

HISTORY GROUP NEWSLETTER



News, views and a miscellany published by the Royal Meteorological Society's
Special Interest Group for the History of Meteorology and Physical Oceanography

Issue No.1, 2016

WELCOME

Julian Mayes, Secretary / Newsletter editor

As this issue of the newsletter was being prepared for publication in December, we heard the sad news of the passing of Malcolm Walker on 21st December. To say that Malcolm is a hard act to follow is to state the obvious – we owe Malcolm a huge debt of gratitude for the work that he put into the Group over its entire life. Distribution of the newsletter has been delayed until after Malcolm's funeral on 18th January. Our new Chairman, Norman Lynagh, pays tribute to his predecessor as Chairman (page 2) and a note on his funeral appears on page 3.

You will probably have gathered that a great deal has happened behind the scenes of the Group since the last newsletter was issued. As we enter 2016 we have a new committee structure, a new newsletter editor (myself) and - more importantly - a new Chairman, Norman Lynagh. A new advisory committee has been established and the old committee has been reconstituted as a steering committee; members of the latter are listed on page 2 together with an introduction from Norman. We welcome several new faces as well as some familiar ones.

I should like to thank RMetS Chief Executive, Liz Bentley, for her support in the transition period.

You should have recently received a communication from the Society about a change to the subscription arrangements for membership of the Group. The subscription is being discontinued (refunds on advanced payments are offered) but we will maintain our identity as a group – this newsletter will continue to list the registered members on the back page.

The structure of the newsletter will be fairly familiar – we start with news of forthcoming meetings,

followed by articles from several committee members. We do have ideas for new features and these will become apparent later this year. Above all, though, this is your newsletter and we will strive to include your contributions with the minimum of delay – my contact details are on the last page. After this issue, I hope to issue another this summer and hopefully a third issue towards the end of the year. I look forward to hearing from you – whether you have contributions or simply any questions about the Group or the newsletter. Do not hesitate to contact me at julian.mayes@meteogroup.com.

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Oliver Ashford, 1915-2016

We are sorry to note the recent passing of long-standing Group member Oliver Ashford who passed away on January 16th aged 100.

An introduction from the new Chairman of the History Group – Norman Lynagh

It is with mixed feelings that I took over as Chairman of the History Group Steering Committee on 1st January 2016. The prospect of taking on a new challenge is always exciting but, in this case, it is also tinged with a great deal of sadness. As you probably all know, ill health forced Malcolm Walker to stand down from the post rather suddenly some weeks ago. Unfortunately, Malcolm's health deteriorated rapidly and, all too soon, he passed away on 21st December. Malcolm had so much left to give and the science of meteorology has been robbed of an extraordinary talent.

For many years, Malcolm had been the leader and inspiration behind the History Group. Ably supported by the Steering Committee he saw the Group grow from strength to strength. All of us who have been members of the Group over the years owe Malcolm a great debt of gratitude. The Group's Newsletter has always been one of my 'must read' journals. My thoughts now are with Malcolm's family. It is a very sad time for them but, in their sadness, I hope they can also find it possible to celebrate Malcolm's remarkable career.

For those who do not know me it is perhaps appropriate that I say something about my background. In my career stretching back to 1961 I have been employed by the UK Met Office, the Australian Bureau of Meteorology, IMCOS Marine and the Noble Denton Group. For the past 19 years I have been a self-employed Consultant and I am still working more or less full time. In the 1960s I spent 3 years on the North Atlantic Ocean Weather Ships. Much of the early part of my career was spent in weather forecasting, first for the Australian Bureau of meteorology and then all over the world with IMCOS Marine forecasting for the offshore oil and gas industry. In my time with Noble Denton I developed the skills necessary to be a successful consultant. In 1996 I decided to become self-employed and I now split my time between Expert Witness work and consultancy work for a variety of industries, including the offshore oil and gas industries. With 54 years of continuous employment in meteorology I suppose that I am almost becoming part of the history! In 1994 I was accredited by the Society as a Chartered Meteorologist.

With a new Chairman and several other new recruits to the Steering Committee, there will inevitably be changes but all of the familiar activities of the Group will continue. Julian Mayes has volunteered to take over preparation of the Newsletter. This is not a trivial task and I hope that you will support him through the submission of material for publication. I have some ideas for broadening the scope of the activities of the Group but they are for the future. For now, my aim will be to ensure that the History Group goes forward with minimal interruption to its activities.

I look forward to meeting and talking to many of you over the coming months and years.

