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

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THANK YOU

from Malcolm Walker, History Group Chairman

I sent out an email to History Group members on 11 December 2013. If you do not have an email address, then you did not know of my request! This is what I said:

I shall not be in a position to do the amount of filling in that I normally do when I come to produce the next two newsletters (which are scheduled to be published in March and July 2014). I am up to my eyes writing a book, and it's nothing to do with meteorology. It's about the organs and organists of Exeter Cathedral.

I am asking for articles long or short, please. Are there any unsung heroes of meteorology or physical oceanography you want to write about? Have you any reminiscences or anecdotes you'd like to recount? Or anything else that's relevant? Photographs of people or old instruments, maybe?

It would be very helpful to me, please, to have contributions for the newsletters, please.

As you will see from this newsletter, the response has been superb. We have an issue of 32 pages. Many, many thanks. Can we manage that again, please, in the summer 2014 newsletter? A couple of people have already promised articles.

If you wish to comment on any of the articles in the current newsletter, do, please, send me what you'd like published in the next newsletter.

If I have forgotten to include any submission you thought would be published in the current newsletter, please let me know. My most humble apologies if I have done that.

RIP

You will see from the above Contents list that Eric Harris has sadly died. He was a great supporter of the History Group from the outset and was a committee member for many years.

Sadly, Christopher Wilson has also passed away. He ran the meteorology group at the Norman Lockyer Observatory, Sidmouth, and some of you will recall that he gave a talk at the Observatory when the Royal Meteorological Society visited in 2010 during the Society's Summer Meeting in Devon.

We send our most sincere condolences to the families and friends of Eric and Christopher.

FORTHCOMING EVENTS

Meeting suggestions are greatly welcomed. Please send ideas and suggestions to Malcolm Walker (contact details on page 32).

Here is information about the next three meetings.

☐ **THE HISTORY OF WEATHER SHIPS**
Saturday 22 March 2014, 11.00am to 5.00pm
University of Birmingham, Geography Department
This is a National Saturday Meeting of the Royal Meteorological Society organized by the History Group.

The booking form for the meeting has been sent out to all History Group members. If you have not received one, please contact Malcolm Walker (contact details on page 32). There is no charge for attending this meeting, but **pre-registration is required**.

☐ **THE METEOROLOGY OF D-DAY REVISITED**
Saturday 17 May 2014, 11.00am to 5.00pm
The Halton Gallery of the RAF Museum, Hendon
A National Meeting of the Royal Meteorological Society organized by the History Group.

The meeting will not go over old ground (so to speak). Much has been published over the years about the meteorology of D-Day. Rather, the intention is that we explore knowledge that has come to light in the past two or three decades which helps clarify and correct who knew what about weather developments in June 1944 and how they knew. The meeting will consider, *inter alia*, the availability of meteorological data from Ireland, the North Atlantic and NW Europe, the reliability of J.M.Stagg's book *Forecast for Overlord*, and the forecasts for early June 1944 made by the Germans.

SPEAKERS

Brian Booth
Yes, a cold front has appeared from somewhere ..... ", extract from Stagg's "Forecast for Overlord".

Anders Persson
Right for the wrong reason? A critical look at some D-day myths

Donard de Cogan
A report from Blacksod (Belmullet) was crucial in deciding which team of forecasters had the right analysis.

Adrian Simmonds (ECMWF) will present a reanalysis of the D-Day weather situation made by means of modern techniques.

The booking form for this meeting will be sent out very soon. As with the Birmingham meeting, there will be no charge for attending, but **pre-registration is required**. Again, contact Malcolm Walker for information about the meeting.

☐ **HISTORY OF THE GREENHOUSE EFFECT**
Wednesday 15 October 2014, 2.00 to 5.00pm
Imperial College, London
A 'Classic Papers' meeting of the Royal Meteorological Society organized by the History Group.

SPEAKERS

Ed Hawkins (University of Reading)
A brief history of climate science: from Fourier to Callendar
Dr Hawkins will discuss the first studies on climate science, starting with Fourier, and including Tyndall, Arrhenius and Callendar.

Keith Shine (University of Reading)
The dawn of modern climate modelling – early one-dimensional studies
The pioneering one-dimensional radiative-convective models in the 1960s, and related studies during the 1970s, firmly established many of the fundamental theoretical understandings of how carbon dioxide causes climate change – and much else besides! They are remarkable in how they have withstood the test of time, and even now can act as a source of inspiration.

John Mitchell (Met Office)
The dawn of modern climate modelling – early three-dimensional studies
Manabe and Wetherald performed the first three-dimensional climate change modelling experiments in the mid 1970s. Their analysis of their results is an exemplary example of how to use models to understand the physical basis of climate and climate change, and their main findings still are valid almost forty years on.

Clive Rodgers (University of Oxford)
Calculating radiation, with and without computers
Methods of calculating radiative transfer, starting with radiation charts and describing the various approximations that were used – and then dropped as computers became more capable.

John Harries (Imperial College)
The 2014 Mason Lecture on Greenhouse Effect satellite observations.

Further information about this meeting will be available fairly soon. It will be sent to History Group members in due course.

LECTURE DISCUSSION
by Austen Birchall

Towards the end of 2013, I attended the following lecture that was held at the Met Office as part of the Hadley Centre's Climate Research Internal Seminar series:

Can we detect long-term global change from sparse 135-year-old ocean data?

which was given by Dr Will Hobbs from the ARC Centre of Excellence for Climate System Science, and the University of Tasmania. In this lecture, Will described how he and a colleague, Joshua Wills from NASA/Caltech Jet Propulsion Laboratory, had compared some ocean temperature data which were obtained by HMS *Challenger* as part of her survey of 1873-1876 with modern observed data and also with data that were calculated using modern day climate models. After doing this, Will went on to describe how he had come to the conclusion that an ocean temperature rise had occurred since HMS *Challenger*'s times and that "early twentieth century warming is highly likely to due (sic) to an anthropogenic forcing" (Hobbs & Willis, 2013a, online).

For the purposes of this newsletter, I had intended to write up a (relatively) formal review of this lecture; however, when I went back to my notes I soon realised that some of the articles that are freely available online and which describe Will and Joshua's work are far more comprehensive than anything that I could produce, so I felt that it would be better simply to cite these and then let readers follow up on the references should they wish to do so. So doing this: some of the articles that I have accessed online are 'Historical sea voyage sends manmade warming signal' (andyextance, 2013, online), Will's lecture slides: 'Can we detect long-term global change from sparse 135-year-old ocean data?' (Hobbs & Willis, 2013a, online) and Will and Joshua's journal paper 'Detection of an observed 135 year ocean temperature change from limited data' (Hobbs & Willis, 2013b, online).

However, in addition to doing this I thought that I would comment briefly on a few of the points that I picked up on from this lecture. First, I was struck by Will's description of HMS *Challenger*'s staff as 'Victorian scientists' and how that this implied that the temperature data that they have left us were gathered through a lot of high quality, precise and detailed work. However, in spite of this, Will identified some 'issues' with HMS *Challenger*'s data, among these being that even on a four-year voyage it was impossible for HMS *Challenger* to survey the *complete* globe, which inevitability meant that there were geographical gaps in the data. In addition, Will also talked about the sounding line bias that occurred when strong sea currents carried the thermometers that were suspended from the ship to shallower (and thus warmer) waters than the fixed lengths of rope that they (the thermometers) were attached to would indicate which meant that they gave an incorrect reading. As Will noted, assuming that ocean temperatures had indeed risen since HMS *Challenger*'s time then the more accurate measurements we take today with regard to the depth meant that this sounding line bias could actually lead to an under-estimation of any temperature differences that were found when comparing HMS *Challenger*'s data with modern-day ocean temperature datasets. (Incidentally, sounding line bias does have the potential to occur in modern day observing systems but as Will later reminded me: 'modern CTD sensors on survey vessels also suffer from 'line out', but because those systems have pressure sensors they have a much better estimate of the 'true' depth of the observation than was possible using the sounding line length alone' (Hobbs, 2014).

In addition, I was also intrigued by Will's use of model output in a historical context. Now, as somebody who has no formal background in climatology or even the physical sciences, I don't mind admitting that I found some of the terminology that was used in this lecture and some of the more technical aspects that were presented in it well outside my 'comfort zone'. (To be fair to Will, I think I should say here that the likes of me were not the main target audience for this lecture, so I don't see this as a bad thing). Perhaps as a consequence of this it seems that I came away from this lecture with an incorrect impression of how Will and Joshua used model output, as, rather than using it as actual source data, they in fact used it as a kind of quality control mechanism. Once again, I think that Will himself can explain this far more clearly than I could and he states that:

"We used the models to quantify the uncertainty in estimating global ocean temperature change from two relatively short periods (Argo and Challenger) of spatially-sparse observations. We also used the models to show that the observed warming was only reproducible within error bounds when anthropogenic forcings were included in model experiments." (Hobbs, 2014)

This was an interesting lecture which (yet another) search online reveals was given at a number of scientific institutions throughout the UK during the latter half of 2013. In addition, it would also seem to be the case that the implications of Will's and Joshua's findings were discussed in at least some parts of the mainstream media. So, in conclusion, I would like to commend Will and Joshua for producing a thought provoking piece of work and also to thank Will for presenting it to us at the Met Office in Exeter.

REFERENCES

Andyextance (2013) 'Historical sea voyage sends manmade warming signal', *Simple Climate*. http://simpleclimate.wordpress.com/2013/06/08/historical-sea-voyage-sends-manmade-warming-signal/
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Hobbs W., Willis J. (2003a) *Can we detect long-term global change from sparse 135-year-old ocean data?* [pdf]. http://www.clivar.org/organization/wgomd/sealevel/agenda
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Hobbs W., Willis J. (2003b) Detection of an observed 135 year ocean temperature change from limited data' [pdf] , *Geophysical Research Letters*, Volume 40, Issue 10, Article first published online: 21 MAY 2013. Available at: http://onlinelibrary.wiley.com/doi/10.1002/grl.50370/pdf
accessed 09 Jan 2014

A LINCOLNSHIRE BALLOON FLIGHT by Roger Phillips

On October 7 1811, "Mr Sadler, accompanied by Mr John Burcham of East Dereham, made his 21st ascension from Vauxhall, near Birmingham, amidst an immense concourse of spectators."[1] So ran the opening sentence of a report in *The Gentleman's Magazine* of October 1811. The report included temperatures, pressures, indications of wind direction change and rough positions. From this information, an estimate of height and wind speed has been attempted. I have taken all data at face value and, therefore, errors are acknowledged. Pressures are also accepted as being above ground level (QFE). The balloon, when filled, measured 40 feet high and 36 feet wide.

At 14:20, the balloon rose rapidly towards the North East by East (approximately 060 degrees.). After three minutes, the craft entered cloud. If a rate of ascent of 6 metres per second is used (the standard rate of ascent of a modern pilot balloon), then this gives a cloud base of about 3000 feet. The report then says that the craft soon cleared the cloud, suggesting a patch of thin stratocumulus of isolated cumulus.

At 14:30, the temperature was recorded as 50 degrees, probably Fahrenheit, and the pressure 24, probably inches. When converted, this gives a temperature of 10 degrees Celsius and a height of around 9000 feet.

On clearing cloud, Lichfield, Coventry, Tamworth and Atherstone appeared nearly beneath the voyagers. At 14:40, Leicester was noted bearing East. At this point, the report suggests, there was a change in wind direction. "In the neighbourhood of Leicester, the wind shifted due East, and in that direction they proceeded towards Market Deeping, in Lincolnshire…"[2] If the wind had been from the east, they could not have travelled towards Market Deeping, but would have headed west towards the Welsh Border. Therefore, the wind must have been westerly. For the climb, based on times and rough positions, the wind direction and speed is possibly 240 degrees at about 70 knots.

At 15:14, the temperature had fallen to 38 degrees F and the pressure to 18 inches; i.e. a height of about 13,500 feet and a temperature of 3 degrees C.

At Market Deeping, the craft had reached its greatest height, estimated at "two miles and one half," or 13,200 feet. This may well be a little higher when compared to the pressure noted at 15:14. At this point, the 'aeronauts' saw the towns of Peterborough, Stamford, Wisbech and Crowland, amongst others. Again, at this point, "Mr Sadler, perceiving a current of air passing under him to the Northward, deemed it prudent to descend, in order to avoid being carried out to sea."[3]

On descending into this airstream, Spalding was observed to the right and Bourne to the left. After all the ballast had been thrown out, the balloon first struck earth to the south of Heckington. Grappling irons were thrown out to little effect and

[1] *Gentleman's Magazine*, October 1811, pp. 379 and 380.

[2] *Ibid*, p. 379.

[3] *Ibid*, p. 380.

Mr Sadler," having hold of the valve-line was, by a sudden jerk, caused by the grapple taking hold for an instant, thrown violently out, and unfortunately received several contusions to the head and body." He did, however, remind Mr Burcham to remain in the car. Eventually, the balloon came to rest at Asgarby, about a mile and a half from the place at which Mr Sadler was thrown out, at 15:40.

The total time taken for the voyage was 80 minutes and covered about 100 miles. This gives an average speed of about 65 knots. While speeds and heights are very approximate, due to the coarseness of the recorded data, the actual voyage has all the hallmarks of a great adventure.

