azores, as well as the UK (Benkendorff, 1946). These exchanges invariably included the airfield weather conditions, including pressure settings, and it was a reasonably easy procedure to convert them to QFF, or mean sea level pressure.

That these transmissions could be listened to over vast distances coupled with the ability of the Germans to receive transmissions from both U-boats off the eastern seaboard of America and the AWS in Labrador suggests it was conceivable that similar data was obtained from the American continent as for the North Atlantic airfields – a further aid to constructing Atlantic analyses, although Benkendorff makes no reference to this in his account.

One further possible source of North Atlantic data was available to German meteorologists. By May 1944, the Americans had established a network of ocean weather ships (OWS) in the western and mid North Atlantic (Reed, 1949). As well as their meteorological roles the OWS acted as Guard ships for aircraft flying between Canada and the United Kingdom, either direct or in stages via southern Greenland (Narsarssuak) and Iceland (either Reykjavik or Meeks Field) (Figure 2, on page 8). In the same way that the German listening and deciphering service could obtain details about airfield weather they could also intercept weather details passed to aircraft overflying the weather ships.

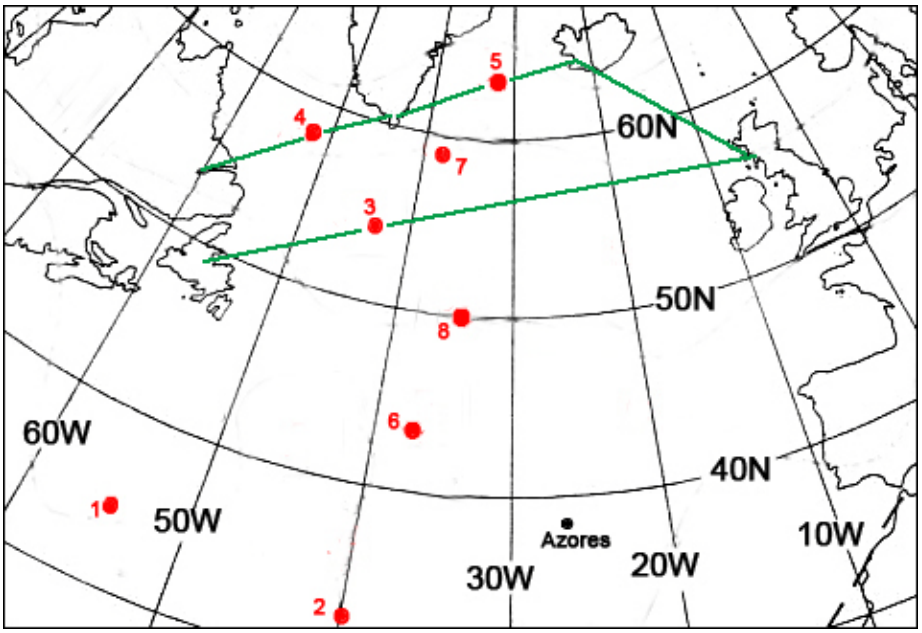


Figure 2. *Positions of the American OWS on 3 June 1944; the green line marks the main North Atlantic ferry routes. Numbers indicate the sequence with which the stations were occupied.*

There is little doubt but that the German forecasters were exceptionally skilled analysts, well able to make the optimum use of small amounts of information from a variety of sources, but they never had access to the Allies' synoptic observations

Epilogue

Of the fourteen U-boats in the North Atlantic on 3 June 1944 only three survived the war – U-540, U-541 and U-861. The others were sunk:

U-107	18.8.1944
U-490	12.6.1944
U-534	5.5.1945
U-548	19.4.1945
U-719	26.6.1944
U-767	18.6.1944
U-853	5.5.1945
U-857	7.4.1945
U-955	7.6.1944
U-1191	18.6.1944
U-1222	11.7.1944

U-534, one of the Wetterboote on D-day, was raised in 1993 and restored. She can be visited at the Woodside Ferry Terminal, Birkenhead.[4]

Notes

1. A reliable online source about the use of U-boats for weather reporting is at http://www.ibiblio.org/hyperwar/ETO/Ultra/SRH-008/SRH008-11.html and http://www.ibiblio.org/hyperwar/ETO/Ultra/SRH-BA-Appendix/Appendix-15.html
2. The location of U-boats was obtained using http://uboat.net/boats/patrols/
3. Details of the Kurt AWS can be found at http://uboat.net/ops/weather_stations.htm
4. Details of U-534 can be found at http://www.britannia-storage.co.uk/GSK/U-534.htm

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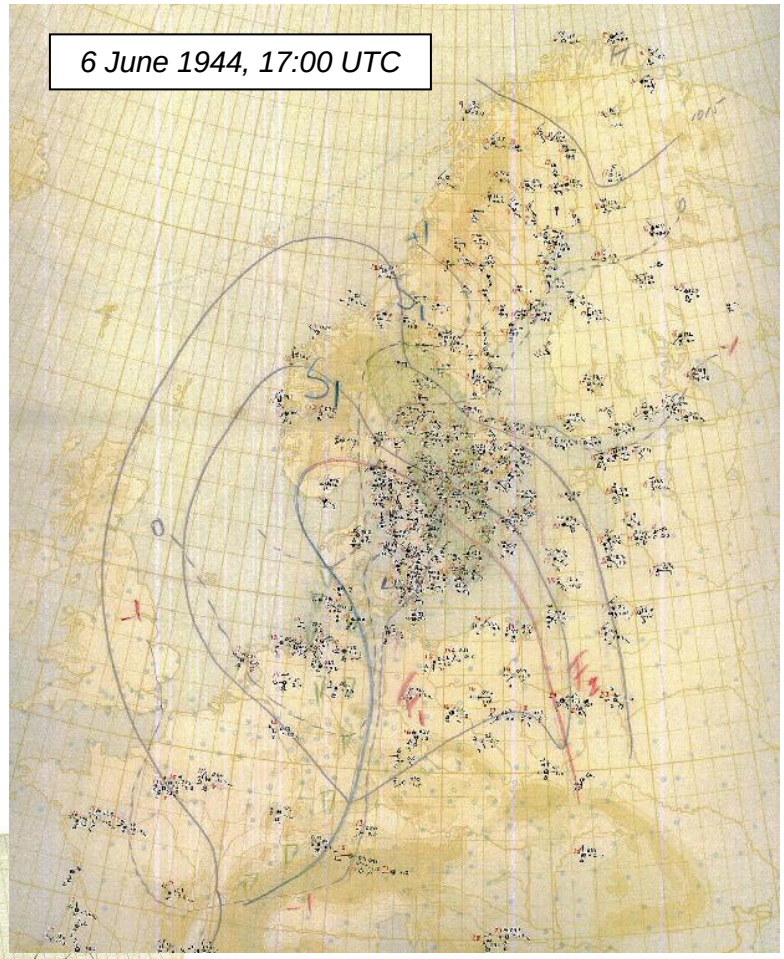
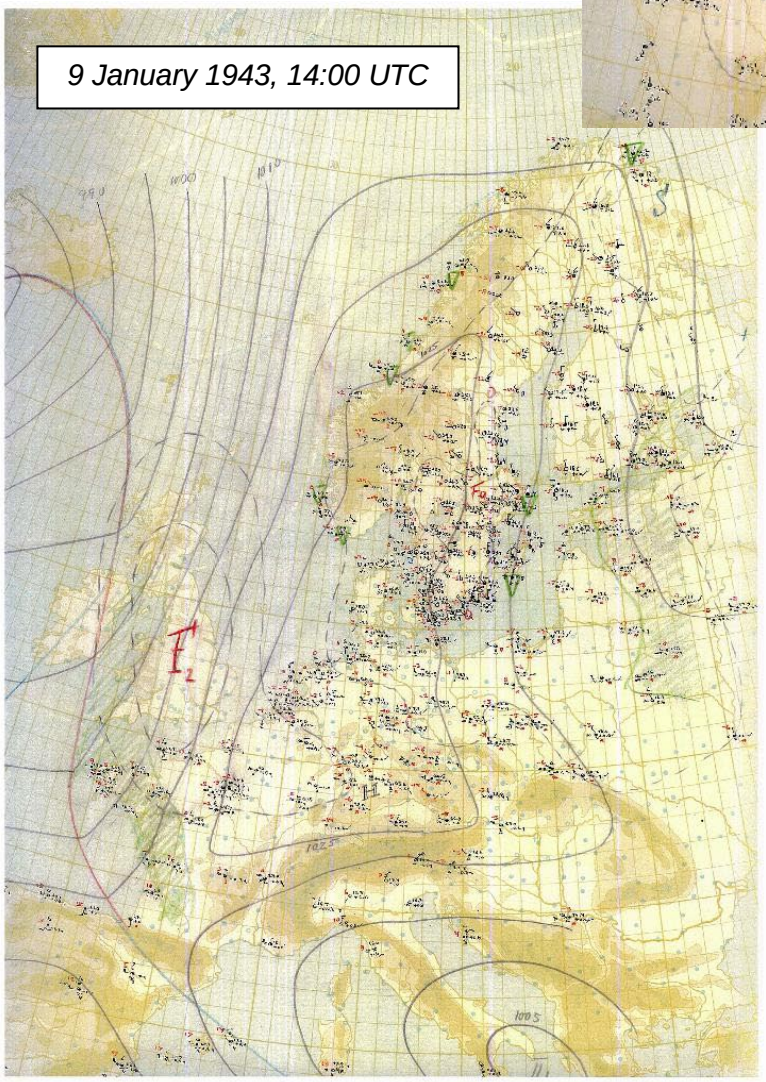
WORLD WAR II WEATHER MAPS by Anders Persson