Norman Lynagh, Tideswell, Derbyshire

Steering Committee Members

Norman Lynagh – Chairman

Julian Mayes – Secretary

Mick Wood – Treasurer

Catharine Bailey (publicity)

Hannah Barrett (publicity)

Brian Booth

Chris Folland

John Gould

Richard Griffith

Howard Oliver (occasional papers editor)

Sarah Pankiewicz (archives)

Catherine Ross (archives)

Peter Rowntree

Andrew Russ-Turner (meetings committee rep.)

Dennis Wheeler

David Pedgley has stepped down from the steering committee but we are pleased to welcome him to the advisory committee. Our thanks to David for many year's work for us.

RECENT MEETINGS WITH HISTORY GROUP INVOLVEMENT

□ SPECIAL FIFTIETH ANNIVERSARY MEETING ON WEDNESDAY 18 NOVEMBER 2015, AT THE MET OFFICE, EXETER

□ 'CLASSIC PAPERS MEETING': GETTING UP TO SPEED WITH JET STREAMS WEDNESDAY 9 DECEMBER 2015, AT IMPERIAL COLLEGE, LONDON

FUTURE MEETINGS

□ The AGM of the RMetS will be held on 18th May.

□ THE 'YEAR WITHOUT A SUMMER', 1816

As announced in previous newsletters, there will be a meeting in May 2016 to mark the bicentenary of the so-called 'Year without a Summer'. The venue will be the Whitby Museum, Whitby, Yorkshire. The date is **SATURDAY 21 MAY 2016**.

The programme was shown in the last newsletter. An optional dinner will precede the meeting on the previous evening.

Registration is open now and places are limited. Please register soon to ensure a place.

For details of this meeting of the History Group, please contact the Society: ☎ 01189 568500 or via the Society's website (www.rmets.org) where registration is available now.

□ THERMOMETER SCREENS 15 October 2016.

This is a joint meeting organised by the History Group and the Met. Observing Systems SIG. Richard Griffith is Meeting Manager.

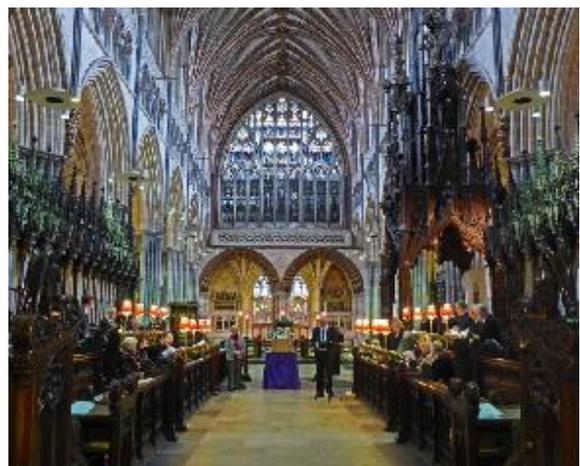
Further details and the venue will be announced shortly.

Malcolm Walker, 1942-2015

A funeral and memorial service for Malcolm was held at Exeter Cathedral on 18th January 2016. The History Group was well represented amongst a large congregation that reflected Malcolm's diverse interests in meteorology, music and history.



The service was held in the magnificent setting of the Choir of the Cathedral, pictured below. It was both fitting and poignant that the service was held in the Cathedral that, in recent years, was such a focus for Malcolm and Diane's enthusiasm for church music.



The Choir of Exeter Cathedral photographed by Howard Oliver before the service began.

Professor Dame Julia Slingo, Chief Scientist at the Met Office and family friend, gave a superb eulogy for Malcolm. An obituary will appear in a future issue of *Weather*.

If any History Group members have any particular recollections of Malcolm that they would like to share in the newsletter, contributions are welcome for the next issue.

Snowfall in the late eighteenth century in southern England

Available data on snowfall in the late 18th century

In my article in Issue No 1, 2014 of this Newsletter (Rowntree (2014), hereafter R), I described the outdoor temperature observations in England in the 1770s and early 1780s, with a paragraph on snow observations. In this article I discuss the data on snow frequency for stations in southern England from the early 1760s to 1800, and attempt to assess its seasonal variation with comparisons to data from more recent periods.

Gordon Manley, in an unpublished document ("Bibliography... London area" dated 25 January 1960) commented on the quality of the available data on snowfall for the London area. He defined his 'grades of alertness' in Manley (1969, *Weather*, 24, 428-437) as follows:

- A: the first-class airfield and observatories
- B: keen climatological observers (but not "expected to watch through the night")
- C: most normal climatological stations at which one daily visit is made to the instruments
- D: less alert, probably maintained by personnel who have other duties.