May I now ask for comments, good, bad or indifferent, so that I may refine the method of interpretation for possible future use.

A HISTORY OF THE 'DISCOVERY' OF THE NORTH POLE
by Jim Rothwell

Early Arctic explorers and mariners brought back amazing tales from their frigid travels across an almost unknown and uninhabitable sea of ice which was often impossible to explore for most of the year in their fragile wooden ships. During the late summer months, however, the fringes of the pack ice occasionally yielded to reveal quite large areas which were mostly clear of solid ice, even in high latitudes near the North Pole. Such 'tales' persisted for many years from the Late Mediæval Period up to the more recent years of famous and well-organized Arctic explorers such as Nansen and Peary.

The earliest known report was from a mariner known as Nicholas of Lynn in 1360. After getting through many miles of pack ice and using leads (elongated areas of open water which may be encountered even at high latitudes above 80 degrees North), he described the area of the North Pole as being of "open sea" in which whirlpools were seen, and also what appeared to be "dark rock formations". Such amazing sights were supported by another explorer Samuel Purchos, who described the Pole as being of "temperate waters". In 1507, an early cartographer Johannes Ruysch was not quite sure whether to place the North Pole as an area of land, as was done by the famous cartographer Mercator in 1595. Also, a Norwegian explorer during the summer of 1594 (at the supposed height of the Little Ice Age) sailed first north, then east into the Kara Sea located to the north of Siberia, and then south up the massive Siberian River Ob for many miles. Even as late as 1845, the Secretary of the British Admiralty (John Barrow) promoted a major expedition to settle the reality of conditions at or near the North Pole.

In the United States, the explorers Kane and Hayes both claimed to have seen part of this elusive body of the sea. In the 1850s, Matthew Fontaine Maury included a description of 'the open Polar Sea' in his textbook *The Physical Geography of the Sea*.

Volcanic activity is known to be present in the Arctic, and one of the largest and most interesting locations is the Lomonosov Ridge of sub-surface mountains. These stretch from NE Siberia to north Greenland, with a sharp 'kink' in the vicinity of the North Pole.

Near the end of the nineteenth century, the American Arctic explorer Peary, who some believe was the first person to reach the North Pole, returned with some very interesting and relevant observations taken at or near the Pole. At a large lead, the air temperature adjacent to the water was minus 45°C and the water temperature would have been about minus 1°C (sea water freezes at about minus 2°C). The resultant very rapid evaporation of the sea water into the extremely cold air around and above it caused a very dense and dark fog, "as black as a prairie fire" said Peary. If Peary observed all this, it may well explain much of what the early explorers had seen centuries before. The extremely rapid evaporation of sea water at very low air temperatures would almost certainly have produced vigorous turbulence within the sea water and so appear to the mariners as whirlpools. The effect of Atlantic storms into high latitudes was to cause considerable chaotic motion of the ice, breaking it into large mainly flat ice floes, which were then forced into more vertical positions by the very great motions of the sea, and so some of the floes eventually bore some resemblance to high rocky formations, as photographed by Peary. With the effects of thick 'ice fog' and the apparent whirlpools, it is not at all surprising that some of them may well have reasonably viewed this as the North Pole. The only negative factor would have been that of poor navigation, and hence precisely where they were, but nevertheless they were probably in high latitudes which were not too distant from the North Pole.

This brief historical narrative may leave some of us a little wary of being too precise in our modern comparisons with the present state of the polar ice, as well as giving these mariners of days gone by our wonder at their bravery and dogged persistence to find the fabled North Pole. When you next look north, give a moment's reflection for such men.

The vertical height of the ice 'mountain' was estimated by Peary at nearly fifty feet. In mist with a low sun behind him, it looked considerably higher, especially with a lead some four miles long and nearly a mile wide around it. Hence the mariners' 'tales'.

RECORDING THE WIND
by Howard Oliver

As someone, like many of our members, who used to spend many hours analysing yards of anemograph charts to obtain mean and maximum wind speeds and wind directions, I was interested to see how apparently little progress had been made over the century between the 1860s and 1960s.

The second (1867) edition of *Symons's Monthly Meteorological Magazine* includes descriptions of the latest anemograph equipment, two of which include recording systems produced by the famous names Casella and Negretti & Zambra.

The Casella system [described on pp.110-112] uses a four-cup anemometer recording onto a narrow strip of paper and is illustrated in the figure (right). Its mechanism is described verbatim as below.

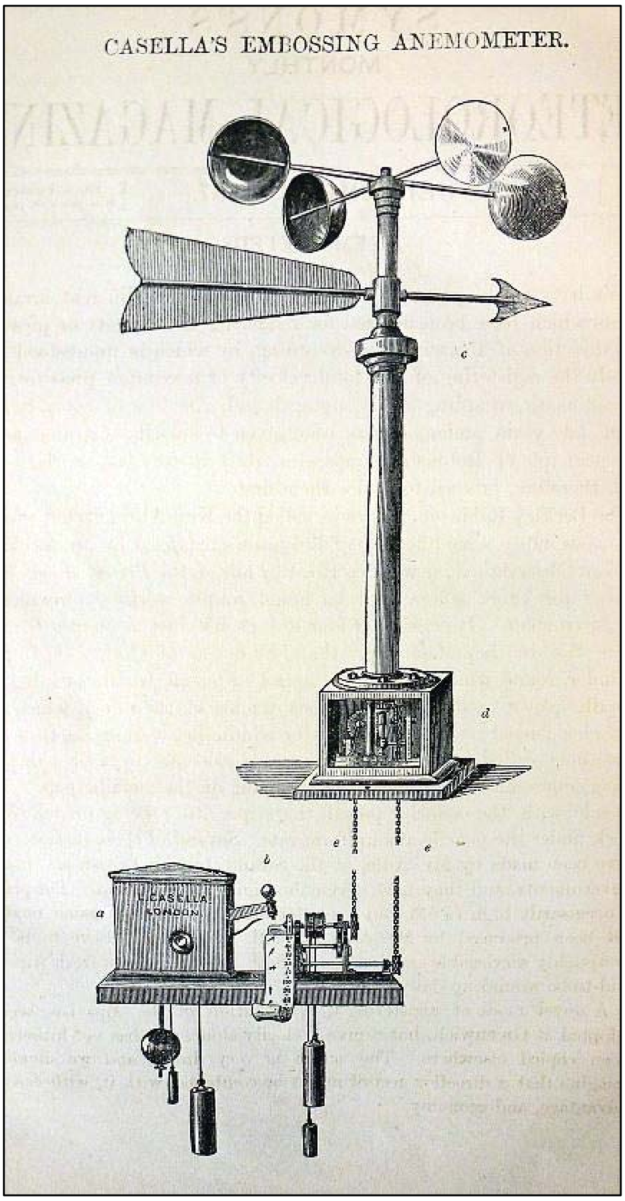
"The paper employed is a narrow strip, wrapped round a small attached roller, from which it is drawn, and embossed on one edge by the action of the rollers, as shown in the sketch.

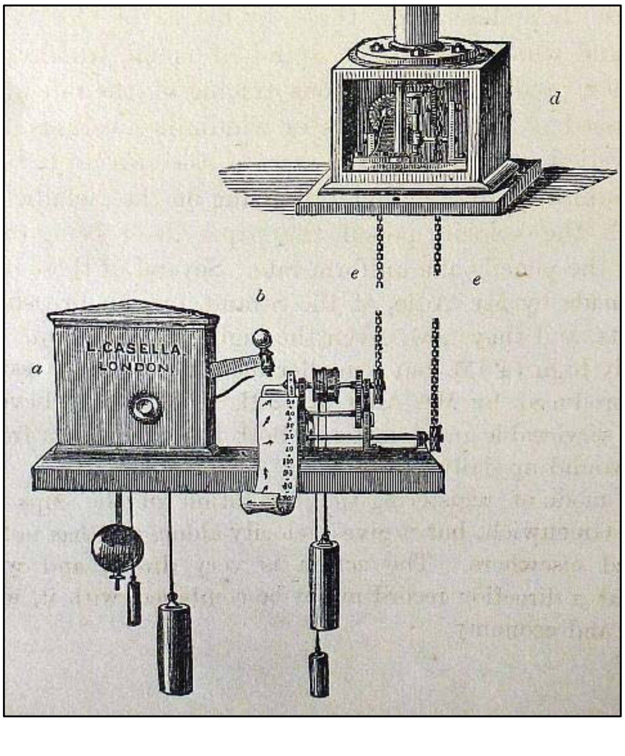
The rollers are divided to represent single miles; they are figured at every ten, and one revolution shows the wind to have travelled fifty miles.

The clock (*a*) raises the small hammer (*b*) which falls once every hour, impressing the other edge of the paper with a small arrow, whose movements are identical with the larger ones at the top, and thus shows the exact direction of the wind at the time, and the distance between the arrows shows the rate of speed during each hour.

The paper is of sufficient length to last six weeks, and the clock may be wound up daily or weekly as desired.

The projection (*c*) contains metal balls, which firmly support the top and give freedom of action. The box (*d*) of cast iron, contains the stronger portion of the





wheel work, and has holes in the flange for screws or nails, by means of which it is easily fixed to the roof of a house, or on a pole in the garden or field, or by the sea-side.

The chains (*e e*) act on *improved* rollers, over which they *cannot pass* without turning them, and are brought into connection with the clock work and registering parts, placed in a room or box for protection, at any vertical distance from the base, from three to twenty five feet.

In size, the height of the upper part is 39 inches from the base of the box (*d*), the diameter over the cups is 24 inches, and its strength and general construction such as to bear the vicissitudes of the severest storm. Where frequent is requisite, or in places of difficult access, the little attention required in using this instrument can hardly be over-estimated. The action of each is tested, and guaranteed to give precisely the same rate of speed as that of the Standard Anemometer of the British Association (BA) at Kew.

The cost of this instrument is £32."

[The Kew (Beckley-Robinson) anemometer is also a four-cup system as described in the BA report for 1858 and produced a single day continuous trace of the wind speed on metallic paper. A few systems using 'windmill governors' to indicate wind direction were also constructed (costing £65) and were reported to have given "highest satisfaction" for the British and other Governments.]

The second, very different, anemograph system, which also includes a chart-recording rain-gauge, will be described in our next newsletter.

DICKENS AND SCIENCE
by Julian Hunt

Reproduced from *Trinity Annual Record*, 2012, pp.119-127, with permission.

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The common view

Like others, when I first read Charles Dickens's novels, *David Copperfield*, *The Pickwick Papers*, *Great Expectations*, and *Hard Times*, I was bowled over by their great characters and their adventures in their vividly described Victorian milieux of school and business, law and and crime, on the beach at Yarmouth or in London's foggy streets. Everyone has their own reactions and maybe learns different lessons; I laughed a lot, to the annoyance of my wife, as I took many weeks slowly reading of *Dombey & Sons* amid the changing scenes of North London and the arrival of the railways. My cautious approach to finance has probably benefited from Mr Micawber's advice that if one's income only just exceeds expenditure that leads to happiness, but if otherwise then misery. But I did not think I was reading novels written by someone with a deep appreciation of science and its wider intellectual and cultural connections.

Like most readers, I generally thought of Dickens as being highly critical of the social and environmental consequences of the scientific and industrial revolutions of the nineteenth century. This was the moral aspect of his novels that the literary critic F R Leavis so much admired. His descriptions of the polluted atmosphere and rivers – the Great Stink – and their effects on people's health are even known to politicians, as the leader of the Green Party in the House of Commons, Caroline Lucas, recently reminded readers of *The Guardian*.

A reassessment

My view of Dickens's interest in science changed completely when I read his last novel *Our Mutual Friend*, published in 1865, which revealed his considerable knowledge of the great developments in science and how these had become part of ordinary people's understanding of the world around them, although this point has been missed by most critics of Dickens's writing as well as by his biographers. Dickens had written about science over many years in the magazines that he edited, *Household Words* and *All the Year Round*. These covered current affairs from politics to railways, and even science policy. Dickens's general view of science, which most journalists and politicians share today, was that there would be greater progress, even at a technical level, if science were explained better to the public and indeed to other scientists. His more profound and ambitious objective, in which he preceded Henri Poincaré's *Science & Method* by fifty years, was that science should inform the public so effectively that it would enable those who became interested in science to explore for themselves the wider implications of scientific ideas. This, he argued, would lead to a deeper appreciation and, to use the modern idiom, a greater public involvement in scientific issues.

Dickens put these ideas into practice through his literature, by surreptitiously popularising science as he wove the latest observations and even theories into the plots of his very human and apparently 'unscientific' novels. In at least one case, like other writers before and after him, by generalising certain ideas then current, he even proposed an important scientific concept before it had been considered in the scientific literature!

Satire and praise

At the same time, Dickens poked fun at scientists and their supporters – but no more than he did in all his books with respect to every professional and business character. In *Hard Times*, written in 1851, he ridiculed the standard school-masterly view of science as being a matter of 'stick to facts Sir – rout out everything else'. He mocked the amateur scientists who met at the Pickwick Club, driven ostensibly by pure curiosity, in order to consider 'speculations on the source of the Hampstead Ponds with some observations on the theory of tittle bats'. This was a gentle satire on the British Association for the Advancement of Science, which was set up in 1831 to popularise science and its applications. In *Our Mutual Friend* the gloomy wine waiter who, at a dinner party, pours out a dodgy Chablis – apparently a common problem then – is compared to an Analytical Chemist, saying under his breath 'you wouldn't drink this if you knew what it is made of.' In Dickens's view, any scientist in the City was also suspect, forming dubious companies like Collapse, Vortex, Docket & Company. He obviously had high-tech fluid dynamicists in mind.