On 21 September 2010, Anders wrote, with reference to weather maps from World War II in the archive of Sweden's Meteorological and Hydrological Institute (SMHI):

Two are attached here. From these, one can see that the Swedes also managed to decode German weather messages from occupied territories. One map is from 9 January 1943 at 14:00 UTC and the other one from D-day at 17:00 UTC. Secondly, from my investigation in the SMHI archives, I also found that the Swedes managed to decode Allied weather messages. There are observations plotted from the liberated areas of Italy, France and later Belgium. However, they do not seem to have managed to crack the British codes. British observations started to arrive only after 8 May 1945. Before that, they seem to have decoded Allied weather observations from those parts of Germany which were controlled by the Americans, but not from the north-western parts of Germany controlled by the British.



6 June 1944, 17:00 UTC



9 January 1943, 14:00 UTC

All this indicates that the American codes were easier to break than the British. This might explain the German analysis over the North Atlantic in 1944 all the way to Canada. The information this was based on did not come from decoded British data, but from American! Indeed, after the war, the Swedish mathematician who was the brain behind the decoding work was rapidly employed by the Americans!

WHY DOGGER?

Why is the Dogger sea area so named? According to Commander C.R.Burgess, on page 227 of the July 1949 issue of *Weather*, it's so called because a two-masted fishing vessel with bluff bow that was once much used in that part of the North Sea was known as a 'dogger', from *dogge* or *dogre*, an old Dutch word for fishing boat.

MEETING REPORT:
GRAVE OF GEORGE JAMES SYMONS
15 JULY 2010
by Julian Mayes

Over fifty Fellows of the Royal Meteorological Society (RMetS) and invited guests gathered at Kensal Green Cemetery in west London on 15 July 2010, most appropriately St. Swithin's Day, to witness the re-dedication of the beautifully restored grave of the Symons family. How fitting, that after many weeks of extremely dry weather in London, several of us actually had some welcome overnight rain to measure on the morning of 15 July. Despite brightening skies, it seemed only right to bring umbrellas to the ceremony. If Symons really was the genial character described in his obituary in *British Rainfall,* one hopes that he would have appreciated this turn in the weather.

The restoration was triggered by the inclusion of the grave in the BBC Four documentary '*Rain*', which was repeated just a fortnight before the ceremony. At the instigation of Stephen Burt and Philip Eden, supported by the RMetS's Council, it was decided to renovate the grave. This was boosted by the support of two participants in the programme who attended the re-dedication: Mr Mark Weir, owner of the Honister slate mine in Cumbria, who very generously provided two splendid slate plaques to mark the restored grave; and Brian Cathcart, Professor of Journalism at Kingston University, author of the book '*Rain'* (Granta, 2002). In addition to Philip and Stephen, the Order of Service also acknowledged the contribution of Society President Professor Julia Slingo, Malcolm and Diane Walker, and the Friends of Kensal Green Cemetery.

The ceremony began with a welcome from Professor Tim Palmer FRS, President-Elect of the RMetS, who spoke of the status of George Symons as a pioneering scientist. The slate plaques were then unveiled by Tim Palmer and Stephen Burt. Stephen then spoke of Symons' place in meteorological history. It is, of course, the 150th anniversary of the founding of the British Rainfall Organization this year, an event already commemorated by an RMetS Saturday meeting (see *Weather*, May 2010 and the meeting report published in September's issue).

The brief service of re-dedication was led by the Reverend Canon Paul Williams of Tewkesbury Abbey, including a most appropriate reading and prayers. Wreaths were then laid on the grave of Symons and the adjoining family grave of his parents, wife and daughter.

At the close of the ceremony, Council members had the novel experience of holding a meeting in a Cemetery chapel, while others adjourned to a nearby public house to drink a toast to the memory of George Symons. It seemed an appropriate way to round off a very worthwhile event.

▲ *Tim Palmer (left) and Stephen Burt (right) unveiling the plaques.*

Photographs courtesy of Richard Griffith

WHICH OLD PAPERS HAVE BEEN CITED MOST IN METEOROLOGY
by Malcolm Walker

On page 1 of Newsletter 3, 2009, I focused upon an article by Werner Marx and Manuel Cardona published in the February 2004 issue of *Physics World.* In this, they had investigated which old papers had been cited most by scientists. I wondered which old papers had been cited most in meteorology and physical oceanography in recent times and suggested that this was a project for someone. Imagine my surprise when, on 23 August 2010, I received an email out of the blue from Werner Marx of the Max Planck Institute in Stuttgart. He had taken up my 'challenge' and sent me his findings. The following is taken from his analysis.

Case study by Werner Marx:

Until the present, old papers (i.e. papers published before 1900) are predominantly not covered as database records by the common literature databases and citation indexes. Such papers cannot be searched by selecting author names, title words or keywords because their bibliographic data are currently not available. However, old papers are sometimes cited until the present and appear as references within the citing papers published more recently. Therefore, the citation indexes give access to the old papers because the cited references are not restricted with respect to their age.

Methodology

The data presented here are based on the Science Citation Index (SCI) accessible via the SCI search database offered by the database provider STN International [ref:1]. This database combined with the STN search system enables sophisticated citation analyses. The SCI searched via STN International makes it possible to ask which old papers in the various fields of the natural sciences have been cited most since 1974.

The Web of Science (WoS) provided by Thomson Reuters [ref:2], the most common search platform of the Thomson Reuters citation indexes, stretches back to 1900. However, the WoS search functions have not been optimized for such a kind of bibliometric research. For example, the selection of large numbers of references out of the citing papers and their further analysis is not possible.

Time evolution of meteorology papers

In Figure 1, the time evolution of the number of papers published since 1974 in the SCI source journals (the altogether about 9,000 journals selected by the database producer as contributing significantly to the progress of science) and assigned to the SCI subject category "Meteorology & Atmospheric Sciences" is presented.

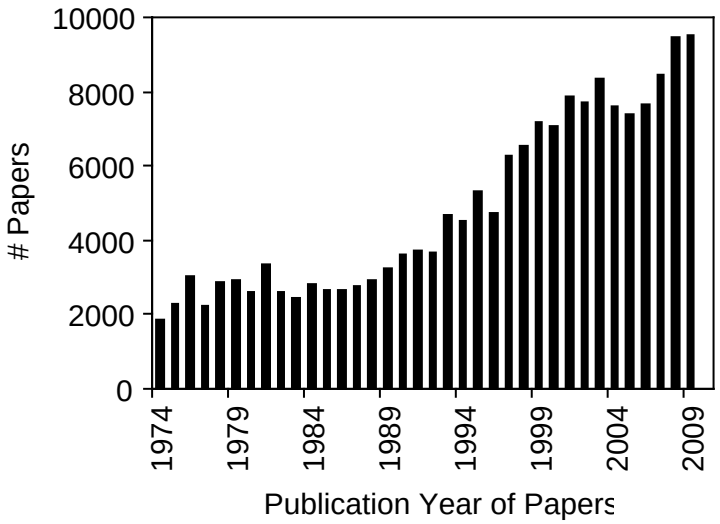


Figure 1: *Time evolution of the number of papers published in each year within the SCI source journals of the subject category "Meteorology & Atmospheric Sciences" since 1974. All SCI document types (articles, reviews, letters etc.) have been included (altogether 180,349 papers at the date of search: 22 August 2010).*

Cited references published prior to 1900

In a first approach, all references with reference publication years prior to 1900 (3,178 references) have been selected out of the references of the complete set of 180,349 papers published since 1974 in the SCI source journals of the subject category "Meteorology & Atmospheric Sciences". In Figure 2 (on page 12), the distribution of the number of the cited references across / throughout their publication years is presented.