Some of his comments follow, in quotation marks, following some details on the locations and periods of observation:

Gentleman's Magazine, (anonymous, near the north bank of the Thames, just below London Bridge, except that from April to October the weather was for a location about 7 miles west of Hyde Park Corner, 1763-1781): "Snow observations, in quality, are probably "D". "As noted for one case in R, the snow data are often quite informative with overall descriptions for each day which might merit a grading of "C" or even "B" on Manley's definitions. From 1782, as discussed in R, the Magazine published data from Gilbert White's brother Thomas in South Lambeth until 1787. However, the weather data are less detailed than previously and snow frequencies correspondingly deficient – for winters 1782/83 to 1784/85 the total number of snow days is 34, only half the total observed by Hoy at Syon House (see below). Also deficient relative to Syon House for this period, with only 40 days, is the record from Albury near Guildford which runs from September 1782 to 1796.

Royal Society (Crane Court, near Fleet Street, 1774-August 1781 and Somerset House, Strand, 1787-

1843): "Careful notes of wind and weather at time of observation, but little or no notes on rest of day: This greatly vitiates the apparent frequency of snow days".

Thomas Hoy (various London sites from 1771, then Syon House, across the Thames from Kew Gardens (1782-1822): "Snow observations generally "C" not better; this can be confirmed by comparing Bent" (see below) but "better for "weather" than Royal Society".

J Bent (Paternoster Row, near St Paul's, July 1784-December 1807, published in *Universal Magazine*): "very good notes of each day's weather. Snow observations unusually good for an individual observer; probably can be regarded as "at least B" " W Cary : Mathematical instrument-maker in the Strand opposite Arundel-street. Observations published in *Gentleman's Magazine* 1786-1846. "Cary noted weather at the morning observations; but his notes are so short as to be of little value, and his snow data, for example, are practically valueless".

Manley did not comment on Gilbert White's Selborne record in this survey, probably because of its remoteness from London (45 miles). However, White provides some of the most detailed and colourful descriptions, including reports on the effects on travel in the local area after the event. Daily data run from January 1768 to mid-1793, in *Naturalist's Journal* format (see Greenoak, 1986-89). Before 1768 his "Garden Kalendar" is of some use for snow data for most winters from 1757, except 1759-60 when he was away visiting Thomas Barker in Lyndon and his brother in London.

Comparison of reports of snow during February-March 1786

R concluded with a comparison of reports on a snowfall event in February 1777. The above notes clearly suggest Bent's data to be the most useful in the London area from winter 1784/85 till after 1800. As illustration of this one may compare the reports from various sources for the snow before and during the exceptional cold spell of early March 1786. Morning temperatures of 8F (-13.3C) were observed on the 5th at both Syon House and Selborne, while afternoon temperatures were as low as 23F (-5C) at Syon House at 3pm on the 5th and 7th, and 26F (-3.3C) even at urban Paternoster Row at 2pm on the 6th. Such low values in March have probably only been approached in southern England since then in the cold spell of March 1845, when maximum temperatures of 24.8F (-4.2C) and 27.6F (-2.4C) were

observed at Greenwich on the 13th and 16th and 2pm temperatures of 23 (-5.0C) and 27F (-2.8C) at Oxford on the same days. Apart from these low maxima at Greenwich, the extreme for March in London reported by Brazell (1968) for 1841-1964 was 28F (-2.2C) on the 9th in 1931.

The cold spell set in on 21st February 1786 with a "strong, sharp wind" from the east as described by Gilbert White. White's observation times are not always clear. The temperature and weather observations were entered in the *Naturalist's Journal* (described in R) which pre-printed four suggested observation times (8am, 12pm, 4pm and 8pm). However, White usually entered data for only some of these; in particular temperatures were often only entered once per day, most often against 8am. He also sometimes described weather events at greater length in a Comments section of the Journal page. The first mention of snow in this cold spell is "Some flakes of snow" on the 25th in these Comments. On the 26th, the observations section reads "Small snow, cutting wind, driving snow" for three observation times and "Snow covers the ground" appears in the Comments. On the 27th a weather observation is entered against each of the four times as "snow", and the Comment reads "Snow all night. Snow shoe-deep." By the following day "The snow is at an average about seven inches deep. As it fell without any wind, it is lodged much on the trees, so that the prospects are very grotesque, & picturesque."

Through early March, the snow cover is reported as "not at all melted" (1st March), "Snow not melted" (2nd), "Snow little abated" (3rd, 4th and 6th) while on the 5th "The sun melts the snow on the roofs of houses. Vast icicles on eaves. Snow deep on the ground." On the 6th "Snow is drifted by the wind, and on the 7th "Snow drifted over hedges & gates!" The snow melted quickly from the 10th ("Snow wastes") and by the 13th "Little snow left". However, as late as the 23rd, "Snow lies under hedges, & deep in some lanes".