But when it came to individual scientists Dickens wrote admiringly about them in his essays, particularly those whose work he used in his novels. John Dalton of Manchester, famous for his discoveries in chemistry, also wrote on meteorology. Dickens reviewed the latter in one of his essays, and meteorology then appeared again in *Oliver Twist* – in the wintry scenes of snow blown about in extraordinary patterns by the wind. Dickens also learned of the fearsome ocean waves experienced by the transatlantic travellers in *Martin Chuzzlewit* from the pioneer American Navy oceanographer and meteorologist, Lieutenant Maury:

"countless miles of angry space roll the long heaving billows. . . a boiling heap of rushing water . . . mad return of wave on wave, . . ending in a spouting-up of foam that whitens the black night; incessant change of place, and form, and hue; . . . louder howls the wind, and . . . the wild cry goes forth upon the storm 'A ship!' …"

Artist and naturalist

The science in Dickens's novels usually connects nature with people and animals. In the opening page of *Bleak House* (1852) one reads a naturalist's notebook transformed into art:

"Fog everywhere. Fog up the river, where it flows among green aits and meadows; fog down the river, where it rolls defiled among the tiers of shipping, and the waterside pollutions of a great (and dirty) city. . . Fog creeping into the cabooses of collier-brigs; . . .Fog in the eyes and throats of ancient Greenwich pensioners, wheezing by the firesides of their wards; fog in the stem and bowl of the afternoon pipe of the wrathful skipper, down in his close cabin; fog cruelly pinching the toes and fingers of his shivering little 'prentice boy on deck. Chance people on the bridges peeping over the parapets into a nether sky of fog, . . . as if they were up in a balloon, and hanging in the misty clouds."

One is reminded of Oscar Wilde writing in 1889: only artists enabled people to "see fogs, not because there are fogs, but because poets and painters have taught them the mysterious loveliness of such effects. There may have been fogs for centuries in London. But . . . they did not exist till Art had invented them."

Of Darwin and Kelvin

But no Oscar Wilde could have conjured up the extraordinary geological perspective that Dickens used, in the same passage in *Bleak House*, to deepen the mysterious gloom of the London scene:

"As much mud in the street as if the waters had but newly retired from the face of earth, and it would not be wonderful to meet a Megalosaurus, forty feet long or so waddling like an elephantine lizard up Holborn Hill. Smoke lowering down from chimney-pots, making a soft black drizzle, with flakes of soot in it as big as full-grown snow-flakes – gone into mourning, one might imagine, for death of the sun."

Dickens's last novel, *Our Mutual Friend* (1865), was written after Darwin's *Origin of Species* had been published in 1859. The great developments in classical physics and mathematics across Europe were also publicly debated, with scientists like Lord Kelvin and Sir George Stokes taking a prominent public role. The most dramatic scenes in this novel take place in the East End of London along the Thames, where an old man is being rowed by his young daughter in a small boat among the barges and sailing ships. She is horrified as he collects floating bodies for the sake of the few coins in their pockets. The description of the watery environment, on which their livelihoods depend, is focussed on the ripples, waves and eddies produced by boats and tidal currents. A then current apocalyptic explanation is given for the darkening, polluted, atmosphere – namely, the fading strength of the Sun:

"while the Sun itself, when it was for a few moments dimly indicated through circling eddies of fog, showed as if it had gone out and were collapsing flat and cold."

Several literary studies (e.g. Patrick Brantlinger in *A Companion to the Victorian Novel*, Blackwell, 2005) have suggested that this passage refers to the recent scientific studies by Lord Kelvin in 1862, following the earlier eighteenth-century analysis by Laplace in Paris, which concluded that the sun's power would gradually run down. This was an understandable error, for it was not until the mid-twentieth century that it was understood that nuclear fusion would keep the sun going for several billion years more.

Conversational science

Some novelists use conversations as a very effective way of introducing scientific ideas into their novels. In *Our Mutual Friend*, again, the Gaffer's children Lizzie and Charlie sit in their riverside house looking at the burning coal in the grate, waiting for their father to come home.

"Then as I sit a-looking at the fire, I seem to see in the burning coal – like where that glow is now – it comes like pictures to me Charlie."

"That's gas, that is,' said the boy, 'coming out of a bit of a forest that's been under the mud that was under the water in the days of Noah's Ark. Look here! When I take the poker – so – and give it a dig."

After being asked to think, earlier, about the mysterious future of the Sun, here the reader is taken on an imaginary journey back through time to some prehistoric era – of which many of Dickens's readers would have heard in the recent public debates about Evolution and the age of the Earth. The drama later moves to the water's edge, where the waiting becomes ominous. The father's boat fails to return. As elsewhere in this novel, the protagonists are carefully observing their surroundings:

At this time of their watch, the water close to them would be often agitated by some impulsion given it from a distance. Often they believed this beat and plash to be the boat they lay in wait for, running in ashore; and again and again they would have started up, but for the immobility with which the informer, well used to the river, kept quiet in his place.

This is a significant statement in which one could say that art is learning from science. A new concept is introduced: that an eddy or a vortex has an impulse, produced by a force, in this case by the movement of a boat. In fluid dynamics and mathematics this is a subtle and complex idea – still being studied today in different situations – because, although a vortex produces motions over a wide area in different directions, there is overall a net forward motion and force. Dickens cannot have got this idea from those scientific papers on the subject that are best known to us. Gustav Kirchhoff, in Germany, wrote the first paper on the concept four years after the novel was published in 1869, so Dickens could not have read Kirchhoff; nor was Kirchhoff influenced by Dickens. Kirchhoff's idea was later elaborated and publicised by Lord Kelvin, to become known as 'the Kelvin impulse'.

One can think of examples where art foretells advances in science and technology, such as the planets of Mars suggested by Swift in *Gulliver's Travels* or Jules Verne's travels by rocket in space and underwater, by submarine. But I don't think Dickens foretold this advance in fluid dynamics. If not, then where the Dickens did he get such a technical idea? Probably, in my view, from John Scott Russell, a railway and ship engineer who worked as the railways editor for Dickens in the Fleet Street office of his newspaper, *Daily News*. Russell was the man who first identified how waves had a force associated with them. He explored this idea in his famous experiment – reported to the British Association in 1845 – when he galloped at about 15mph along the towpath of a canal near Edinburgh, to measure the solitary wave or little mountain of water that moves under its own dynamics for a few miles along the canal when a barge suddenly starts to move. He then applied this observation to the design of steel ships – he was involved, with Brunel, in the construction of the Great Eastern – by attempting to minimise the force on the hull that is generated by the waves as the ship moves through the water, which he vividly described in a lecture at the Royal Institution. It seems quite likely that Dickens would have heard of all this from Russell and made the imaginative leap, but of this I have no proof. I cannot find any correspondence between Dickens and Russell on this topic – but nor does G. Emmerson, in his biography of Russell (1977), make any reference to conversations the two may have had in their newspaper office.

Returning again to the expectant party on the river, as they counted the hours, they made a further interesting observation.

The wind carried away the striking of the great multitude of city church clocks, for those lay to leeward of them; but there were bells to windward that told them of its being One – Two – Three.'

The fact that sound is apparently only carried downwind had been established experimentally in the 1850s; this is (still) surprising because the speed of sound, measured by Isaac Newton among many others, is much faster than wind speed near the ground. But in the 1850s, John Tyndall and Sir George Stokes had explained how, because wind speed increases with height above the ground, the wind bends sound waves upwards from downwind sources of noise, so that they cannot be heard on the ground in the upwind direction. Dickens's text perhaps implies that this is another new discovery, and in yet another new field of science, in this case acoustics.

Science and society

Dickens expressed his general ideas about how new fields of science emerge in his essay on 'History of a young ology' – in *All the Year Round* vol 6 (1861), p187 – his own term for the new sciences of geology, archaeology, meteorology, oceanography etc. He noted that in the early years of an 'ology' there may be a 'vast multitude of results' that might not be 'very accurate or very interesting'. He also recognised that individuals are important, especially at this stage, as in his attribution of progress in the new science of meteorology to Dr Dalton of Manchester. The leaders of science today might agree with this observation, even if they still cannot agree on how best to encourage new ologies. They would probably also agree with Dickens's – and later Poincaré's – views about the value both of explaining science to the wider public and of making connections between the different branches of science.

Dickens's thoughtful writing about science and its contributions to his novels is consistent with his affirmation in the last decade of his life about the broadly beneficial effects of science and technology on the nation and on people's lives. Peter Ackroyd's biography explains that, despite Dickens's reservations about the nationalistic tenor of the Great Exhibition of 1851, "at the very end of his life he was praising the major discoveries and inventions of his period" that romantic idealists like Ruskin and Morris disparaged. I would agree with Ackroyd's conclusion that "In that sense Dickens was very much a modern man, very much a man of his period, and highly sceptical about 'the good old days''." Scientists can certainly learn something, even today, from Dickens's ideas and how to convey them in brilliant writing.

Julian Hunt, Lord Hunt of Chesterton, is currently researching into the effects of climate change on the world's tropical coastlines. This article is based on a talk given at University College London in March 2012 and has benefited from advice given by Giles Foden and Adrian Poole.

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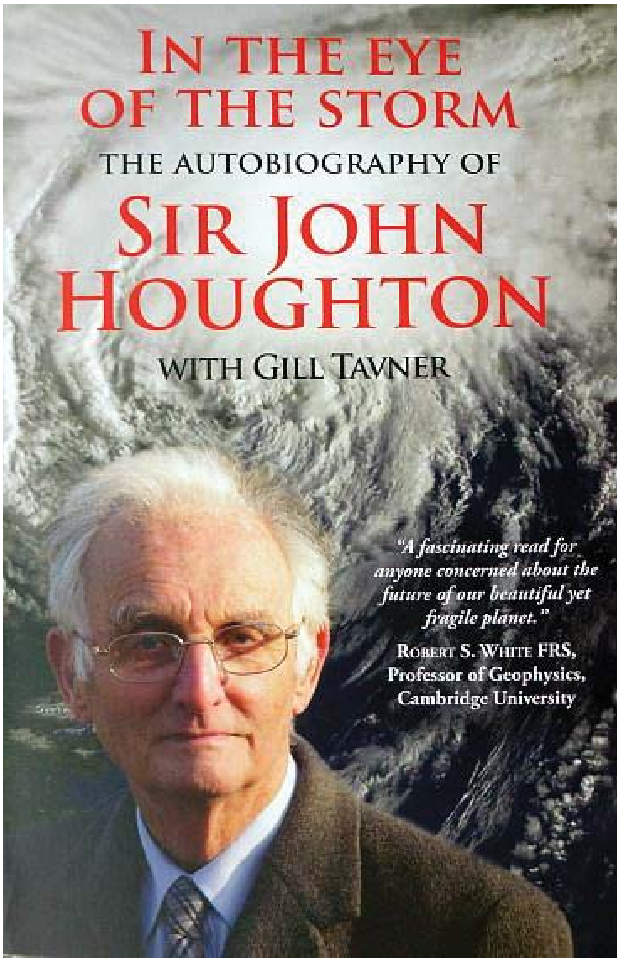
This list was published in *Transactions of the Meteorological Society* (London: Smith, Elder and Co., Cornhill, 1839, 152 pp.).

A PERSONAL IMPRESSION OF SIR JOHN HOUGHTON'S RECENTLY PUBLISHED AUTOBIOGRAPHY
by Howard Oliver

I first met John Houghton during my physics degree at Oxford, when I was studying the advanced option in atmospheric physics along with my soon-to-be fiancée, Sylvia. Subsequently, I well remember the excitement at post-graduate research seminars during the period when the successful data from the department's 'selective chopper radiometer' were being received and analysed. In later years we met occasionally, especially during his time at the Met Office and when he was president of our Society.

I also know him as a committed Christian, not only from his writings on the subject – both in his religious works (eg: *The Search for God - Can Science Help?*) and the related chapters in scientific books – but also as the person who kindly used to take my elderly aunt to church on Sundays.

A full account of John Houghton's remarkable career is now available to read in his autobiography *In the Eye of the Storm*. It is co-written by Gill Tavner and published in paperback by Lion Books.



The book takes its title from his account of the events surrounding the October 1987 gale when he was Director-General of the Met Office. He was supposed to be enjoying a family party that weekend to celebrate his engagement to his second wife, Sheila (his first wife, Margaret, having died some time previously after a long battle with cancer). The traumas of that period are vividly described, the aftermath, however, being conveniently reduced by the dramas of 'Black Monday'! John kept his job and Michael Fish has been able to use the adverse publicity he received to great effect on speaking engagements ever since!

During his impressive career Sir John has held a variety of key positions in areas of meteorology and climate. He has been professor of Atmospheric Physics at Oxford, Chief Executive of the Met Office, Director of the Appleton Research Laboratories, President of the John Ray Initiative and co-chairman of the IPCC science working group. The book presents a vivid impression of all these positions and is likely to be of great interest to everyone whether or not they themselves have worked in the field of meteorology.