The reference publication years stretch back to the year 1002. However, most of the references with reference publication years prior to 1500 turned out to be erroneous. Misspelled citations (e.g. incorrect with regard to the numerical data: volume, starting page, and publication year) are a general problem in citation analysis. The references of earlier articles, however, are particularly susceptible concerning 'mutations'.

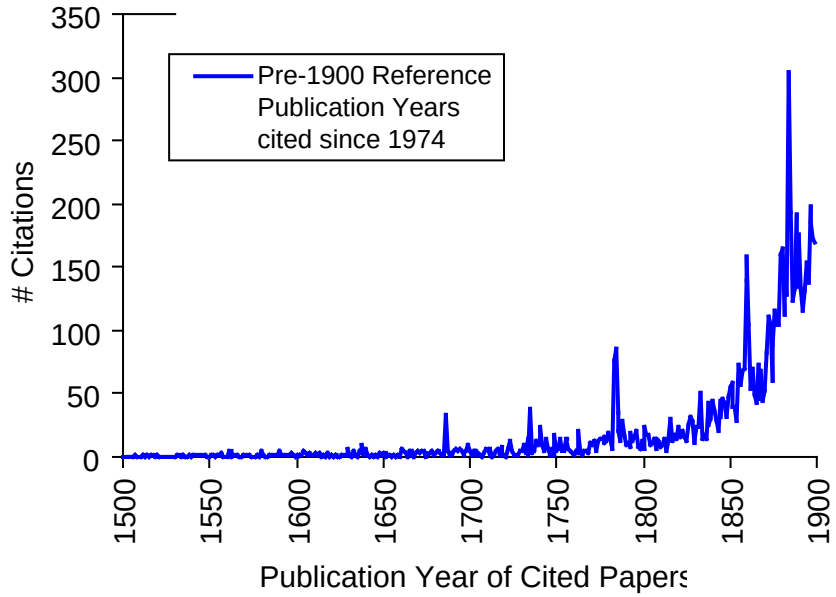


Figure 2: *Distribution of the cited references within the papers published in the SCI source journals of the subject category "Meteorology & Atmospheric Sciences" since 1974 across / throughout their publication years.*

Figure 2 shows some distinct peaks with respect to the number of old references. The earliest (correctly cited) old reference seems to be cited by: R.B.Stothers: 'Climatic and demographic consequences of the massive volcanic eruption of 1258'. *Climate Change* **45**: 361-374 (2000). This paper cited amongst others two old papers published 1260 and 1265, respectively:

al-Mak ın: 1260, *Chronicle*, translated into French by A.-M. Eddé and F. Micheau, Académie des Inscriptions et Belles-Lettres, Paris, 1994, pp. 114–119.

Albertus Miliolus: c. 1265, Liber de Temporibus et Aetatibus, in Societas Aperiendis Fontibus Rerum Germanicarum Medii Aevi (ed.): 1903, Monumenta Germaniae Historica, Scriptores 31, Hahn's, Hannover, p. 525.

The first peak in Figure 2 can be assigned to the reference publication year 1638. However, there are various references published in that year and not one specific reference. The subsequent distinct peaks can be assigned to the reference publication years 1686, 1723, 1733, 1735, 1783, 1784, 1859-1861, 1884, and 1896. Most of the cited references collected under these peaks result in each case from the citations to single papers, the papers given below:

E.Halley: 'An historical account of the trade winds, and monsoons, observable in the seas between and near the tropicks, with an attempt to assign the phisical cause of the said winds'. *Philosophical Transactions* **16**:153-168 (1686).

J.Jurin: 'Invitatio ad observations meteorologicas communi consilio instituendas a Jacobo Jurin M.D Soc. Reg. Secr et Colleg. Med: Lond: Socio'. *Philosophical Transactions* **379**: 422–427 (1723).

J.J.D.DeMairan: *Traité physique et historique de l'aurore boréale imprimerie royale* (1733).

G.Hadley: 'Concerning the cause of the general trade-winds'. *Philosophical Transactions* **39**: 58-62 (1735).

J.J.Hemmer, and C.König: 'Weather observations from Mannheim, Germany', in: *Emphemerides Societatis Meteorologicae Palatinae, Observationes Anni 1783*, edited by J. Hemmer and C.König, pp.1–77, Fr.Scwan, Mannheim, Germany (1783).

B.Franklin: 'Meteorological imaginations and conjectures'. *Manchester Literary and Philosophical Society Memoirs and Proceedings* **2**, 122 (1784).

H.F.Blanford: 'On the connection of the Himalayan snowfall and seasons of drought in India'. *Proceedings of the Royal Society of London* **37**: 3–22 (1884).

S.Arrhenius: 'On the influence of carbonic acid in the air upon the temperature of the ground'. *Philosophical Magazine* **41**: 237-276 (1896).

In contrast to the above-mentioned reference publication year peaks (mostly caused by the citations of single old papers), the peaks in the time period 1859-1861 (and also past 1900, see further below) result from the citations of a multitude of different papers, those with the highest number of citations given below:

R.C.Carrington: 'Description of a singular appearance seen in the sun on September 1, 1859'. *Monthly Notices of the Royal Astronomical Society* **20**: 13 (1860).

R.Hodgson: 'On a curious appearance seen in the sun'. *Monthly Notices of the Royal Astronomical Society*, **20**, p. 15 (1860).

B.Stewart: 'On the great magnetic disturbance which extended from August 28 to September 7,

1859, as recorded by photography at Kew Observatory'. *Philosophical Transactions* **151**: 423–430 (1861).

A series of nine papers published by E. Loomis pertaining to the geomagnetic storm of 1859 (title: The great auroral exhibition of August 28 to September 4, 1859) and published in the *American Journal of Science*, Volumes 28-34 (1859-1862).

At this point in his analysis:

Dr Marx tabulated citation counts of the top 100 most frequently cited old papers published prior to 1900 and cited since 1974 within the journals of the SCI subject category "Meteorology and Atmospheric Sciences". This showed that the paper cited most often was that by Arrhenius (275 citations). Second was that by Blanford (152 citations).

Dr Marx went on to consider references to papers published before 1950 (rather than 1900) and cited since 1974. This produced a very different result. The top three papers were found to be:

J.S.Marshall and W.M.Palmer: 'The distribution of raindrops with size'. *Journal of Meteorology* **5**(4): 165-166 (1948)
– with 1,456 citations.

E.T.Eady: 'Long waves and cyclone waves'. *Tellus* **1**(3): 33-52 (1949)
– 1,032 citations.

J.G.Charney: 'The dynamics of long waves in a baroclinic westerly current'. *Journal of Meteorology* **4**(5): 135-162 (1947)
– 722 citations.

So what about Hooke and Boyle?

Dr Marx addressed this question. In his words:

The works of the early pioneers in meteorology are typical examples of 'obliteration by incorporation', a phenomenon first described in 1949 by the sociologist Robert K.Merton [refs:3,4]. The process of obliteration or palimpsest (the latter expression referring to a piece of parchment used more than once, that is, being erased to make room for newer work) affects seminal works (i.e., truly ground-breaking research) offering novel ideas that are rapidly absorbed into the body of scientific knowledge. Such work is soon integrated into textbooks and becomes increasingly familiar within the scientific community. As a result of this absorption and canonization, the original sources (mainly articles or books) fail to be cited, either as full references (formal citations) or even as names or subject-specific terms (informal citations). Therefore, it is not surprising that the fundamental works of Boyle and Hooke for example are barely cited.