In London, Bent reported "little snow but chiefly fine, cloudy: little snow" on the afternoon of the 25th, the next morning "more cloudy and windy with little snow at times" and in the afternoon "Little sleet at times: less wind and much snow". Each of these appears to be describing a sequence of weather through the period. Then on the 27th we have "continual snow" alongside the 7am observation and in the afternoon "continual snow:

chiefly snow". He reported snow and sleet (mostly "little") each day from 25th February to 7th March except the 5th. Bent's observations may be compared with Thomas Hoy's record a few miles to the west at Syon House. After a mention of "small snow in the evening" on the 25th, he has "Cloudy some snow" on the 26th, "Snow all day from North snow on the level 8 inch" on the 27th and on the 28th "some small snow all day". In March, he reported snow on each of the 3rd to 7th – e.g. on the 6th "Mostly cloudy high wind some snow". Bent and Hoy both appear to be reporting snowfall in fair detail, though Bent has more snow days not only in this spell but generally.

W Cary's weather reports for the Strand were first published in *Gentleman's Magazine* from January 1786. However, his weather notes are, as Manley remarked, of limited value – generally a single word for each day. Thus in February 1786, his notes for 26th, 27th and 28th read "snow", "heavy snow", "cloudy". In March, "snow" is reported only for 2nd and 3rd. The observations for Albury, near Guildford, are almost as terse – typically two words. He reports snow on the 25th February ("Cloudy Snowy") and on the 26th ("Snow Cloudy"), and 27th and 28th (both "Snow"). Further snow is mentioned on 2nd, 3rd, 4th and 7th March, either as "Snow", "Snow Frost" or "Fine Snowy".

Since January 1782, the *Gentleman's Magazine* had carried reports a year in arrears from Gilbert White's brother Thomas in South Lambeth. These continued till mid-1787, alongside Cary's data, which were published for up to about the 26th in the following month's Magazine. These are more informative than Cary's, using up to 6 words (e.g. Feb 26th: "thin flights of snow; harsh wind"). Snow is mentioned on 25th-27th Feb, but in March "snow lies" reported on 2nd and 4th may or may not indicate more snowfall, and thereafter we only have "snow sinks" on 6th, "snow melts" on 9th and "snow on hills" on 10th.

Snow frequency in the late 18th century

I have analysed the frequencies of snow days (days with snow or sleet observed to fall) for several of the series available. Daily data have been used to analyse the variation of snow frequency through the snow season. Stations with useful data were found to be the following:

Selborne: The frequencies for 1777-1789 are 20% below Barker's careful record at Lyndon (see below). Data for 1912-38 in *Climatological Atlas of the*

British Isles suggest annual frequencies of about 20 for both Lyndon at 320' (100m) and Selborne at 400'(120m). For the overlap period 1777-89, the Lyndon record averages 26, Selborne 21.

Gentleman's Magazine data for London "just below London Bridge" Snow frequencies average about 10% below those for Selborne during 1768/69-1780/81.

Lyndon: As discussed in R, Thomas Barker provided a detailed account of the day's weather throughout his 1777-1789 Journal, including comments on the night when appropriate. Although not used for the London area averages, they provide a useful comparison to other series.

Syon House: Thomas Hoy moved from Muswell Hill to Syon House about June 1782. I have, to date, analysed his data for 1782-87 and 1792 to 1800.

Paternoster Row: As noted earlier, Manley assessed the snow record quality as probably "at least B". Frequencies for 1786-1792/3 (17) are just above those for Selborne (16), whereas 1912-38 data suggest 20 for Selborne, about 15 for London. Frequencies for 1792/93 to 1799-1800 average 13.9, above the 11.1 for Syon House, confirming Manley's assessment of the two records (B for Pat. Row and C for Syon House).

The annual totals for these series were correlated over common periods. The highest correlations were:

1768/69-1780/81: Selborne - London (*Gents. Mag.*): 0.871

1776/77-1788/89: Selborne - Lyndon 0.888

1785/86-1792/93: Selborne – Paternoster Row: 0.947

1792/93-1799/1800: Paternoster Row - Syon House: 0.937

Prior to 1768, the *Gentleman's Magazine* data are available from 1763. They appear lower than those for later periods, relative to mean winter temperatures, but the cold winters of the mid-1760s were often dry according to notes in Gilbert White's *Garden Kalendar*, and Kingston (2010).