However, the chapters go much further than a bald account:

Firstly, they include a good deal of scientific background information. This is often presented in the form of text-book style easily understood boxed paragraphs, so those who are not familiar with the science (or have forgotten it!) can get up-to-speed adequately to understand properly what is being discussed.

Secondly, they provide frank and illuminating descriptions of the behind-the-scenes goings on, especially the underhand misinformation tactics around the preparation and eventual publication of the climate change reports. It is truly eye-opening the read about what the mainstream scientists had to contend with!

Interspersed with the science chapters is the very personal account of the highs and lows of his family life and some very frank discussion of the importance of his Christian faith to his life and work. It ends with a challenging 'where are we now?' chapter which anticipates the publication of the latest edition of his book *Global Warming – the Complete Briefing* in 2014.

continued next page

Sir John at the Royal Meteorological Society headquarters in 1978 presenting to Her Majesty the Queen a rain-gauge for her Balmoral Estate.

The 300-page book includes a range of related notes and appendices together with a comprehensive index.

I found it an absorbing book which, as well as giving a vivid description of his personal life, research and past science, also presents a sobering account of the current and future climate problems of our globe. It provides a really interesting and useful history of a wide range of areas of meteorological science over the last sixty years and will be of special interest to members of our specialist group. I can thoroughly recommend it.

In the eye of the storm, the autobiography of Sir John Houghton, 2013, Oxford: Lion Hudson, 304 pages, paperback, £9.99. ISBN 9780745955841.

AN OCEAN WEATHER SHIP TRAGEDY by Alan Heasman

The UK Met Office operated Ocean Weather Ships (OWSs) from the late 1940s until the early 1990s. Although there were several medical emergencies and probably some injuries involving either the Met Office staff or the crew, there were, as far as I know, no fatalities during the several hundreds of voyages. The French were not so fortunate.

Like the UK service, the French meteorological service made use of redundant Second World War naval vessels to perform OWS duties. This included the substantial ex-USS frigate *Lorraine*, bought by the French navy in 1947 and renamed the *Laplace*. In September 1950, the *Laplace*, with 92 crew and meteorological personnel on board, was returning from 25 days on station west of Finisterre. She was en route to St. Malo to participate in the celebrations marking the inauguration of the new lock gates built to replace those destroyed by the Germans in 1944. On the evening of 15 September, because of darkness and unfavourable sea conditions, and despite the availability of a pilot, the *Laplace* anchored offshore in the Baie de la Fresnaye – an area marked on charts as not yet having been cleared of wartime mines!

At about a quarter past midnight there were two heavy explosions near the stern. It is assumed that she had been struck by at least one magnetic mine which she had triggered. Within a few minutes the ship had broken almost in two and had sunk. Those who had escaped the explosions found themselves in the water, struggling for survival amidst fuel spilt from the stricken ship. Many were swept away by the strong tide. Of the 92 personnel, only 41 escaped and were rescued. Captain Remusat and the chief meteorological officer M. Colcanat were amongst those who died.

Today the wreck of the *Laplace* lies inverted in about 25 metres of water (at high tide). The wreck is well known to divers but is considered to be rather dangerous to investigate closely. On shore, on the heights of St.Cast, there is a granite memorial to the tragedy.

The tragic incident was reported in the editorial of the Royal Meteorological Society's '*Weather*' magazine in October 1950. Currently, accounts with some photographs of the *Laplace* can be found on various internet websites.

WEATHER RECONNAISSANCE FLIGHTS

These online references to a German Wekusta meteorological reconnaissance aircraft that was forced down on Fair Isle in 1941 may be of interest:

- http://www.aircrashsites-scotland.co.uk/heinkel-he111_fair-isle.htm
- http://www.fairisle.org.uk/History/fair_isle_incident.htm

The last page of the second reference includes an account by the pilot of the aircraft, a Heinkel.

See also page 47 of *Wekusta Luftwaffe Meteorological Reconnaissance Units & Operations 1938-1945*, by John Kington and Franz Selinger (Flight Recorder Publications Ltd, 2006, 26pp.). ISBN 9780954560584.

HOW I FIRST BECAME INTERESTED IN WEATHER OBSERVING

by Peter Rogers

Some 60 years ago, when I was a teenager, my father was appointed British Trade Commissioner to Edmonton in Alberta, and, of course, we moved there as a family. We travelled across the Atlantic on the *Empress of Canada* in September, and I remember that it was a very stormy crossing. In fact, it was so stormy that almost nobody could keep their meals down, but I wasn't affected, so the waiters offered me second helpings of all meals! They were very skilful, moving with the fall and rise of the vessel (the ship didn't seem to be very well stabilised!), thus avoiding spilling the contents of the plates they were holding Only a few months later, *Empress of Canada* sank, though I can't remember where or how.

From Montreal we travelled across Canada by steam-hauled train, taking, as I remember, three days and four nights. My other abiding interest – steam trains – seems to have been kindled by that journey, though, of course, we didn't visit the Rockies on that journey.

We had been told to expect the ground to be snow-covered on arrival, and to remain that way till March. So I was a little disappointed that the weather was dull, drizzly and mild on arrival, with temperatures in the high 30s F. Conditions remained like that, with no snow at all, until a week or two before Christmas. Then, one Saturday, I was shopping for Christmas presents, and as the sun set, a number of 'mock suns' were quite clearly visible. The friend I was with said that a big change in the weather was on the way, and advised me to hurry home.

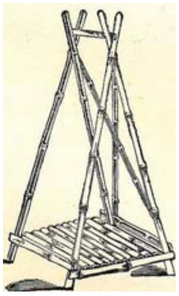
Houses on the Prairies had outer windows: storm windows to keep the cold out in the winter which were converted in the summer to netting to keep out mosquitoes. A thermometer, obviously calibrated in degrees F, hung on the outside of the window nearest to the front door so that it could be read from inside. Arriving home, I noted that the outside temperature registered 40F. Obviously it soon became dark, the wind got up and it snowed, though not particularly heavily. So I went to bed being curious about the change that this suggested was on the way.

The following morning, the sun was shining out of a pin-clear sky, so I looked at the outside thermometer, and to my amazement, it read minus 40F, indicating that there had been a fall of no less than 80F overnight! From then on, I was hooked on the weather, and shortly afterwards starting keeping a weather diary, which I have maintained ever since, though I pursued a career as a lawyer rather than as a scientist.

Edmonton certainly had a very continental climate, as in the course of a single year I experienced a minimum of minus 65F and a maximum of plus 95F. But the air was very dry, so that, in summer, the heat wasn't too enervating, but in winter, it was absolutely essential to be completely wrapped up to avoid frost-bite. Houses were kept very warm, and most shopping was, even in those days, in (over-) heated underground malls, while cars were plugged into heating points when not in use. The famous 'Chinook' rarely got as far north as Edmonton, but, in Calgary, 200 miles south and closer to the Rockies, it frequently occurred. Although I did not experience this personally, a friend told me that when he was in Calgary, the temperature rose from minus 10F to plus 35F in ten minutes, quickly melting the snow-cover. Hence the meaning of 'Chinook' – American Indian for 'snow eater'. The story, almost certainly apocryphal, is told of a man who had travelled to town in a horse-driven sledge. While there, he saw the 'Chinook arch' to the west, an infallible sign of an impending Chinook, so he leapt into his sledge and drove back to his farm as fast as the horse would travel. As he entered the farm yard, the horse's hoofs were in snow but the back of the sledge was dragging along on bare grass!

HOW DO YOU CARRY A BAROMETER?

From page 17 of the *The Indian Meteorologist's Vade-Mecum*, by Henry F.Blanford (Calcutta: Thacker, Spink & Co., 1877, 281 pp.)



"A barometer must always be packed and carried in an inverted position, that is, *cistern upwards*, or else horizontal. The safest mode of packing is to construct a dooly of bamboo of the form shewn in the figure; and to lash the barometer to it in the proper position and well surrounded by straw. The whole may then be covered with canvas or gunny cloth, leaving a hole for the insertion of a bamboo beneath the forks, by which it is to be carried by two coolies in the manner of an ordinary dooly. Such a package can be sent safely by rail or ship, provided ordinary care be used in placing and moving it."

OBITUARY OF ERIC HARRIS
by Maurice Crewe

Eric Harris: born St Pancras, 16 December 1923, died Frimley, Surrey, 21 December 2013

Born: 16 December 1923, St Pancras.
Died: 21 December 2013, Frimley, Surrey.

Fellow of the Royal Meteorological Society and recipient of the Society's Outstanding Service Award in 1997, Eric Harris has died at the age of 90.

When war loomed, London-born Eric saw another side of life when his school, the Regent Street Polytechnic, was evacuated to Minehead for a year. On return, he started work as a clerk Grade 3 in the Ministry of Supply. In January 1941, the *Evening News* advertised for Meteorological Assistants. Impressed by an annual salary of £110 and only £6 of income tax to pay each year, he applied and was accepted. Eric went on a four-week course in Kingsway, Holborn, and then, despite being one of the fastest synoptic chart plotters on his course, was posted to Larkhill. There he was introduced to the system of measuring upper winds, usually using three direction-finding stations and some detailed trigonometry, and also to the early measurements of temperature with height (or more accurately atmospheric pressure). Then, in August 1941, he was posted to Fazakerley, Liverpool, until January 1942, when he was sent to the station being opened at Downham Market.

In September 1942, he was conscripted into the RAF. After the appropriate basic training (square bashing!), he finished up being posted to Lerwick Observatory in the Shetland Islands, where he was one of the youngest working with the new radiosonde and pre-radar wind finding systems. By late 1945 he was demobbed, having become an NCO, but his experience and training as a radiosonde supervisor was put to good use, spending nearly two years in Cyprus setting up a radiosonde station at Nicosia, followed by a short spell in uniform in Germany. By early 1949, Eric was back living in north London, where he'd earlier met his future wife Joyce; they married in December 1949. In 1950, he was promoted and returned to Kingsway for training as a forecaster, followed by a tour of duty at the busy aerodrome RAF Hendon in Colindale. When flying ceased there in November 1957, Eric had a spell at Croydon, another historic airfield (that closed in September 1959). In 1958, there followed a return to radiosonde and three years as Officer-in-Charge at Qrendi in Malta; among other things this was a great place for Eric to pursue his life-long enthusiasm for swimming.

Eric and family returned to the UK in 1961 and he became the Officer-in-Charge of the upper-air station at Pease Pottage, near Crawley. From here, several of his staff went on to higher things and recall Eric's attention to detail, demand for high standards of accuracy as well as his encouragement of staff to progress. In 1968, his next significant move was to Beaufort Park, Bracknell, and the Branch concerned with the development and quality of instruments and equipment and where Eric was involved in changes to upper-air operations. The Harris family set up home in Crowthorne and established deep roots there.

In 1978, Eric was promoted to Senior Scientific Officer and had a major change of career when he took charge of the Meteorological Office Library, an ideal job for someone keen on organization, planning and accuracy (cataloguing). Eric was a good staff manager and always happy to deal with visiting customers. He identified areas where change was needed: a start was made to computerising the Library Catalogue, and the powers that be were convinced that the Meteorological Office Archives should be under the same management as the Library – both being open to the public. This established the largest team in the Met Office managed by a Senior Scientific Officer. On retirement in 1984, his knowledge, management and training skills set the pattern to maintain a world-famous source of specialist subject information in the National Meteorological Library and Archive.

When the Royal Meteorological Society moved from South Kensington to Bracknell (and subsequently Reading), its Library and Archives were split up and partly sold off. Eric took custody of part of that Library into the Met Office Library, but some nineteen archive boxes with correspondence and articles were only retrieved in 1993. Cataloguing the latter was fairly straight forward, but their storage and management was a problem – a challenge that Eric took up, eventually becoming Honorary Librarian & Archivist to the Society. For many years in retirement, Eric returned to the National Meteorological Library and Archive and the Society Headquarters almost every week, reviewing material and recommending action. He received the Royal Meteorological Society's Outstanding Service Award in 1997. Eric was also a Fellow of the Society and attended many of its lectures.

In 1991, he wrote an article in *Weather* highlighting the dependence of meteorological information on postage as a means of passing reports quickly from observers to users before the introduction of the telegraph. Away from the Met Office, Eric's energy and enthusiasm for stamp collecting and postal history led to an exceptional reputation as a philatelist. He formed prize winning collections of 'Weather' (illustrated by worldwide stamps) as well as Greece and Cyprus. However his major interest was Colombia, particularly the postal history of SCADTA founded in 1919. SCADTA was the first commercial airline in the Americas and it opened Colombia to the rest of the world. Eric was also a 'mover and shaker' in the Met Office branch of the Civil Service Stamp Club.

As a founder member of the Camberley & District Stamp Club, Eric was a driving force: its Chairman in 1968 and 1995, Trading Secretary since 1976 and President since 2003. His knowledge and energy will be greatly missed. He also raised money for charities for the blind by the sale of donated stamps.

For many years, Eric was a member of the Wokingham Theatre, where he assisted the theatre group in various ways, perhaps most notably as front-of-house manager.

He is survived by his wife Joyce and daughters Karen and Brenda.

With thanks for comments contributed by family, friends and former colleagues.