The ideas survive, sometimes becoming substantial elements of the basis and groundwork of modern science. But building over the groundwork implies obliteration of the sources. For example, the articles by Albert Einstein on the Theory of Relativity (published 1905 and 1916, respectively) are rarely cited in current research work (as compared to less fundamental articles), although they are the basis of modern cosmology and mainly caused Einstein's popularity. It may even happen that a transmitter, being familiar with the origin of a concept and assuming the same of his readers, brings the idea back to life without citing the source, with the eventual result of becoming identified with its originator.

Eugene Garfield, the inventor of the citation indexes and the founder of ISI (Institute for Scientific Information, Philadelphia), concisely stated in one of his essays [ref:5]: "Obliteration—perhaps even more than an astronomical citation rate – is one of the highest compliments the community of scientists can pay to the author…. It would mean that his contribution was so basic, so vital, and so well-known that scientists everywhere simply take it for granted. He would have been obliterated into immortality." Bearing this in mind, we should not expect that formal or even informal citations of seminal works of can be taken as a real measure of the influence of their ideas in modern science. There is no metrics for quantifying fundamentality, significance or even elegance, which are terms falling under a completely different category.

References

[1] http://www.stn-international.de/stndatabases/databases/

[2] http://scientific.thomsonreuters.com/products/wos/

[3] R.K.Merton: *Social Theory and Social Structure*. The Free Press, New York (1968). First edition 1949.

[4] R.K.Merton: *On the Shoulders of Giants: A Shandean Postscript.* The Free Press, New York (1965).

[5] E.Garfield: 'The obliteration phenomenon in science – and the advantage of being obliterated'. *Essays of an Information Scientist* **2**, 396–398 (1975).
http://www.thomsonreuters.com/business_units/scientific/free/essays/

RECENT PUBLICATIONS

This list of books and articles concerned with the history of meteorology and physical oceanography has been compiled by Malcolm Walker and Anita McConnell.

ATLAS,D., HOLLAND, G. and LEMONE, P., 2010. Obituary of Joanne Simpson, 1923-2010, *Bulletin of the American Meteorological Society*, Vol.91, pp.938-939. Joanne was a pioneer in the use of aircraft, computer modelling and weather modification, with particular reference to tropical meteorology in general and hurricanes in particular. She is believed to have been the first woman to obtain a PhD in meteorology.

BOOTH, B., 2010. 'The first Royal Air Force Meteorological Flight (1918/1919): Part 1. *Weather*, Vol.65, pp.259-262.

CHIHYUNG JEON, 2010. 'Flying weathermen and robot observers: instruments, inscriptions and identities in US upper-air observations, 1920-40'. *History and technology*, **26**(2), pp.119-145.

DUPIGNY-GIROUX, L-A. and MOCK, J. (Editors), 2009. *Historical climate variability and impacts in North America*. Springer, 278 pages. The blurb says this:

Climatologists with an eye on the past have any number of sources for their work, from personal diaries to weather station reports. Piecing together the trajectory of a weather event can thus be a painstaking process taking years and involving real detective work. Missing pieces of a climate puzzle can come from very far afield, often in unlikely places. In this book, a series of case studies examine specific regions across North America, using instrumental and documentary data from the 17th to the 19th centuries. Extreme weather events such as the Sitka hurricane of 1880 are recounted in detail, while the chapters also cover more widespread phenomena such as the collapse of the Low Country rice culture. The book also looks at the role of weather station histories in complementing the instrumental record, and sets out the methods that involve early instrumental and documentary climate data. Finally, the book's focus on North America reflects the fact that the historical climate community there has only grown relatively recently. Up to now, most such studies have focused on Europe and Asia. The four sections begin with regional case studies, and move on to reconstruct extreme events and parameters. This is followed by the role of station history and, lastly, methodologies and other analyses. The editors' aim has been to produce a volume that would be instrumental in moulding the next generation of historical climatologists.

FIELD, M., 2010. 'Pen portraits of Presidents – William Ellis'. *Weather*, Vol.65, pp.250-252.

HARDAKER, P., 2010. Obituary of Dr Joanne Simpson. *Weather*, Vol.65, p.283.

LE BLANCQ, F., 2010. 'Rescuing old meteorological data'. *Weather*, Vol.65, pp.277-280.

MERGEN, B., 2008. *Weather matters – an American cultural history since 1900*. University Press of Kansas, 398 pages. From the blurb:

Bernard Mergen's captivating and kaleidoscopic new book illuminates our inevitable obsession with weather—as both physical reality and evocative metaphor—in all of its myriad forms, focusing on the ways in which it is perceived, feared, embraced, managed, and even marketed. From the roaring winds atop Mount Washington to the reflective calm of the poet's lair, he takes a long-overdue look at public response to weather in art, literature, and the media. In the process, he reveals the cross-pollination of ideas and perceptions about weather across many fields, including science, government, education, and consumer culture.

MOORE, G.W.K., SEMPLE, J.L. and SIKKA, D.R., 2010. 'Mallory and Irvine on Mount Everest: did extreme weather play a role in their disappearance?', *Weather*, Vol.65, pp.215-218.

RYAN, R. *et al*, 2010. Obituary of Kenneth Spengler, 1915-2010. *Bulletin of the American Meteorological Society*, Vol.91, pp.798-801. Ken was Executive Director of the American Meteorological Society from 1946 to 1988, when he became, such was the esteem in which he was held, Emeritus Executive Director. Thanks to his charm and determination, the AMS acquired its present headquarters at 45 Beacon Street, Boston. The property was then (in the 1950s) somewhat dilapidated and Ken managed to get it donated to the Society, on condition that the Society restore it to its original elegance and architectural style.

SAHA, Suranjana *et al*, 2010. 'The NCEP climate forecast system reanalysis', *Bulletin of the American Meteorological Society*, Vol.91, pp.1015-1057. This paper has 52 authors! NCEP is short for National Centers for Environmental Prediction. The paper's abstract reads: "A new coupled global NCEP reanalysis for the period 1979 to the present is now available, at much higher temporal and spatial resolution, for climate studies".

STICKLER, A., 2010. 'The comprehensive historical upper-air network'. *Bulletin of the American Meteorological Society*, Vol.91, pp.741-751. The paper's abstract reads: "A systematic compilation of global upper-air data from the first half of the twentieth century has weather and climate applications and may be useful in reanalyses". A very good photograph

of an umbrella kite appears on page 741. This type of meteorological kite was used to obtain vertical profiles of temperature, pressure and humidity. During an ascent on 1 August 1919 by a combination of several umbrella kites, an altitude of 9,740 metres was reached.

TAVARES, Conceição, 2010. *Albert 1er de Monaco, Afonso Chaves et la Météorologie aux Açores,* Ponta Delgada, Présidence du Gouvernement Régional des Açores
ISBN 978-989-96294-5-5

FINALLY – from the National Archives list of MSS deposited in UK repositories:
Highland Council Archives, Highland Archive and Registration Centre, Bught Road, Inverness, IV3 5SS
Commander Ian Alexander Scrymgeour-Wedderburn: meteorological records, including rainfall and temperature readings, taken at Dunlichity Lodge, Farr 1979-2007 (D1167).

OCCASIONAL AND CLASSIC PAPERS

All nine of the History Group's Occasional Papers are online on the Royal Meteorological Society's website. To find them, go to:

http://www.rmets.org/about/history/index.php

and scroll down the page. You'll find them on the right-hand side of the page.

More occasional papers are being prepared. The Group's newsletter will contain information about them in the fullness of time.

A considerable number of 'classic' papers of the meteorological literature have also been scanned. You'll find them on:

http://www.rmets.org/about/history/classics.php

THE SUMMER MEETING IN DEVON
by Malcolm Walker

When the idea of a two-day Summer Meeting was put to the Royal Meteorological Society's Meetings Committee back in 2008, there was a sceptical response. The Society used to have such meetings but they'd been discontinued some twenty years ago for lack of support. Even the one-day Summer Meetings hadn't all been well supported in recent years. Well … in the event … the meeting in Devon in the summer of 2010 attracted 56 people. Bookings had to close. Not all of our hosts could take more people; and we had a fifty-seater bus, so some folk had to travel by car.