Seasonal variation for 1762/63 to 1799/1800 for London and environs

To define the seasonal variation it is desirable to use the series with highest frequencies, indicating the most alert observers, but in or close to London – i.e. not Lyndon, and Selborne only as necessary. This suggests:

Gentleman's Magazine London for 1762/63 – 1780/81 except Selborne for October-December 1762

Selborne for 1781/82

Syon House for 1782/83-1785/86

Paternoster Row for 1786/87-1799/1800.

The derived frequencies averaged over 10-day periods are compared with the author's own results for Bracknell and Crowthorne in east Berkshire for the 50 winters 1964/65-2014/15, omitting 1967/68. Both sets of data are scaled to frequencies per 50 year period – thus 10 indicates that the average day in that 10-day period has snow or sleet falling 10 times in 50 years.

Table 1: 10-day averages of daily frequencies of snow days per 50 years

		Oct22	Nov1	Nov11	Nov21	Dec1	Dec11	Dec21	Dec31	Jan10	Jan20
		Oct31	Nov10	Nov20	Nov30	Dec10	Dec20	Dec30	Jan9	Jan19	Jan29
1762/63-	1799/1800	0.7	0.7	1.6	2.4	2.4	3.2	7.1	7.2	6.8	5.3
1964/65-	2014/15	0.2	0.1	0.9	2.3	1.9	3.4	6.4	5.8	6.4	5.7
		Jan30	Feb9	Feb19	Mar1	Mar11	Mar21	Mar31	Apr10	Apr20	Apr30
		Feb8	Feb18	Feb28	Mar10	Mar20	Mar30	Apr9	Apr19	Apr29	May9
1762/63-	1799/1800	4.6	7.2	6.2	7.4	5.4	6.2	3.8	2.9	0.7	0.9
1964/65-	2014/15	6.0	8.3	7.1	6.5	4.8	3.8	2.8	2.5	1.0	0.4

There are some noteworthy features in the series summarised in Table 1:

- The three 10-day periods up to November 20 had markedly less snow days in the recent period than in the late eighteenth century with a drop from 3.0 to 1.2 days per 50 years for the 30-day totals.
- There are rapid increases in December: for both periods the frequency roughly doubles between December 11-20 and December 21-30. A similar feature is evident from a preliminary analysis of Luke Howard’s record for 1806-30, with means for the three December periods of 2.0, 4.0 and 6.8; however, a strong rise occurs a little later, with 10-day means centred on December 17 and December 24 of 3.8 and 7.0 respectively.
- The rises in December culminate in almost coincident peaks in early January of 8.2 for the 2nd-11th for the 18C and 7.2 for 3rd-12th for the last 50 winters.
- Marked minima occurred in late January in both series, again almost coincident, 5.3 for 15th-24th for the 18C and 5.1 for 16th-25th for the recent period.
- Both series exhibit a strong peak in mid-February. The highest 10-day means in February are 7.6 for Feb 12th -21st for the 18C data, and 8.3 for Feb. 8th - 17th and Feb. 9th – 18th for the recent period.
- Table 1 shows a marked reduction in late March snow days in the last 50 years compared with the 18C. However, the end of season period from March 31st to May 9th shows a much weaker decline (totals for the period decreasing from 8.3 to 6.7 per 50 years) compared to the start of the season (October 22 to November 20).

Snow at Christmas and Easter

One result, which emerges clearly for both periods, is that the statement not infrequently heard in recent years that snow is more likely at Easter than at Christmas is not supported by these data. Easter Day falls with about equal frequency from March 26 to April 21, though the extreme range is from March 22 to April 25. Even for the first 10 days of the possible dates for Easter, the 18C period, with a peak of 6.7 days / 50 years for 23rd March to 1st April, is below the Christmas peak. For the more relevant recent period the 5-day mean frequencies throughout the Easter period are below 5, a figure exceeded in 5-day means from 16-20 Dec onwards. Table 2 shows that the means for the Easter period are at most half those for Christmas both in the 18C period and 1964/5-2014/5.

The peak 5-day means during the Easter period in the last 50 years are 4.2 / 50 years for March 24-28 and 4.6 / 50 years for April 6-10, neither as high as the means for Christmas Day or December 23-27.