ONE RESULT OF 'SURVEYING THE FABRICK' – A BRIEF NOTE ON THE SHAPE OF THE DOME OF ST.PAUL'S CATHEDRAL, LONDON
by Jane Insley

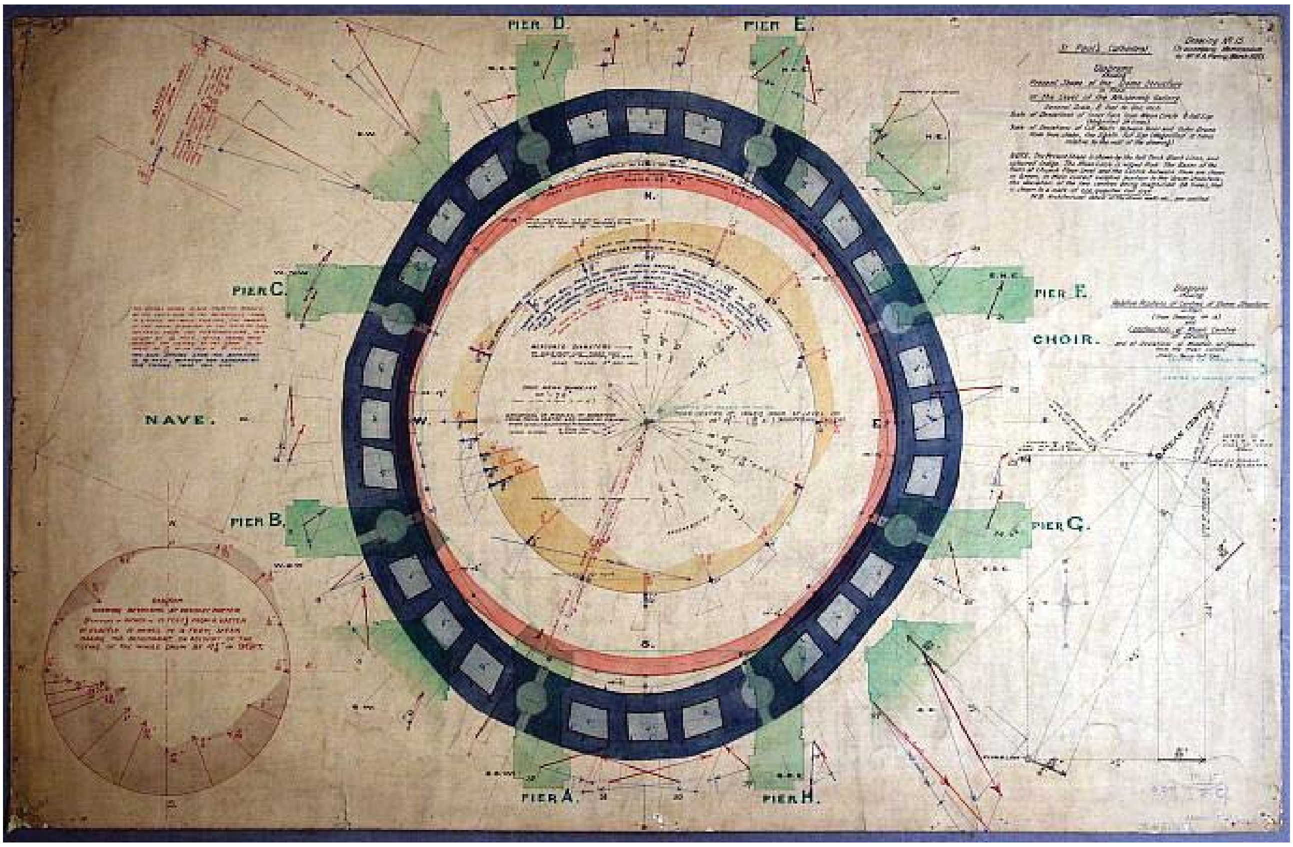
In the summer of 2013, I was invited to inspect some surveying equipment stored in the architect's office at St Paul's Cathedral. As this is about five minutes' walk from my flat, I jumped at the chance; with the two foremost questions in my mind being: What? – and, shortly after, Why?

The equipment was mainly fairly typical 1920s, and I settled in to cataloguing that, but the Why? question was rather more interesting. Since the present cathedral opened at the beginning of the eighteenth century, its iconic size and shape have dominated the London skyline. However, with the passing of time, there have been periodic moments of concern about the stability or otherwise of the fabric of the building, and one of these periods was at the beginning of the twentieth century.

Sir Christopher Wren, known as the first 'Surveyor of the Fabrick', or chief architect, had taken into account as much as he could the issues of putting a very heavy building down on a small hill with water-bearing gravels and London clay below the foundations. He took into account the way the building would settle, and the ground below compress, but probably never imagined the scale of the building works in the vicinity today – underground railway lines, re-routed sewers, building of river bridges, and the massive buildings in its immediate neighbourhood, all of which had impacts on the flow of ground water, and indeed the strength of the hill. As the piers and bastions rose to support the roof and the dome structure, the inner rubble was allowed to settle, and the outer sides were faced with well-cut ashlar masonry. The outer dome sat on the bastions and the four great arches, and the inner dome on standing on eight piers and 32 buttresses, which were supported horizontally by a Great Chain (somewhat to Wren's disgust, as he was confident his design for the building would hold up).

During the 1920s, though, bits of inner masonry were falling out, cracks in the walls were being monitored, and there was growing concern that the Dome and the eight huge piers in the centre of the church floor were in danger of collapse. In order to inform the reparation work, very detailed measurements were taken of various parts of the structure, in winter, summer and winter again, and the results were illuminating. Where the inner cracks went through the structure, it was found that the temperature buffering provided by the double dome structure meant that if the outer crack was opened, the corresponding inner one narrowed, and the reverse, according to temperature conditions outside and heating arrangements inside.

Rather more dramatically, the diameter measurements across the Whispering Gallery (inside the inner dome) showed that the diameters increased during the summer months and decreased during winter, but did not absolutely return to their original position. Basically, the cathedral was breathing in and out on a seasonal basis, with a very, very slight expansion horizontally at the base of the dome. (see the plan drawing on the next page created from the measurements).



Plan drawing of the Dome, from the Archives of St Paul's Cathedral, reproduced by permission.

The story of what they did about all this is for another place, another time, but just to add, Lt Col C E P Sankey, the poor chap who carried out the three series of measurements, then became the Resident Engineer for the remedial works, in one of the more extreme examples of project creep that I have come across. The piers were strengthened by retro-fitting reinforced concrete, another steel chain was installed round the dome support to maintain its circumference, even if it still needed to move as a result of solar warming, and the last time I looked out of my sitting room window, the whole lot was still standing!

St Paul's Cathedral

Photograph by Jane Insley

MSc IN APPLIED METEOROLOGY AND CLIMATOLOGY, UNIVERSITY OF BIRMINGHAM, 1963-2013
Recollections by Brian D Giles

Abstract

An MSc in Applied Climatology and Meteorology has been taught in the Geography Department of the University of Birmingham since 1963. It has recently celebrated its 50th anniversary and this paper recounts the high and low points of the degree course during that period. The various inside and outside influences on the course are described together with comments on the destinations of the graduates.

Introduction

On Friday 25 September 2013, past and present staff and students celebrated the 50th anniversary of the inauguration of the MSc in Applied Meteorology and Climatology by the University of Birmingham's Department of Geography. In the subsequent years, nearly 400 students have graduated from the course. (Fig. 1)

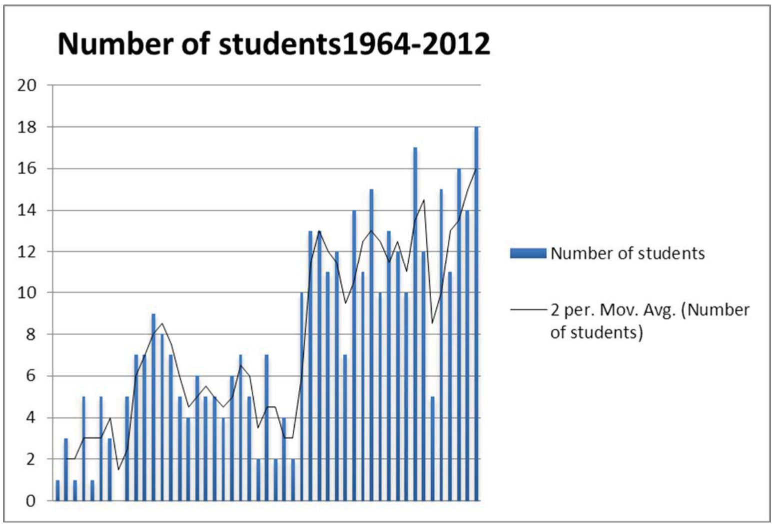
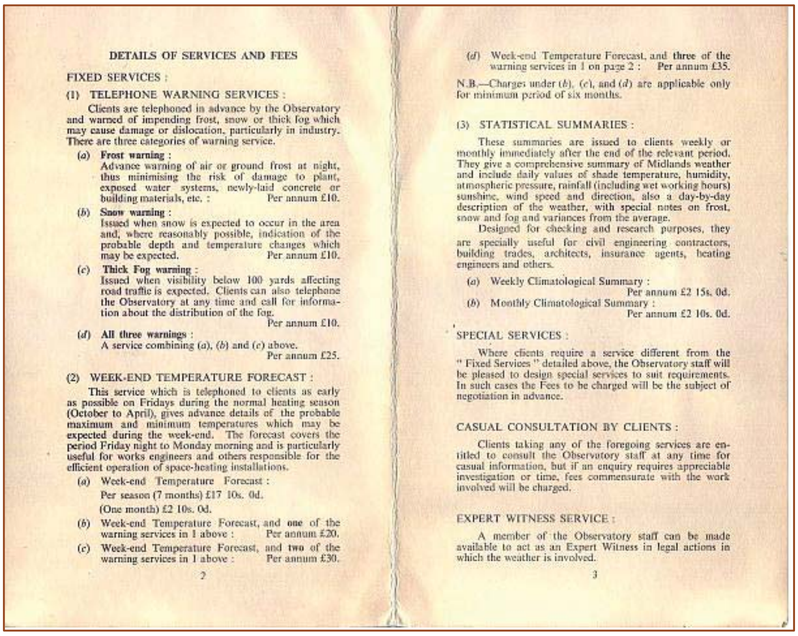


Fig.1 Number of students completing the MSc in Applied Climatology and Meteorology 1964-2012.



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Clients are telephoned in advance by the Observatory and warned of impending frost, snow or thick fog which may cause damage or dislocation, particularly in industry. There are three categories of warning service.

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Per annum £10.

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(One month) £2 10s. 0d.

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2

(*d*) Week-end Temperature Forecast, and **three** of the warning services in 1 on page 2 : Per annum £35.

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Where clients require a service different from the " Fixed Services " detailed above, the Observatory staff will be pleased to design special services to suit requirements. In such cases the Fees to be charged will be the subject of negotiation in advance.

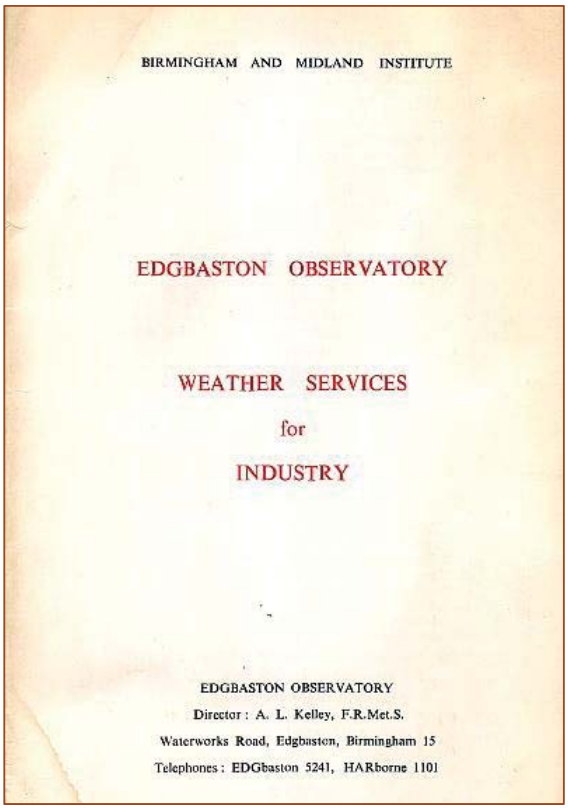
CASUAL CONSULTATION BY CLIENTS :

Clients taking any of the foregoing services are entitled to consult the Observatory staff at any time for casual information, but if an enquiry requires appreciable investigation or time, fees commensurate with the work involved will be charged.

EXPERT WITNESS SERVICE :

A member of the Observatory staff can be made available to act as an Expert Witness in legal actions in which the weather is involved.

3



BIRMINGHAM AND MIDLAND INSTITUTE

EDGBASTON OBSERVATORY

WEATHER SERVICES
for
INDUSTRY

EDGBASTON OBSERVATORY
Director : A. L. Kelley, F.R.Met.S.
Waterworks Road, Edgbaston, Birmingham 15
Telephones : EDGbaston 5241, HARborne 1101

Fig.2 (above and left). Birmingham and Midland Institute leaflet c.1960 outlining services and warnings available.