Summer Meeting participants assembled at the University of Exeter in the late afternoon of Sunday 18 July and were soon enjoying the beautiful campus – and the view from the Holland Hall bar across the Exe Valley! After dinner in the Hall's restaurant that evening, Professor Julia Slingo, President of the Royal Meteorological Society, spoke about today's challenges in atmospheric science, conveying in her talk both the excitement of meteorology today and the sophistication of the methodology.

At 9.00am sharp the following morning, Summer Meeting participants gathered in the modern and beautifully situated Institute of Arab and Islamic Studies, about 200 yards from Holland Hall, to hear talks by Ewen McCallum and Nick Grahame of the Met Office on 'Recent developments in weather forecasting'. Wow! No seaweed or fir-cones now, nor even pencils and rubbers. The world of the forecaster is electronic today. Observations come from drifting buoys, land-based automatic weather stations, radar and aircraft; and satellites are more important than radiosondes these days. Supercomputers do the number crunching and are so powerful that some amazing improvements in forecasting have been achieved. The four-day forecast is now as accurate as the one-day forecast in the 1960s, and the extreme rainfall events at Morpeth in 2008 and Cockermouth in 2009 were well forecast days ahead. Rainfall features just a few kilometres across would soon be forecast routinely – but postcode forecasting hasn't yet arrived. Ensemble forecasting is practised – but how can forecasters get the idea of uncertainty across to the public, especially the press? Forecasting of the trajectories and dispersal of the ash from the Eyjafjallajökull volcano in Iceland in the spring of 2010 had been highly successful but many people had wrongly blamed the Met Office for the closure of airspace. It had been the job of others to decide on the action necessary.

After coffee, the next item on the agenda was a visit to the Met Office's headquarters. It's tempting to call this innovative environmentally-friendly building new, but *tempus fugit*! The building was actually seven years old. The group visited the Library, the Operations Centre and the experimental site and then, after lunch, walked the 300 metres to Great Moor House, the home of the National Meteorological Archive, where there was a most impressive display of material (see pages 16 and 17).

Article continues on page 19

ITEMS ON DISPLAY IN THE NATIONAL METEOROLOGICAL ARCHIVE

RARE BOOKS

Collection of sermons, including: Mercy and judgment met together. A sermon preached at the Abby Church of Westminster by the order of the Right Honourable the House of Lords in Parliament assembled, on a solemn day of humiliation occasioned by the Great Rain in June and July, 1661.

Tracts consisting of observations about the saltiness of the sea: an account of a statical hygroscope and its uses: together with an appendix about the force of the air's moisture: a fragment about the natural and preternatural state of bodies. By the Honourable R. Boyle, 1674.

The general history of the air, designed and begun by the Honble. Robert Boyle Esq. Includes a register of weather kept by Mr Locke, in Oxford, 1666-1683. Published 1692.

The storm: or a collection of the most remarkable casualties and disasters which happen'd in the late dreadful tempest both by sea and land, by Daniel Defoe, 1704.

Philosophical experiments and observations of the late eminent Dr.Robert Hooke, S.R.S., and other eminent Virtuoso's in his time, imprint by W.Derham, 1726.

A voyage to Hudson's-Bay, by the Dobbs Galley and California, in the years 1746 and 1747, for discovering a north west passage, with an accurate survey of the coast and a short natural history of the country. Together with a fair view of the facts and arguments from which the future finding of such a passage is rendered possible. By H.Ellis, 1748.

Meteorological observations and essays, by John Dalton, 1793.

Luke Howard's *Barometrographia* (Twenty years' variation of the barometer in the climate of Britain, exhibited in autographic curves with the attendant winds and weather, and copious notes illustrative of the subject), published 1847.

The climate of the south of Devon, and its influence upon health: with short account of Exeter, Torquay, Babbicombe, Teignmouth, Dawlish, Exmouth, Budleigh Salterton, Sidmouth, etc. Second edition, by Thomas Shapter. This edition 1862.

WEATHER DIARIES

Observations of the weather from the year 1657 to 1686. By Mr Samuel Clarke of Reinham (Raynham) in Norfolke. (Imprint, 1699).

Register of weather at Upminster 1700-1706 by William Derham. (Photocopy)

Weather diary kept at Kemnay (Aberdeenshire) by J Burnet, 1758-1795. (Photocopy)

Private weather diary of Admiral Sir Francis Beaufort from 6 June 1805 to 29 October 1812, open at 13 January 1806, showing his wind and weather scales.

Meteorological journal, kept at the apartments of the Royal Society, by order of the President and Council (January 1 to December 16 1822).

Private weather diary for Modbury, Devon, kept by John Andrews Senior from 1788 to 1822 and John Andrews Junior from 1831 to 1868. (The 1844-46 volume on show here)

Ernest Gold's diaries of forecasts issued to Service Units on the Western Front between 24th October 1916 and 30th March 1919.

Diary kept by Dr J M Stagg whilst at SHAEF Headquarters in 1944.

Early meteorological observations at the Radcliffe Observatory, Oxford.

MARINE OBSERVATIONS

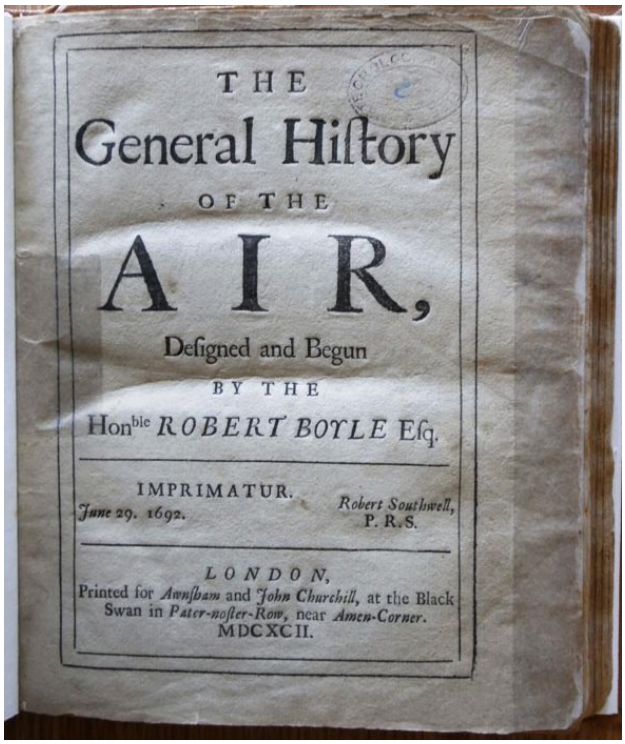
Observations made by Surgeon Menzies during the voyage of Vancouver around the world 1791 to 1795.

Weather logbook of HMS *Beagle* for 1838, a few years after her famous Darwin voyage, when she was Captained by Robert FitzRoy. Here she is Captained by John Clements Wickham, who had been a Lieutenant on the Darwin voyage

OTHER ITEMS

Included the first published weather chart (1861), the D-Day chart of 6 June 1944, Richard Strachan's *Meteorological Magazine* of 1864, photographs by Ralph Abercromby, minutes of the London and British Meteorological Societies, and various letters, among them one written by Admiral FitzRoy. Also included an annotated version of L.F.Richardson's book *Weather prediction by numerical process* which he prepared for publication in the mid 1930s as the second edition, together with comments by several eminent meteorologists. This revised edition was never published.

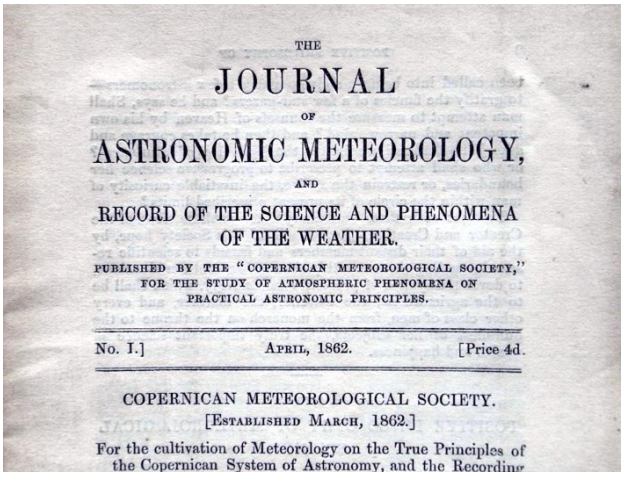
ROYAL METEOROLOGICAL SOCIETY TREASURES IN THE NATIONAL METEOROLOGICAL ARCHIVE



THE
General Hiſtory
OF THE
AIR,
Deſigned and Begun
BY THE
Hon^ble ROBERT BOYLE Eſq.