Spring snowfall tends to lie for a shorter time than that in winter. It is thus no surprise that the frequency of snow lying relative to that of snow falling is less in the Easter period than at Christmas. Table 2 shows that the frequency of lying snow at Christmas is over ten times that at Easter. Only one day (April 6) during the Easter range of dates had as much as 2 occurrences in the 50 years

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 Manley, G. (1969): *Snowfall in Britain over the past 300 years*. *Weather*, **24**, 426-437.
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Peter Rowntree
Crowthorne, Berkshire

Table 2: Frequencies of snow days and snow lying per 50 years for the Easter period (average for March 26 – April 21) and Christmas Day (Dec. 25 and Dec. 23-27)

	Snow or sleet falling		Snow lying	
	1762/3-1799/1800	1964/5-2014/5	1964/5-2014/5	
Easter period	3.7	2.6	0.4	
Dec. 25	11.8	6	6	
Dec. 23-27	8.7	5.2	4.8	

Ernest Gold and Geostrophy

March 2016 will be 100th anniversary of the word "Geostrophic"

In 1907 Gold was the author of an official Meteorological Office publication, M.O No 190, *Barometric Gradient and Wind Force*. In this paper the gradient wind was explained in great detail, but a suitable word could not be found for the gradient effect. Napier Shaw was considering a suitable word in 1915 just before Gold went to war in France. Gold states that "naturally he had to recourse to Greek, the fountain from which the nomenclature of science draws its inspiration"! Two words that could be used were "geostreptic" or "geostrophic". Gold thought that "geostrophic is the more euphonious of the two and it might have turned out "catastrophic" to have adopted "geostreptic" !

Napier Shaw chose the pleasanter sounding word for the first time in *The Meteorological Glossary* first printed in March 1916. Shaw is not shown as the author of this publication (M.O 225i *The Weather Map*) but Gold was certain that Shaw was responsible. The Fourth Issue of 1918 gives Sir Napier Shaw, F.R.S. Director of the Meteorological Office, as the author.

Mick Wood
Ex Archivist, National Meteorological Archive, Bracknell

The last fifty years of hydrometeorology

NERC's Institute of Hydrology was founded fifty years ago and to mark the event the book *Progress in Modern Hydrology – Past, Present and Future* had recently been brought out. It describes the history of the research programmes from all the related hydrological disciplines represented at the Institute. Of greatest interest to History Group members is the chapter *The Physics of Atmospheric Interaction* authored by Colin Lloyd and Sylvia Oliver. It begins with the story of hydrometeorological research from the pathfinding programme at Thetford investigating the water and energy balance of dry forest area in East Anglia. It continues with subsequent similar projects in the UK before going on to describe the many overseas programmes in France, Spain, Brazil, Africa and the Arctic.

Several other chapters, in particular those on Basin Studies and Instrumentation and Climate Change and Hydrology, also contain much of relevance to the recent history of meteorology.

The 400 page hardback book, edited by John Rodda and Mark Robinson, is published by WILEY Blackwell and available for around £70.

Howard Oliver

History Group Occasional Papers published in 2015

Members will know that Occasional Papers have been produced by the Group at quite regular intervals. 2015 was a prolific year for new Papers with four published. We note that the last two to have been produced were written by Malcolm Walker.

No. 15: *'John Wesley, Travelling Weather Observer'*, by Dr. Howard Oliver.

No. 16: *'January 1809: Synoptic Meteorology of Floods and Storms over Britain'*, by David E Pedgley.

No. 17: *'The Field Courses of the Royal Meteorological Society'* by Malcolm Walker.

No. 18: *'James George Tatem, William Henry White and early Meteorological Societies in Great Britain'* by Malcolm Walker.

These are available online at the Society's website: <http://www.rmets.org/publications/occasional-papers>

News from the National Meteorological Library and Archive (NMLA)

Over the last few years the NMLA have been working towards a new archiving capability that provides a safe and secure repository for our digital library and archive content. Digital preservation lies at the heart of this archive which means we are able to protect and preserve our digital content for the long-term just as we have been doing with our paper records for so many years. The solution addresses the important need for digital preservation as well as offering direct access to our customers. The Met Office Digital Library and Archive is an important development of our commitment to preserve and make available the National Memory of the Weather. It provides access to a growing collection of born digital content as well as copies of some of our older publications and unique archive treasures.

<https://digital.nmla.metoffice.gov.uk/archive/>

Archive Structure

The archive is organised into a series of "collections" and "records" and at the lowest level "files".

Content currently available by collection name

Corporate Publications

- Barometer

Observations

- Daily Weather Report 1860 to present day
- Summaries of the Monthly Weather Report
- Symons British Rainfall series
- Snow Survey of Great Britain

Meteorological Publications

- Meteorological Magazine ("Met Mag")
- Forecasters' Reference Book
- Source Book to Forecasters' Reference Book
- Handbook of Weather Forecasting

Met Office Science

This comprises a selection of technical reports including the Forecasting Research Technical Report series and the Ocean Applications Technical Note. The Hadley Centre Technical Note series will be uploaded shortly.