The course's beginnings were grounded in the belief that a modern Geography Department in the mid-twentieth century could teach both meteorology and climatology from a practical point of view. The old-fashioned ways rooted in Kendrew and Köppen were rejected for the 'new' ideas of Hare and of Haurwitz and Austin. The idea was to emphasise the 'applied' aspects of the subject and to try and bridge the gap between university departments of meteorology and geography. The latter were at a disadvantage because few geographers at the time were experienced in the mathematical and physical side of climatology; the former were usually under a comparative of a lack of spatial awareness except in the form of synoptic charts.

In 1954, Dr E T Stringer was appointed to a vacancy in the Geography Department for a climatologist. He had graduated in 1949 and received his PhD in 1951 based on a geomorphological thesis. He had been trained in meteorology during his national service. He immediately became involved with a unique source of meteorological data available in the West Midlands in the form of Edgbaston Meteorological Observatory run by the Birmingham and Midland Institute (BMI) and housed in Perrot's Folly in Waterworks Road, Edgbaston (Kelly, 1961). At this time, the Observatory was already offering a variety of weather-related services and warnings to the local community and Industry. (Birmingham and Midland Institute, c.1960). (Fig.2). He began a series of extramural courses reaching out to the community. In 1958, Professor R H Kinvig (an historical geographer) retired and was replaced by Professor D L Linton (a geomorphologist) who was quite sympathetic to the idea of closer relationships between the Observatory and the Department.

The 1960s

The result was the inauguration of the MSc course in September 1963 with one student. (Fig 3) The added work load of the new course, the development of the links with the Observatory and the increasing numbers of undergraduates led the department to expand with additional staff appointed including a second climatologist – B D Giles. Another graduate of the department (with a Master's degree in historical geography), he had spent three years in the Antarctic as a meteorologist (trained by the Met Office) in the Falkland Islands Dependencies Survey at one of the two British radiosonde bases during the International Geophysical Year (1957-58).

UNIVERSITY OF BIRMINGHAM
M.Sc. COURSE IN METEOROLOGY AND CLIMATOLOGY Session 1963-64
Applications are invited for the above course, which will commence on 30 September 1963, and terminate at the end of September 1964. The syllabus provides for work on Theoretical and Practical Meteorology, Dynamical, Physical, Synoptic and Applied Climatology in the Department of Geography, together with study in the Departments of Mathematics, Statistics, Physics and Mathematical Physics, and in the Engineering Departments.

Fig.3. A copy of the advertisement in Weather May 1963 for the MSc course.

These early years of the MSc course were greatly affected by three closely intertwined outside influences: government postgraduate funding policy, the growth of the forecasting side of the Observatory, and its change of administration (and ownership) from the BMI to the University.

Postgraduate funding was dependent on grants from the National Environment Research Council (formed in 1965). It made only limited grants to taught Master's courses and these were offered on a competitive basis. As far as the writer can recall, the first received by the Birmingham MSc were in 1973. Before that, students were self-funding – hence the low numbers. But the course had a growing reputation and several overseas students were enrolled in the late 1960s and continuously since 1973.

In 1965 The BMI handed responsibility for the Observatory to the University, and in 1968 its position was formalised by becoming part of the Geography Department, although still housed in Waterworks Road. (Linton,D.L. 1966). At this time, the Observatory consisted of three locations: Perrot's Folly, a 100 ft (30m) tower with a 139 step spiral staircase with rooms off it (Fig 4 and Fig 5); the terrace house next door converted into offices and lecture rooms for the MSc students; and the closed

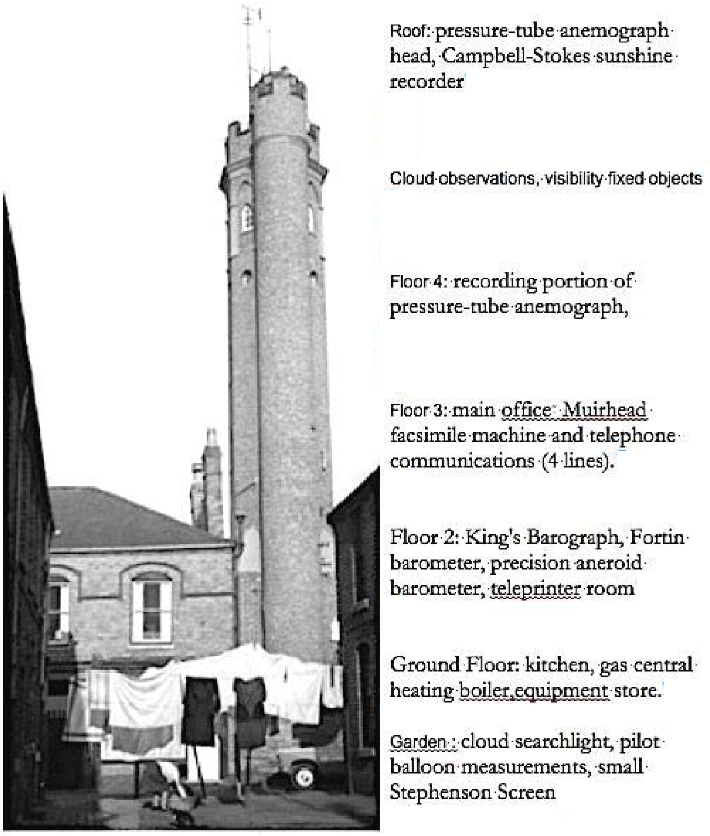


Fig.4. Perrot's Folly Waterworks Road (Kelly1961) with annotations by Hales (2013).

Fig.5. The garden at Perrot's Folly around 1968 with instruments. (downloaded from www. oldladywood.co.uk/ waterworksroad.htm

reservoir 30-40 m down the road where some of the instruments were housed on a site owned by SevernTrent Water. (Fig 6)

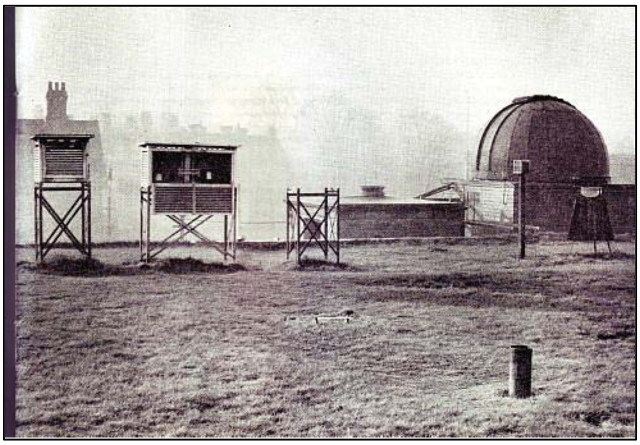


Fig.6. The instruments at Water works site (Kelly, 1961)

Stringer was given the title of Scientific Director, although the day-to-day running of the Observatory was still in the hands of the Superintendent, who at this time was Roland Chaplain. He had a theology degree but had attended the extramural courses given by Stringer and was appointed to the Observatory in 1967. He and Stringer issued a note in 1968 setting out their vision for the Observatory

*The prime purpose of Edgbaston Observatory, in conjunction with the Postgraduate School of Applied Meteorology and Climatology in the University of Birmingham, is to act as a centre for the provision of information and advice concerning the past, present or future influence of weather in all fields of human activity in the Birmingham area. (*MSS foolscap publicity notice dated *c.*1968 in BDGs possession).

This philosophy was reiterated by Stringer (1970) who said

For the past 25 years Edgbaston Observatory has been responsible for advising local authorities, industrial and commercial undertakings and, to a lesser extent farmers, in the Midlands concerning weather-dependent decisions…every problem the Observatory has to deal with is a problem in economics and geography as much as in meteorology…some years ago we decided that the basis of our future services was to be provided by the probability forecast, prepared on an objective basis.

Also in 1968 they set out another proposal – *Station network and local weather research project* – which proposed establishing an intensive, co-ordinated network of amateur weather observers over the Midlands area to be closely related to the Local Weather Research Project Courses run by the University's Extra-Mural Department. This was ten years before the setting up of the Climatological Observers Link (COL) that had been suggested by Tom Suttie in 1950 but had fizzled out, and 50 years before the inauguration of the Birmingham Urban Climate Lab (BUCL) in May 2011 (Muller *et al* 2013). These various proposals would all cost money, and Stringer and Chaplain were also busy drumming up customers for the various services offered by the Observatory, the longest lasting being the Weekly and Monthly summaries it issued. Unfortunately, they did not agree on strategy. Stringer wanted to go slowly and steadily and Chaplain wanted to move much faster and get finance on the way. The consequence was Chaplain's dismissal in 1969. The full story is available from Baker *et al* (mid 1980s) and Martin (1981-2), although these are somewhat biased accounts. From 1968 to 1978 the Observatory was a full synoptic station (reporting to the Met Office) and supporting six forecasters (Kings, 1985). It also provided a range of specialist forecast services to local industries (Stringer, 1970).

The 1970s

This was the environment that the MSc students entered in the first 15 years. An exciting, expanding meteorological station with specialist forecasting services as well as standard observations every three hours, but fraught with difficulties because of policy differences and changing administration and ownership. If one reads the titles of those first fifty MSc dissertations there is a clear emphasis on long-term forecasting and objective weather prediction or applied climatology. Objective forecasting has changed over the years. After the Second World War it was synonymous with probability forecasting using contingency tables. Later, under the influence of Namias and crude computers, it morphed into numerical prediction. But in the 1960s and early 1970s computers were hardly known by the MSc students. As Jones (2013) puts it: "regular trips to the Computer Centre across Pritchatts Road with punched packs of programming 'postcards' to feed the giant processor occupying a room of its own – frequently spat out for want of a comma". These early attempts at statistical predictions in climatology are described by Stringer (1970, 1972) and are illustrated by some of the early theses. For example, Greenland (1965) gives a state-of-the-art review of the methodology with some simple cost/benefit examples. In most of the theses, use was made of either the Observatory long-term data and/or the various synoptic charts published daily by the Meteorological Office and archived in the Observatory. The resultant theses covered a multitude of subjects, most of which would be relevant to industry in the West Midlands: snow forecasting (roads), soil moisture (civil engineering), flood rains, maximum temperatures, precipitation rates (civil engineering), frost forecasting (agriculture, roads), water demand forecasting, driving-rain index (construction), radiation fog (roads), hoar frost (roads), visibility, mean weekly temperatures, pollution, dry spells in upper Severn Valley (not agriculture, but sites for storing rock salt for roads!). In addition, several of the overseas students wrote theses based on data they brought with them and relevant to their home country: aridity in the Indian subcontinent, thunderstorms in Sudan, rainfall and temperature in Nicosia, daily rainfall forecasts in Rhodesia, summer monsoon in Nepal, estimating daily rainfall from satellite data in Sudan, drought in Sri Lanka, atmospheric pressure at Nicosia, surface winds over the Aegean Sea, summer rainfall in Ethiopia, tropospheric wave disturbances over Gan.

In 1972, the MSc moved into the 12th Floor of the Muirhead Tower and enjoyed the delights of the paternoster, as well as a very hot lecture room. In the following year, Mike Hamilton was appointed as a research fellow to digitize the Observatory records. At the same time, the administration of the Observatory was transferred from the University to the Geography Department. The staff of the Observatory moved to the campus and were integrated into the Department and became the Meteorological Services Unit (MSU). Perhaps of greater long-term importance was the arrival of J.E.Thornes (1973) to do the MSc course, and so began the thermal mapping era. During the 1970s, several MSc students were employed by the Observatory as forecasters to maintain its local forecasting facility and to maintain its full synoptic station status.

During these formative years of the MSc, students were also introduced to conference attendance. At this time, J A Taylor (Geography, Aberystwyth) was running annual conferences on broad themes connecting meteorology/climatology and agriculture and the students were encouraged to attend. Trips to Royal Meteorological Society monthly meetings in London were also arranged, as well as occasional visits to Aughton (radiosonde), Loughborough (agricultural research), amongst others. While there were about three students each year in the 1960s this increased to five a year in the 1970s.

The 1980s

At the end of the 1970s, there were two quite traumatic events. In 1978, the Severn-Trent Water Authority gave notice to quit the Waterworks Road site and a new site was established on the campus in 1979 – Winterborne 1 – in the research gardens of the Department of Botany (Giles, 1982). Readings continued at Waterworks Road in order to obtain an overlap of data so that the long period of Observatory record could be homogenized at any future date. It was the MSc students who were responsible for the 09:00 readings at the Waterworks Road site, thus giving them training in real-time weather observing. But this change of site also resulted in the Meteorological Office downgrading the station from full synoptic status and station *'03531 was deleted from the WMO list of stations'* (Kings, 1985). The last reading was taken on 3 February 1982 and the instruments were removed (Fig.7, next page).

1979-80 was the year that Stringer was dismissed from the University. He had been involved with a company selling solar heating equipment about which there were numerous complaints. A case was brought under the Trades Descriptions Act and the company was found guilty. Stringer was convicted in 1980 of supporting false claims by using his position as Scientific Director of the Observatory to back the company's claims, thus bringing the University into disrepute. As Jones (2013) put it – "the Year of the Missing Head of School – like Icarus, it seems he had flown too close to the sun" – or as the judge in the trial said (Martin 1981-2) – "you utterly prostituted your reputation as a man of science in this case, and in the end one can only say that you resorted to charlatanism and, eventually, downright dishonesty".