IMPRIMATUR.
June 29. 1692. Robert Southwell, P. R. S.

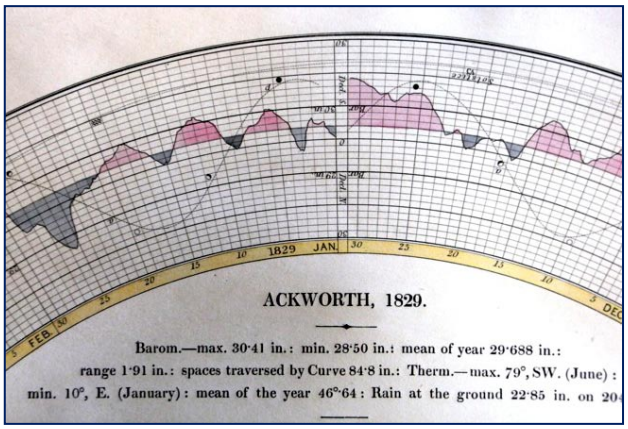
LONDON,
Printed for Awnſham and John Churchill, at the Black Swan in Pater-noſter-Row, near Amen-Corner.
MDCXCII.



THE
JOURNAL
OF
ASTRONOMIC METEOROLOGY,
AND
RECORD OF THE SCIENCE AND PHENOMENA OF THE WEATHER.
PUBLISHED BY THE "COPERNICAN METEOROLOGICAL SOCIETY," FOR THE STUDY OF ATMOSPHERIC PHENOMENA ON PRACTICAL ASTRONOMIC PRINCIPLES.

No. I.] APRIL, 1862. [Price 4d.

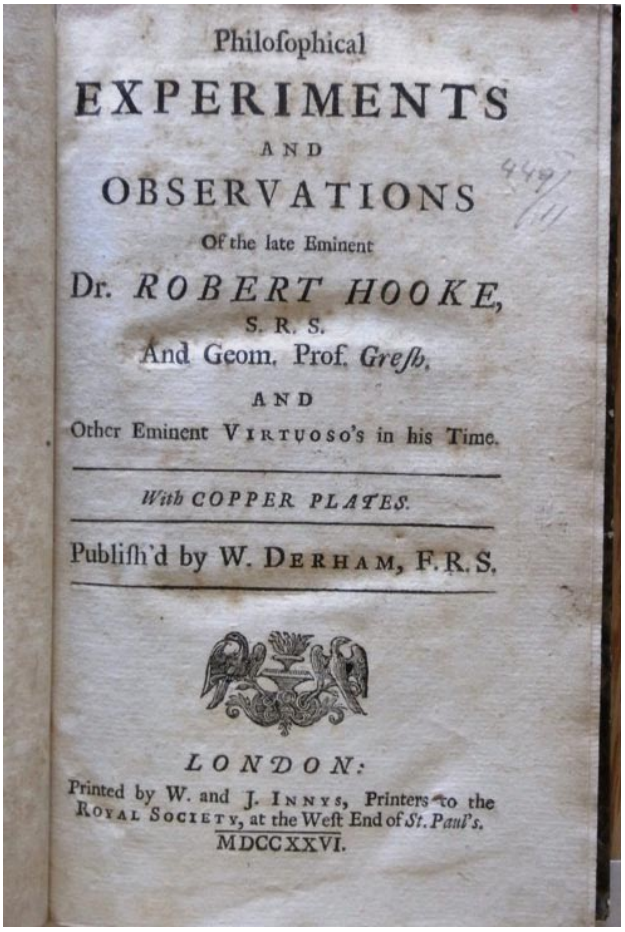
COPERNICAN METEOROLOGICAL SOCIETY.
[ESTABLISHED MARCH, 1862.]
For the cultivation of Meteorology on the True Principles of the Copernican System of Astronomy, and the Recording



ACKWORTH, 1829.

Barom.—max. 30·41 in.: min. 28·50 in.: mean of year 29·688 in.: range 1·91 in.: spaces traversed by Curve 84·8 in.: Therm.—max. 79°, SW. (June): min. 10°, E. (January): mean of the year 46°·64: Rain at the ground 22·85 in. on 20

From Luke Howard's *Barometrographia*



Philoſophical
EXPERIMENTS
AND
OBSERVATIONS
Of the late Eminent
Dr. ROBERT HOOKE,
S. R. S.
And Geom. Prof. Greſh.
AND
Other Eminent VIRTUOSO's in his Time.

With COPPER PLATES.

Publiſh'd by W. DERHAM, F.R.S.

LONDON:
Printed by W. and J. INNYS, Printers to the ROYAL SOCIETY, at the Weſt End of St. Paul's.
MDCCXXVI.

Mercy & Iudgment
MET TOGETHER.

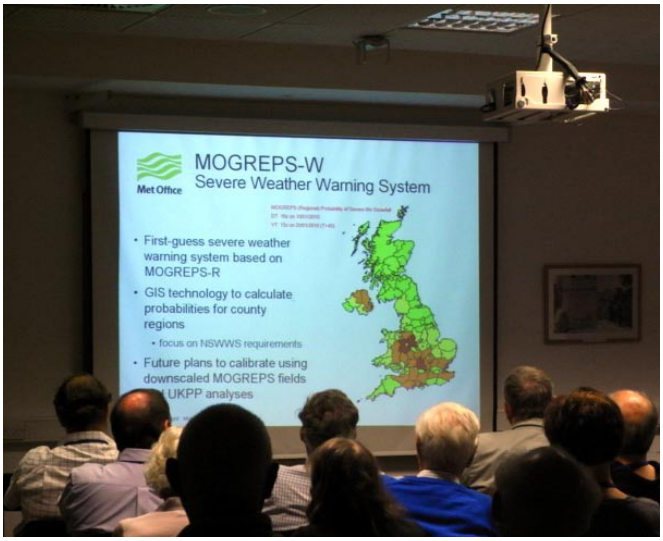
A
SERMON
PREACHED
At the ABBY Church of WESTMINSTER
by the Order of the Right Honourable
the Houſe of
LORDS
IN
PARLIAMENT Aſſembled,
Upon a Solemn Day of Humiliation occaſioned
by the Great Rain in June and July,
MD. DC. LXI.

SUMMER MEETING PHOTOGRAPHS

Concentration in the National Meteorological Archive.

See how many bottles of water were needed to pull the hemispheres apart! Demonstration by Philip Collins (wearing hat) at Barometer World.

Left: coffee time outside the lecture theatre. Right: the terrace outside the coffee area and the beautiful view westwards across the Exe Valley.



During Nick Grahame's talk on 'Recent developments in weather forecasting'.

Dinner in the village hall at Merton.

Photographs by
Diane and Malcolm Walker

From the Archive, the coach took us to the village of Merton (five miles south-east of Great Torrington). Here, at *Barometer World*, there was another treat in store. Philip Collins, the firm's Managing Director, had prepared some experiments to demonstrate atmospheric pressure. We had a tug of war to separate Magdeburg hemispheres, and Philip used bottles of water to demonstrate just how many of them were required to pull the hemispheres apart (see pictures opposite). Philip also demonstrated his model atmospheric railway, and everyone was amazed at how fast the train travelled.

To round off a long day, there was dinner in the village hall at Merton – and what a hall and what a meal! The hall is not many years old and has won awards for its facilities; and the only response most could make to the meal was "Yum!". Locally-sourced food, superbly cooked in the kitchen on site, was only part of the treat. The four desserts were pretty special – with second helpings offered and most certainly accepted.

At 9.00am on the second morning, we were all back in the lecture theatre of the Institute of Arab and Islamic Studies to hear talks by Professors John Mitchell and Chris Folland on advances in climate science in the past two decades, a session which marked the twentieth anniversary of the Met Office Hadley Centre.

John spoke first, tracing the history of the Office's climatological work from the 1950s, when Hubert Lamb was at the heart of the work, through the 1960s and 1970s, when numerical modelling transformed studies of climate, to the establishment of the Intergovernmental Panel on Climate Change in the late 1980s and the work of the Hadley Centre since 1990.