Archive Treasures

In this collection we aim to bring together some of unique archive records to illustrate the fascination and wide ranging materials we hold in our archive collections – including some of the rare books and records we hold on behalf of the RMETS.

Accessing the Digital Archive

All of the content held in the digital library can be found by searching our online catalogue at <http://library.metoffice.gov.uk> and from here you can link to any of our available electronic content. You can also browse the archive collections directly by visiting <https://digital.nmla.metoffice.gov.uk>





We are also promoting our archive treasures through the Met Office web site and these pages give a flavour of the range of materials that form our paper archive. You can visit our treasures page at <http://www.metoffice.gov.uk/learning/library/archive-hidden-treasures>

The pages currently include:

- [Rare Books](#) – a growing collection of texts by many of the most outstanding scientists and meteorologists of their times
- [Robert FitzRoy and The Daily Weather Reports](#) - a brief history of FitzRoy and the daily weather reports
- [The Royal Charter Gale](#) - an account of the Royal Charter Gale and its consequences for weather forecasting
- [The Beaufort Scale](#) - extracts from the private weather diaries of Sir Francis Beaufort, including the Beaufort Scale and Battle of Trafalgar
- [D-Day](#) - a selection of synoptic charts and archive records related to the D-Day landings



Digitisation currently in progress

We are continuing to scan and quality control existing content from the library and archive and the following will be added to the digital archive over the coming months

- Marine Observer
- Quarterly Weather Report of the Meteorological Office
- Geophysical Memoirs.
- Minutes of the Meteorological Committee.
- Met Office Annual Reports from 1857
- Scientific and Technical Review
- Report of the Met Dept Board of Trade 1862.
- The Weather Map

- The practice of weather forecasting
- Handbook of meteorological instruments
- Meteorological Glossary
- Handbook of Aviation Meteorology
- Elementary Meteorology
- A course in elementary meteorology (1962)
- A century of London weather (1952)
- London weather (1968)
- Forecasters' reference book
- Meteorology for mariners
- Marine observer's handbook
- Scientific Papers Nos.1-42 (loose copies)
- Professional Notes Nos.1-126
- Observer's Handbook
- Weekly Weather Report
- Monthly Weather Report 1884-1993
- Daily Weather Summary 1981-2002

The Scottish "Red Book" series 1856-1913 held at the Edinburgh Archive

In 1856 the Scottish Meteorological Society set up a network of stations to help in the 'investigation of the meteorology of Scotland'. Observations were taken daily and the monthly returns were sent by the observers to the Society. The earlier forms are stored loosely in boxes but from 1866 these forms were bound together in a series of very large and cumbersome books, two for each year.

The data contained in the books is unique and very valuable as a memory of the weather at the time. Continued use is causing damage to the forms which is leading to loss of some data. Many of the forms are fragile and are particularly vulnerable along the lines of where they were folded for posting. This combined with the size and quantities of the forms in each book make them vulnerable to tearing when the pages are being turned. Each request normally necessitates access to many books (years of data for one or two stations). It is therefore important that we limit public access to the books as much as possible to prevent more damage and loss of valuable data and stamps.

In addition to the Scottish stations the collection also contains returns from foreign stations including stations in Syria, Cyprus, Jerusalem and Iceland. Some Welsh, Isle of Man and English stations such as London and Kew are also included. Again this is thought to be the only source of daily data and is therefore extremely valuable for research purposes.

The Library and Archive funded a two year project to have these scanned for both access and preservation purposes and this has now been completed. A quality control process (QC) is now underway and when this is complete the original forms will be transferred to National Records of Scotland and the digital version will be uploaded to our digital archive. The QC phase is time consuming and likely to take some months to complete but we are already providing the scanned files to customers in order to answer related enquiries.

Sarah Pankiewicz
Library and Archive Manager

Edmund Halley's second voyage on the *Paramore*

Although best known as an astronomer, Edmund Halley also carried out important work in the fields of navigation and oceanography. Between 1698 and 1701 he led three government sponsored voyages to study magnetic variations, ocean currents and tides on the "pink" the *Paramore*. [A "pink" is a ship design originating from the Netherlands with three masts, flat bottom and bulging sides]. He reported his findings to the Royal Society both at its meetings and in written reports. Halley's logs were also formally published with additional annotations by Alexander Dalrymple in 1775. A superb volume containing his logs with Dalrymple's notes, together with relevant letters and articles and a separate folio of charts, was published by the *Hakluyt Society* in 1980. Copies of these volumes are still readily available.