The gap in academic staff was bridged initially by Alan Perry, who came up from Swansea once a week, and later by the appointment of John Thornes in 1981. As noted above, he had written an MSc thesis on hoar frost on roads and moved to University College London as a lecturer while working on his PhD on road surface temperature measurements on motorways (Thornes, 1984). He returned to Birmingham as an academic lecturer and the Director of MSU. This resulted in a marked change in emphasis on the work of the MSU with the inauguration of University-based companies (Thornes, 1985) and a consequent change in the specialized training afforded to the MSc students. The latter became adept at road surface temperature measurements and there was a concentration on modelling changes as well as more general aspects of heat islands and other extreme weather conditions in the West Midlands. In spite of this upheaval, the MSc continued with both home and overseas students. During the 1980s, numbers were maintained at around five each year. By this time, students were able to access the digitized data base of Observatory and MSU records dating back to 1885 as well as the post-1980 data for the Winterborne site.

There were numerous administrative changes in the MSU, which also diminished in size following the change of site and loss of synoptic status. The personnel reduced to two, and, since most of the historical data was now digitized, their primary concern was to maintain the record and continue to produce weekly and monthly summaries for local customers. Annual Reports ceased after 1992 and MSU became variously known as the Weather Service and then Weather Facility of the Department of Geography. At the same time, instruments were gradually changed to self-recording and monitored from a distance and ultimately replaced by automatic weather stations (AWS). This was the time when there was an explosion in availability of data through cheap AWS, which resulted in specific networks set up for specific tasks, for example thermal mapping. National meteorological services were being forced to become more commercial as the private sector of weather forecasting expanded. The general public were becoming more aware of weather through TV and the internet and the instant transmission of news of disasters. All of these innovations required personnel who could interpret and explain to lay people the results. The MSc students were ideally placed to partially fulfil this demand especially as the Meteorological Office were competing with private sector – oil rigs, farming, etc. – as employment sources.

Fig.7. After 97 years, readings finally ceased at the Waterworks Road site (University of Birmingham Bulletin, 1982)

Reigning for 97 years

At 0900hrs on 3 February the final climatological observation at Edgbaston Observatory, Waterworks Road, was taken. This ended a daily practice which first commenced over 120 years ago in the 1860s. The picture shows the removal of the last of a long line of Stevenson Screens, the first of which was erected on the site in October 1885. Thus ended a climatological record of 97 years. Since the Edgbaston Observatory 'move' in October 1979 and the opening of the present climatological site at Winterbourne, the Waterworks Road site has been maintained for the purpose of establishing an overlap of the records between the two sites. A comparison of the two sites has shown that whilst daily maximum temperature do not differ significantly, daily minimum temperatures present a different problem, something which will be investigated at a later date. Consequently one can anticipate the continuation of a climatological record for Birmingham in the years to come.

John Kings and Richard Johnson

The 1990s

In 1992, Glenn McGregor joined the team directly from Hong Kong and brought with him ideas about tropical climatology, bioclimatology and various statistical techniques. His influence was immediately apparent in a series of MSc theses related to health issues (air quality, thermal comfort, human morbidity) and synoptic climatology. He was instrumental in setting up a series of collaborative efforts within the University researching public health, air quality, water management, and geosystems. He also began a series of radiation balance experiments, using MSc manpower, in the Pyrenees. Other appointments increased the training available to the students: Cai on modelling mesoscale systems, Kidd on satellite remote sensing, Widmann on climate modelling and downscaling, and more recently Leckebusch (natural hazards) and Muller (Birmingham Urban Climate Laboratory). In the last year or two, there has been a resurgence of interest in Birmingham's heat island for a variety of reasons and this is documented by Tomlinson *et al* (2013). In 2012, Winterborne1 was closed by the BBC but replaced by Winterborne2 (Xoserve, 2013), and so the story continues.

Giles retired in 1996 after over 30 years involvement in the MSc course. His favourite mantra was always "check it against ground truth". He always suggested that students should not take their analyses (modelled, statistical, cartographic) as correct unless they meant something in the physical world. He continued in a consultant capacity until he moved to New Zealand in 1999 but found time to return for the 40th and 50th anniversary get-togethers. (Fig.9).

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Fig.9. The Group Photo for the 50th anniversary of the MSc in Applied Climatology and Meteorology at Birmingham University September 2013. (Downloaded from the MSc group Facebook page October 2013).

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CET TEMPERATURE RECONSTRUCTION
by Tony Brown

If you can help Tony in any way, please contact him via tony@climatereason.com. Ed.

Central England temperature (CET) is the world's oldest instrumental temperature data set. It is maintained by the Met Office in two formats: one from 1659 compiled by Gordon Manley using monthly records; the other using daily data commencing 1772, seen in Figure 1 to the end of 2013.

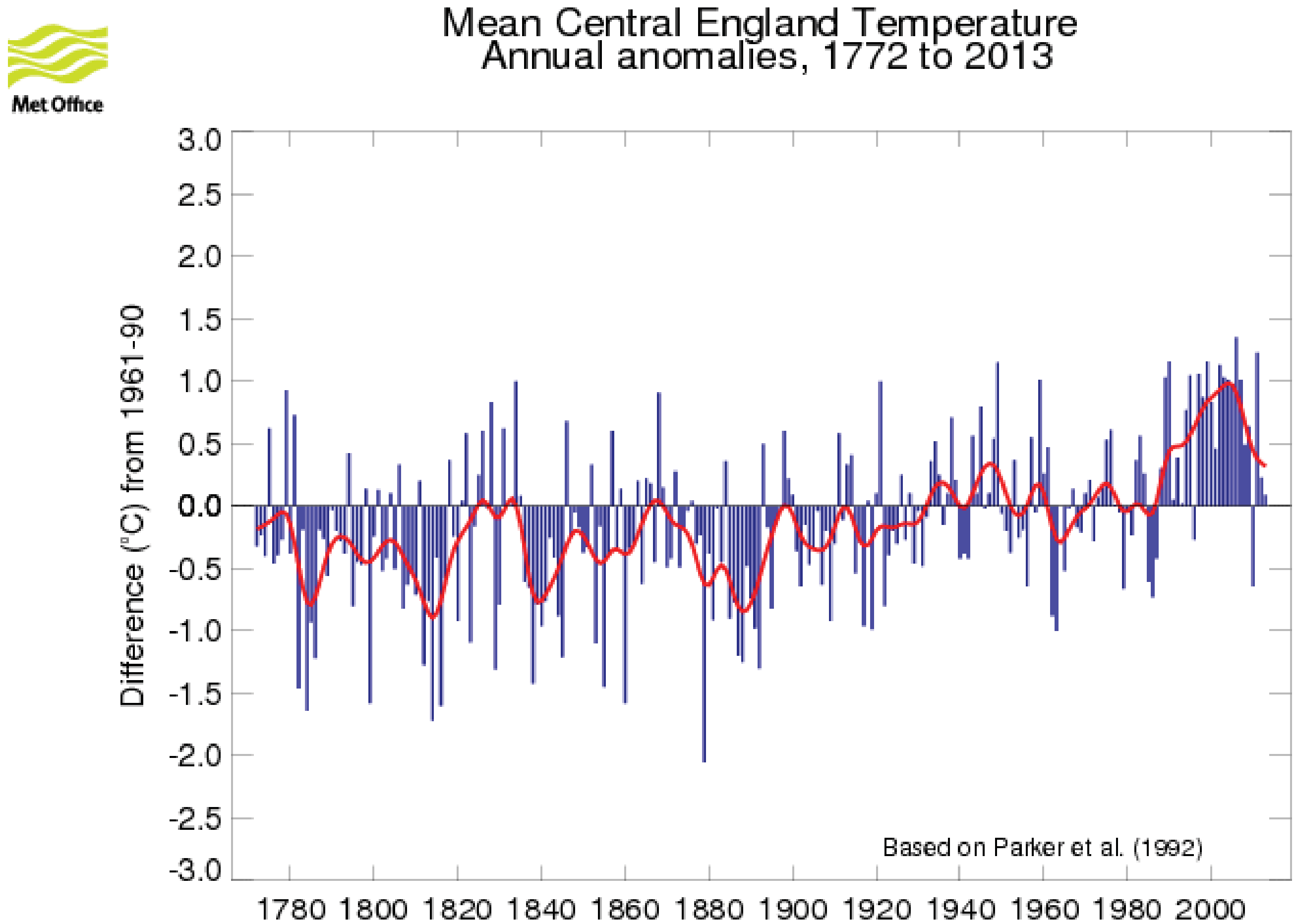

Figure 1; CET to end of 2013
http://www.metoffice.gov.uk/hadobs/hadcet/

This was developed by David Parker who I had the pleasure of meeting at the Met office a few months ago with regards to my own project: extending CET beyond 1659 through the use of crop records, observations, weather diaries, manorial records and other valid weather related means.

See Parker, D.E., T.P. Legg and C.K.Folland, 1992. 'A new daily Central England Temperature Series, 1772-1991'. *International Journal of Climatology,* **12***,* 317-342.

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Current results are shown in Figure 2, with reconstructed temperature from 1538 linking into instrumental CET from 1659. It is taken from my article **'The long slow thaw?'** carried at Dr Judith Curry's science blog 'Climate Etc'.

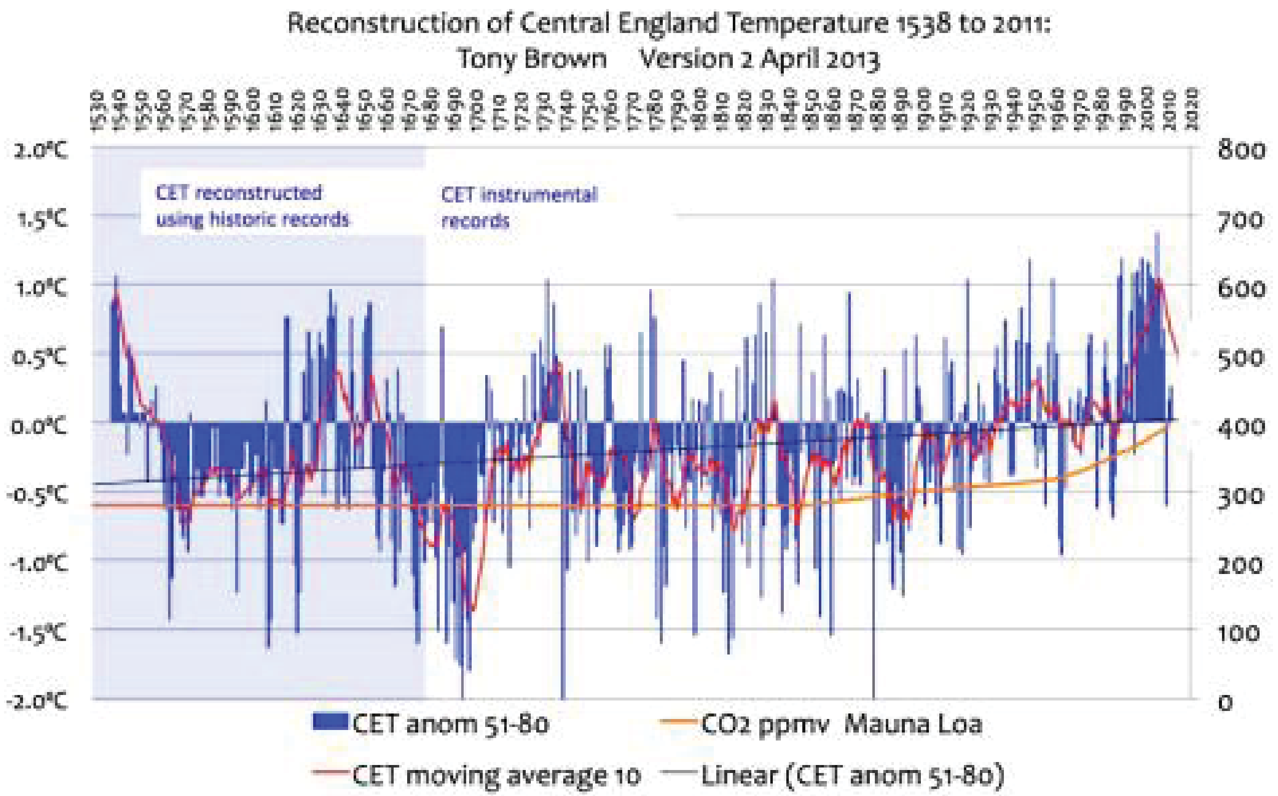

Figure 2; CET to 1538
http://judithcurry.com/2011/12/01/the-long-slow-thaw/

'The long slow thaw?' also compared temperature reconstructions to 1500 by the late Hubert Lamb of CRU and Dr Michael Mann who, with Bradley and Hughes, originated an iconic view of past climate known as the 'hockey stick.'

The detailed research gathered for the article is linked here;
http://curryja.files.wordpress.com/2011/12/long-slow-thaw-supplementary-information.pdf

Some months elapsed between the data used in Figure 1 and 2, where it can be seen the official temperature 'anomaly' has dropped further to around 0.3°C.