Then, Chris Folland spoke about climate change, variability and monitoring studies, and the data sets and instrumentation used, including ARGO floats, 2,000 metres down in the oceans. He then reviewed knowledge of atmospheric and oceanic change and variability, with particular reference to El Niño, the North Atlantic Oscillation and a project called EMULATE, through which daily gridded fields of mean-sea-level pressure over the extratropical North Atlantic and Europe (25°N to 70°N; 70°W to 50°E, on a 5° by 5° grid spacing), from 1850 to date, are being created.

John Mitchell then spoke again, this time about climate science. He focused on the physical basis and reliability of the models used for climate prediction and showed that comparisons of simulations with contemporary observations are extremely encouraging.

Whereas the weather had been good on the Sunday and Monday, showing up Devon at its glorious best, it did not behave itself so well on the Tuesday. By the time the group reached the Blue Ball at Sidford, for lunch, the weather was rather misty. After a really tasty meal in this historic thatched pub, we moved on to the last visit of the Summer Meeting, to the Norman Lockyer Observatory, near Sidmouth. Here, as the picture below shows, the result of a mild, humid, southerly airflow being lifted up cliffs 500 feet high was clear to all (or not, depending on your point of view!!).

At the Observatory, Dr George Wilkins told the life story of Norman Lockyer and the work he carried out at the Observatory. Then, History Group member Chris Wilson talked about Lockyer's meteorological work (see page 20).

The coach then took participants back to Exeter and the Summer Meeting ended, having been hugely enjoyed by everyone.

▲ There was plenty to see inside the Norman Lockyer Observatory … but it was a different story outside! ▼

NORMAN LOCKYER AND METEOROLOGY
by Chris Wilson

This is a summary of the talk given by History Group member Chris Wilson at the Norman Lockyer Observatory on 20 July 2010 during the Summer Meeting. For an account of this meeting, see pages 15-19 of this newsletter.

Sir Norman Lockyer was prominent in science in the late Victorian and Edwardian periods; greatly involved in astronomy, solar physics, scientific journalism and other areas. However, today he is much less well known, perhaps mainly as the discoverer of the element helium. So it is also not widely known that he and his youngest son, Dr W.J.S.Lockyer, were involved to a significant degree in meteorology. This note is intended to provide a short description of their work in this field.

Norman Lockyer decided to get involved in meteorology about 1870, and his first period of activity covered that decade. At the time, he was still a civil servant, but he had behind him a considerable record of success in solar physics. This included a medal from the Academie de Sciences, jointly with Janssen, for the discovery of the important technique of using a spectroscope to view the Sun's atmosphere outside an eclipse, the discovery of an unknown element in the solar spectrum which he called helium, and detailed studies of the solar chromosphere and the nature of sunspots. He had also become the first Editor of *Nature*.

Lockyer became interested in meteorology because of his suspicion, shared by others at the time, that the eleven-year sunspot cycle might be a driving factor in meteorology; and, more generally, that a search for cycles might provide a much needed theoretical basis for meteorological science. The sunspot cycle had only been properly published during the 1850s, so it was fairly new science at the time. By 1870, Lockyer's experience and scientific contacts had brought meteorology very much into his mind. For many years, he had been a collaborator and personal friend of Balfour Stewart, the Superintendant of Kew Observatory. His contacts with Kew had familiarized him with meteorological methods, and with sunspot observation and terrestrial magnetism. Another of his friends was Charles Meldrum, the Observer on Mauritius, who was claiming to have found an influence of the sunspot cycle on rainfall round the Indian Ocean and on the frequency of Indian Ocean cyclones.

In 1871, Lockyer travelled to India for the 1871 total eclipse of the Sun. During the preparations for this he heard that it was believed in India that the intensity of the monsoon rains varied in a cycle of similar duration to the sunspot cycle. This of course strengthened his interest in the subject. On his return he decided to repeat some of Meldrum's work with new data. Meldrum had claimed that the annual rainfall at several stations round the Indian Ocean peaked at the time of sunspot maximum, and also that the number of cyclones in the Indian Ocean was greatest at these times. Norman Lockyer located some new rainfall series for Madras and the Cape, and his analysis using these confirmed Meldrum's findings. He published his results, and a review of Meldrum's, in 1873, in his first significant meteorological paper. Both Meldrum and Lockyer were hampered in trying to identify the solar cycle in weather data by the shortness of the available rainfall series for the area.

Lockyer spent a good deal of time in the 1870s studying the techniques of meteorology. He became involved in training meteorologists for polar expeditions, and in 1878 he was in the U.S.A. for another eclipse, and stayed on to study the organization and methods of meteorology in that country, visiting a number of meteorological sites and observatories, and meeting the leading figures. His first period of meteorological activity ended in 1879, with the publication of an important report to the Indian Famine Commission, entitled "The cycles of sunspots and of rainfall in Southern India". This was authored by Lockyer together with Dr Hunter, the Director of Statistics to the Government of India, and the Professor of Mathematics at Patna, Dr Archibald. The report suggested that the sunspot cycle had considerable potential for monsoon forecasting but was not yet sufficiently robust for immediate use.

Norman Lockyer was particularly concerned by the lack of a physical mechanism which could explain any solar influence on weather. He believed that the Sun's heat output must be greater at sunspot maximum, and for the next twenty years he tried to prove this point as part of his work in solar physics. The first attempt was by direct measurement. Lockyer and Balfour Stewart assembled two actinometers, and a soldier was trained to use them in the clearer skies of India. Unfortunately this man succumbed to the Indian climate and died soon after arrival. Subsequently the Indian Meteorological Department proved unable to continue this programme effectively. During the

last two decades of the nineteenth century Lockyer was carrying out long series observations of changes in the spectra of sunspots through the solar cycle, and he now considered that it might be possible to derive solar heat from these. He was joined in 1897 by his son, Dr W.J.S.Lockyer, and they jointly analysed this data together with the now rather longer rainfall series. They thought that they could discern a relationship between the changes in sunspot spectra, interpreted as changes in solar heat output, and the pulses of rainfall round the Indian Ocean. These were presented in a major paper in 1900. This paper was well received, especially by the Indian Meteorological Service, but ultimately it was on the wrong track. The longer rainfall series which were included were useful, but with hindsight it is clear that in trying to determine solar heat output from changes in spectra the Lockyers were attempting something which would only become possible over two decades later when interpretation of spectra on the basis of quantum theory became practical. However, in the 1900 paper they reported that they had decided that there was more hope of understanding the Indian monsoon variations by analyzing variations in barometric pressure rather than rainfall. More widespread records were available, and pressure would not be subject to the problems of local variation and exposure that were experienced with rainfall.

This proved to be a fruitful change of plan. Between 1900 and 1904, Norman and James Lockyer produced a series of papers analyzing long term barometric pressure variations not just round the Indian Ocean but worldwide. They found little evidence in this data for the 11 year sunspot cycle, but identified a pseudo-periodicity of around 3.5 years, varying between 2.5 and 4 years, in much of the data. Above all they discovered what they called “see-saws”, in which high pressure in a particular area was correlated with low pressure in another region. For example, when the barometric pressure in Bombay was in its high phase the pressure at Cordoba in South America was always low. Plotting their results on a world chart showed that the high pressure in Bombay was in phase with a whole region round the Indian Ocean and Australia while the low pressure for Cordoba was representative of a whole region covering South and Central America. So the Lockyers had clearly identified the see-saw which much later would be named the Southern Oscillation by Sir Gilbert Walker, and which later again became part of the ENSO phenomenon. They also identified other see-saws, of which an important one was between Iceland and the Azores. This of course would later be named the North Atlantic Oscillation. In their 1904 paper they predicted that these pressure oscillations would be important for forecasting. Several decades later, when Sir Gilbert Walker published his own statistical studies of world meteorology, in which he named and studied the Southern Oscillation in much greater detail, he always referenced the Lockyers’ papers and recognized their discoveries.