The second voyage which sailed from Deptford on 16 September 1699, was focussed on completing the study of magnetic variations in the Atlantic that he had begun during his first one. This time, regular wind speed and direction observations were supplemented by measurements of atmospheric pressure and air temperature. The voyage included Cape Verde Islands, Trinidad, Rio de Janeiro, St Helena, Barbados, Bermuda and Newfoundland. At its most southerly point they reached the iceberg-strewn seas of latitude 50 deg. S.

The wind, pressure and air temperature data contained in the log form a useful basis for study but, as is common for this era, suffer from the lack

of consistent calibration to allow direct comparison with other data as explained in the following paragraphs.

Wind

In 1686 Halley had published his paper and charts on trade winds and monsoons and established the relationship between sea level and atmospheric pressure. He had also identified solar heating as the cause of atmospheric motions. Further information on this subject can be found, for instance, in 2006 *History of Meteorology* paper on Hadley's Principle by Anders Persson.

During the *Paramore* voyages very precise wind directions were again recorded at least once per day. However the associated wind speeds have to be deduced from about thirty different terms used! For instance the term "gale" is generally used simply to mean any significant wind speed is frequently used and is normally accompanied by a vast range of qualifiers including: small, gentle, fine gentle, gentle fine, moderate, steady, fresh, pretty fresh, steady fresh, fine, stout, hard, very hard. Many other terms were also used ranging from calme (sic) and small breeze to blowing hard, stormy very violent and smart tornado.

The use of such a complex qualitative set of terms really shows the need for the Beaufort sail deployment and sea state wind scales gradually introduced from the early 1800s.

Atmospheric pressure

The readings by the barometer used on the voyage vary between a high of 30.01" and a low of 27.40". Relative, but of course not absolute, values can probably be used with some confidence. Halley does show that he well understood the increasing possibility of overcast and rainy weather with decreasing pressure and the clearing tendency associated with increasing pressure.

Some unexpected meteorological effects were occasionally noted in detail. For instance:

"It was very remarkable, that the Barometer, which had been very Low with moderate North and NW: winds began to rise as soon as the wind vered to the Southard, and rose all the time of the storm, contrary to what I ever observ'd of it; which is, that it never rises till the Storme begins to abate, it is to be observ'd also, that this Southerly wind warmed the Air and the Thermometer started upon it, when all the late Northard winds had no effect, Contrary to any apparent cause"

Air temperature

A universally understood temperature scale requires a pair of easily reproduced fixed calibration points and this was by no means the case for well over the first century of their development. To give a few examples: Sanctorous used a candle flame and snow (~1600); Hooke, freezing distilled water (1663); Boyle, congealing aniseed oil or freezing water (~1665); Newton, melting snow and blood heat (1701). Halley himself used the temperature of deep caves and boiling spirit. It was not until scientists such as Farenheit using ice/water/salt mixture, ice/water mixture and blood heat (1720) and Celsius with melting ice and boiling water (by 1741) that reproducible scales became possible. A full account of these developments is available in *Inventing Temperature – Measurement and Scientific Progress* by Hasok Chang which can be readily accessed on-line.

The temperature readings in the annotated version of his log range from 101degrees at 7°N on 2 November to -4degrees at 52°S at the end of January. The readings exist for the period 27 September 1699 to 10 March 1700 and then end abruptly [perhaps the instrument was broken?]. Halley was quite unprepared for the cold during the Southern summer of January/February 1700 as these extracts testify:

30/31 January: *"At nine in the Morning the Wind came up extream Cold, The Thermometer being below the Frezzing point in my Cabbin. If the Easterly winds should sett in I should have a long passage and endure the Severity of the weather in these tempestuous Climates, and endanger my mens healths who are all very tender by being so long near the sun..... We had very serene weather but though the Sun Shone out very clear for 7 houres, he had not force enough to warm the Air, but the Thermometer continu'd below the freezing point."*

In the following days they sailed close to large icebergs which they first took for land. When they got close enough to find they were solid ice, and despite failing to make a sounding, Halley still felt they had to be grounded and not floating. It was with some difficulty that they extricated themselves from the ice fields.

The voyage eventually safely reached Deptford again on 7 September 1700. Among the varied information collected over his first two *Paramore* voyages, Halley had successfully amassed sufficient

magnetic data to produce the much needed first reliable map of compass variations over the whole Atlantic from 60°N to the “Icye Sea” towards 60°S. This chart is beautifully reproduced in the folio which accompanies the Hakluyt Society publication.

Howard Oliver

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