After this, Sir Norman Lockyer, who was nearing retirement, did little further research on meteorology, although he was charged by the International Meteorological Committee with setting up a central collection system for world-wide meteorological data. Dr James Lockyer continued his studies of monsoon meteorology, and produced large reports on Australian meteorology and southern hemisphere meteorology. These did not produce much impact, probably because they were published as Reports of the Solar Physics Observatory, and not in more mainstream meteorological journals. However, James had an ongoing practical interest in photography of clouds and of lightning. He was a pioneer of cloud photography and some of his slides are in the National Meteorological Archive. He worked on a book, to be called “In Thunderstorms with a Camera”, but it was never finished, as the Great War arrived.

As a footnote, it may be worth mentioning that the present day Norman Lockyer Observatory, on Salcombe Hill, Sidmouth, which is devoted to the public understanding of science, has an automatic weather station and a weather satellite receiving station run by members of the Norman Lockyer Observatory Society.

REFERENCE

Wilkins G.A. and Wilson C.M.W., 1997. ‘The contribution of Norman and James Lockyer to meteorology’, *Weather* **52**(9), pp.276-281.

Sir Nelson Johnson was Director of the Meteorological Office from 1938 to 1953. It is not well known that he spent a year at the Lockyer Observatory. After gaining an honours degree in physics at the Royal College of Science (South Kensington) in 1913 and then remaining there for a year as an assistant demonstrator in spectroscopy, he took up astronomy under Sir Norman Lockyer at the Observatory on Salcombe Hill but gave up this career in 1915 to join the Royal Flying Corps.

FORTHCOMING MEETINGS

The Group's next meeting will be at the **Scott Polar Research Institute in Cambridge on Saturday 26 March 2011**. The South East and East Anglia Centres of the Royal Meteorological Society will join us for this meeting.

The meeting is being arranged to mark the centenary of Captain Scott's fateful Antarctic expedition of 1910 to 1913. Perhaps we shall find out at the meeting exactly where Scott and his team were on 26 March 1911.

We have three speakers (so far), all History Group members: Alan Heasman on "Weather registers from the Expedition"; Mick Wood on Griffith Taylor, one of the meteorological team: Malcolm Walker on "The scientific work of 'Sunny Jim' Simpson during Scott's last expedition". And there's more. The Scott Polar Research Institute has recently been refurbished, including the museum which contains items from the expedition in question. We shall have a conducted tour of the museum store and the Library by Scott Polar's Librarian and Keeper of Collections.

This is definitely a meeting not to be missed. A booking form will be sent to you in early January, and one will also be placed on the Royal Meteorological Society's website. The cost of the meeting will be £10, to include morning and afternoon refreshments but **not** lunch. We start with coffee/tea at 10.30am and finish about 5.00pm.

Captain Scott's 1900-1904 sledge flag, in Exeter Cathedral

Next year's **Summer Meeting** will also be a joint one with the Royal Meteorological Society's South East Centre. It's a **Thames Barrier Visit, on Tuesday 21 June 2011**.

Again, the charge will be £10, to include coffee/tea on arrival but **not** lunch. The meeting will include a couple of talks and a technical visit to the Barrier and will run from mid-morning to late afternoon, but exact timings have not yet been finalized. Full details and a booking form will be sent out with the next issue of the newsletter and will also be placed on the Royal Meteorological Society's website. Meanwhile, do please put the date in your diary.

This is another meeting not be missed.

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Next year's a bumper year. **On Saturday 24 September 2011**, from mid-morning to late afternoon, we have a meeting **at the Farnborough Air Sciences Trust on 'The use of aircraft in meteorology, Part 1'**. This meeting also marks a centenary. The practice of making upper-air soundings by means of meteorographs attached to aeroplanes began about a century ago.

And why Part 1? Because, of course, we plan to have at least one further meeting on this very big subject. At the meeting on 24 September, we shall focus on the period 1910 to the 1930s, which was a very exciting era in aviation and meteorology. We shall consider both aeroplanes and airships. We have four speakers, all members of the History Group, and there will be a tour of the museum. Details will be available in due course and will be sent to you.

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Finally, in 2011, we have **the fourth 'Classic Papers' meeting**, this one **on cloud physics**, marking the centenary of C.T.R.Wilson's cloud chamber.

This will be Royal Meteorological Society National Meeting, **on Wednesday 16 November at the University of Reading, starting at 2.00pm.**

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In **March 2012**, we have a meeting on **Weather and health**. **This will be held in London** and arrangements are well in hand. More details in due course.

2010 MEMBERS

Rob Allan (Exeter)
Alberto Ansaloni (Milano Italy)
Oliver Ashford (Didcot)
Graham Bartlett (Slough)
Rodney Blackall (Buckingham)
Brian Booth (Devizes)
Ron Bristow (Maidstone)
Stephen Burt (Stratfield Mortimer)
Anna Carlsson-Hyslop (Manchester)
Jacqueline Carpine-Lancre (Beausoleil, France)
M J Chapman (Royston)
Nick Chappell (Lancaster)
Alan Cobb (Gerrards Cross)
Mike Collins (Frinton on Sea)
Philip Collins (Merton, Devon)
Andrew Cook (Newport on Tay, Fife)
Stan Cornford (Bracknell)
Maurice Crewe (Watford)
B D Dagnall (Lymington)
Peter Davies (Reading)
Tony de Reuck (London)
Federico de Strobel (La Spezia, Italy)
Margaret Deacon (Callington)
Laurie Draper (Dingwall)
Storm Dunlop (Chichester)
Philip Eden (Luton)
Michael Field (Arundel)
Tom Fitzpatrick (Glasgow)
Robert Gilbert (North Chili, NY, USA)
Brian Giles (Auckland, New Zealand)
John Goulding (Middlesborough)
Valerie Green (London)
Richard Gregory (Woodbridge)
Eric Harris (Crowthorne)
Alan Heasman (Marlborough)
Althea Howard (Reading)
A M Hughes (Oxford)
Lord Hunt of Chesterton FRS (London)
Jane Insley (London)
Arnold Johnson (Maidenhead)
Simon Keeling (Wombourne, Staffs)
Joan Kenworthy (Satley, County Durham)
Martin Kidds (London)
John Kington (Norwich)
Daudu Kuku (London)
Richard Link (Croydon)
Norman Lynagh (Chalfont St Giles)
Joyce MacAdam (Watford)
Ian MacGregor (Ivybridge)
Julian Mayes (West Molesey)
Anita McConnell (Stowmarket)
Reg Milne (Farnborough)
Alison Morrison-Low (Edinburgh)
John Norris (Gerrards Cross)
Howard Oliver (Swanage)
Alan O'Neill (Twyford)
Sara Osman (London)
Andrew Overton (Doncaster)
David Pedgley (Wallingford)
Ernie Pepperdine (Scunthorpe)
Anders Persson (Lehmo, Finland)
R W Phillips (Lincoln)
Vernon Radcliffe (Newark)
Nick Ricketts (Exmouth)
P R Rogers (Sevenoaks)
James Rothwell (Southwell)
Peter Rowntree (Crowthorne)
Marjory Roy (Edinburgh)
Andrew Russ-Turner (London)
Ann Shirley (Canterbury)
David Simmons (Cambridge)
Hugh Thomas (Hassocks)
Derry Thorburn (London)
Keith Tinkler (Ontario, Canada)
Jack Underwood (Barham)
Bill Wade (Harrogate)
Diane Walker (Tiverton)
Malcolm Walker (Tiverton)
Catharine Ward (Bury St Edmunds)
Dennis Wheeler (Sunderland)
G D White (Truro)
Peter Wickham (Wokingham)
Clive Wilkinson (Diss)
John Wilson (Nottingham)
Christopher Wilson (Cullompton)
Sir Arnold Wolfendale FRS (Durham)
Mick Wood (Bracknell)

THIS IS YOUR NEWSLETTER

Please send any comments or contributions to:
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http://www.rmets.org/activities/groups/SIG/detail.php?ID=9

The Group's annual subscription is £5 (cheques payable to *Royal Meteorological Society History Group*). A reminder will be sent when your subscription is due.

THE NEXT NEWSLETTER

All being well, the next newsletter will be published in March 2011. Please send comments, articles etc to Malcolm Walker (address above) by 20 February.

Malcolm would particularly welcome reminiscences of life in the Met Office (at home or abroad) in the 1950s, 1960s and 1970s, also recollections of meteorological activities in universities, research institutes or the services (at home or abroad) in those decades.