Those of us attempting to grow the exotic fruit or flowers readily managed in the 1990s might find the reason for recent failures in the declining temperatures from the turn of this century.

Many climate scientists, including Hubert Lamb, believed CET to be a reasonable proxy for global or northern hemisphere temperatures. This is of considerable scientific relevance as CET covers a longer time scale than the 'global' temperature sets from the Met Office (commencing 1850) and the Goddard Institute for Space Studies – GISS (commencing 1880). As a separate project, I am compiling a paper for peer review to examine whether CET has merit as a possible historic proxy for global or northern hemisphere temperatures.

CET is interesting for another reason, by providing a long slice of validated data enabling a re-appraisal of modelled climate reconstructions that demonstrate past climate stability, as articulated by the Met Office here: "Before the twentieth century, when man-made greenhouse gas emissions really took off, there was an underlying stability to global climate. The temperature varied from year to year, or decade to decade, but stayed within a certain range and averaged out to an approximately steady level."

The results of comparing CET to the ‘spaghetti’ paleo proxy climate reconstructions were highlighted in this article:
http://wattsupwiththat.com/2013/08/16/historic-variations-in-temperature-number-four-the-hockey-stick/

In **Figure 3** (below) it can be seen that the ‘spaghetti’ reconstructions (generally representing ‘global’ or NH climate using 50 year slices of data) exhibit stability within a narrow temperature range.

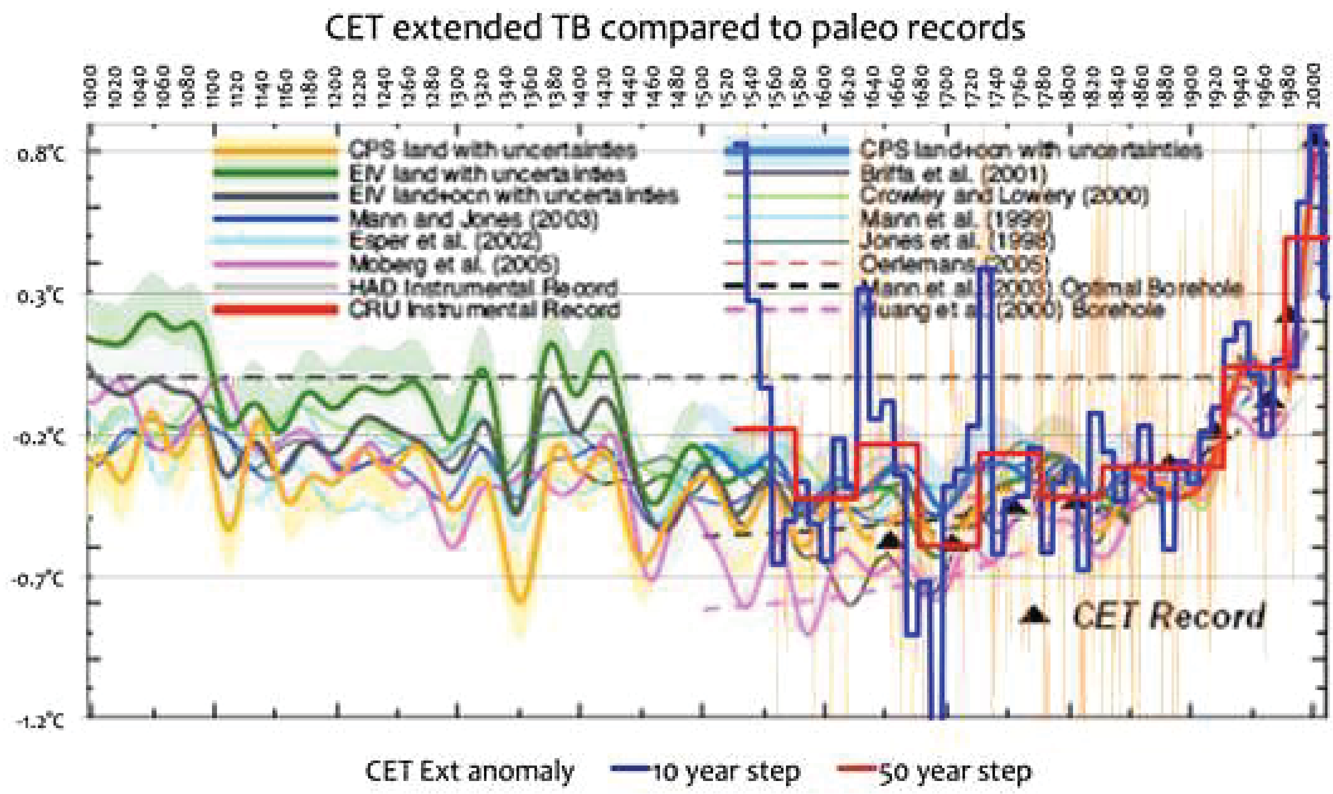

Figure 3; Paleo climate and CET
http://wattsupwiththat.files.wordpress.com/2013/08/clip_image0041.jpg

Annual CET is represented by brown verticals, blue verticals are CET decadal, red horizontals are 50 year CET periods. It can be observed that the red CET 50 year slices have many similarities to the ‘spaghetti’ paleo proxy models. Intriguingly, though, 50 year paleo data miss many notable climatic events, from the catastrophic cold of the 1690s, the returning heat of the 1730’s and a return to ‘Little Ice Age’ conditions at the start of the nineteenth century, all captured in the highly variable instrumental record. The largest and most rapid temperature change is that centred around 1690 to 1740 (the decade of the 1730s was the warmest in the record until the 1990s, according to Phil Jones).
Note: The sharp rise around 1540 is partially a result of this being an end point of data, although preliminary examination of data provisionally shows a notably warm period during the first few decades of the sixteenth century.

CET potentially has considerable importance to climate science and extending it in a meaningful manner (and validating its possible geographical validity) may provide useful guidance on the nature of past climatic episodes and extreme weather events, either on a regional, Northern Hemispheric or global basis.

This is where readers of the History Group newsletter can be of assistance.

It is hoped to eventually reconstruct CET to 1086 – the Domesday Book provides some clues on likely climate. However, this is with decreasing accuracy levels and requires awareness of dubious weather references based on religious or supernatural interpretations and duplications.

continued next page

Whilst fortunate that considerable information exists for later parts of the era between 1086 and 1538, there remain considerable gaps in our knowledge. Consequently, any current attempt at further temperature reconstruction would be guesswork.

In trying to rectify this, it appears there is no comprehensive digital data base of historic weather records from the CET area broadly covering Oxford to Bristol to Manchester that would enable scientific credibility to replace conjecture.

Consequently, I am asking those reading this newsletter to suggest to the author any additional sources of weather related data for the period 1086 to 1538, whether already 'well known' or highly obscure. These might be one-off examples of a frost fair, estate records for a season, notes of extreme weather such as individual storms, or droughts that lasted for weeks, books, papers, diaries etc. Historical distance from events that occurred up to 900 years ago make it unlikely that the depth of plausible material needed to create a credible extension can be obtained from just the CET area. Therefore, weather records can be supplied from anywhere in England (but NOT Scotland, Wales or Northern Ireland). A factor will be applied to references from outside the traditional CET region to homogenise the record.

I will close with this intriguing reference to a frost fair found in the annals from 1309/10:

"Around Christmas great frost and ice on the Thames which was used as a passageway. '…such masses of encrusted ice were on the Thames that men took their way thereon from Queenhithe in Southwark and from Westminster into London and it lasted so long that the people indulged in dancing in the midst of it near a certain fire made on the same and hunted a hare with dogs in the midst of the Thames; London bridge was in great peril and permanently damaged. And the bridge at Rochester and the other bridges standing in the current were wholly broken down.' Said to be a north wind blowing, then a great thaw and flooding that rose so fast the King had to hastily leave Salisbury Cathedral lest he drowned. This rage endured for two days."

Whilst snow and ice do figure in the records, the most notable impression of severe weather events over the last 600 years or more, come from storms, droughts, heat-waves, but most especially prodigious amounts of rainfall for weeks and months on end, with no regards to season, which put current extremes events in their historic context and makes the CET extension of considerable relevance to today

I look forward to your historic weather references for England covering the period 1086 to 1538, so we can piece together more of the fascinating CET climate jigsaw.

DAILY OBSERVATIONS OF OUTDOOR TEMPERATURES IN ENGLAND IN THE 1770s AND EARLY 1780s
by Peter Rowntree

From around 1700, series of temperature observations are available for a number of sites in Britain (Manley, 1953)[1]. However, many of these were indoor observations, following the recommendation by James Jurin (1722)[2] that the thermometer "should be exposed in a fireless room where no sun can penetrate". However, there are outdoor daily data for London from 1755 to 1759 in *The Gentleman's Magazine*, and from 1757 to 1761 in *The Universal Magazine of Knowledge and Pleasure*. There is a set of monthly means for London from 1763 to 1772, tabulated in Buchan (1893)[3] and summarized by Heberden (1788)[4], which, judging by the temperature differences between 08:00h and 14:00h, appear to be from outdoor thermometers. However, I have been unable to find the original source used by Buchan.

At Lyndon in Rutland, Thomas Barker's 1748-63 journal provides outdoor as well as indoor data for January 1763 (Manley, 1952)[5]. Unfortunately the following journal from September 1763 to December 1776 is missing, though the monthly means and extremes for outdoor and indoor temperatures from January 1771 to December 1798 were published (Barker, 1772-1800[6]; reproduced in Kington, 1988[7]). The 1777-89 journal is in Met Office archives and forms an invaluable account of East Midlands weather. His observation times, given to the nearest five minutes, vary, typically during 1777-

1789 from about 05:30h to 07:30h in the morning in summer (around sunrise in winter), and 12:30h to 15:30h in the afternoon, with occasional days well outside these ranges. Whilst corrections can be made for this during the period of the extant journal, the average corrections for 1777-89 have to be used outside this period. During 1777-89, morning observation times vary from the average sufficiently to require corrections up to 0.4°C different, and in one month, June 1781, when Barker was away and observations were made about 08:15h, about 2°C different. A problem, probably common to most series, but explicit in Barker's, is that of thermometer breakages. At Lyndon these occurred in December 1786 and 1790, both stormy months. The first of these was estimated by Manley (1952)[5] to cause a discontinuity of 1.7°F (0.95°C). The exposure of the outdoor thermometer is not known, though a note on thermometer comparisons which he made in the 1750s does refer to exposure "against a North wall" (Kington, 1988[7], Figure 20).

Thomas Hughes' daily observations near Stroud commenced in January 1771, though for the first two months he observed indoors. However, these ceased in January 1774 when he moved into Stroud to his apothecary premises and did not restart until January 1775, after which they continued, albeit with a few missing observations in most months, until 1813, though with a change of site when he moved next door in September 1795 (Rowntree, 2012)[8]. The times of observation vary and are quoted only to the nearest hour, though they are available throughout the series. Morning observation times were similar to Barker's, while the post-meridian observations were near sunset. A few morning observations are missing in most months, while the evening ones are less frequent and almost ceased in the late 1780s. Although the location of the observations was probably unchanged from 1775 to 1795, the exposure may have been affected by building, around 1784, of a house nearby; comparisons to other stations suggest a discontinuity around this time, Stroud displaying a relative warming of order 0.5°C, though the time of this is not easy to identify.

One of the most useful series of observations commenced in January 1774 at the Royal Society's premises in Crane Court, an enclosed court off the north side of Fleet St just east of Fetter Lane**.** The location is within 800m of Somerset House, home of the Royal Society observations from 1787, Paternoster Row where Thomas Bent observed the weather from mid-1784, and the site on the Strand where W. Cary observed from 1786. The observations, instruments and their exposure were described by Henry Cavendish (1776)[9]. The outdoor thermometer was "placed out of a two-pairs-of-stairs [second floor] window, looking to the North, and stands about two or three inches from the wall". Cavendish notes that "as the opposite building is only twenty-five feet distant, perhaps the heat may be a little increased at the time of the afternoon observation by the reflections from thence". He also comments that "In the middle of summer the Sun shines on the wall of the house, against which the thermometer is fixed, for an hour or two before the morning observation, but never shines on the thermometer itself, or that part of the wall close to it, except in the afternoon, long after the time of the observing. On the whole, the situation is not altogether such as could be wished, but is the best the house afforded".

The daily data for each year were published in *Phil Trans Roy Soc*, including readings of outdoor and indoor thermometers at 07:00h (08:00h in winter) and 14:00h. The indoor thermometer was "intended chiefly for correcting the heights of the barometer" and "the room in which it is kept looks to the North, and has sometime a fire in it, but not often" so the indoor observations do not adhere to Jurin's recommendations. Unfortunately, the observations ceased from September 1781 and were not resumed till January 1787 at the Royal Society's new home 700m to the WSW at Somerset House. The annual summaries of monthly means combine the morning and afternoon figures and contain many errors, with differences from means of daily data exceeding 0.15°F (and so larger than the round-off error) in 1 in 3 months during 1774-1781.

Thomas Hoy was an assiduous observer in London from July 1771 to March 1822, with daily data for 08:00h and 15:00h (14:00h up to November 1775). The journals are in Met Office archives. After a few months at Barn Elms (near Barnes, Surrey), he observed in Kennington till August 1774, then at Muswell Hill, till finally moving to Syon House in May 1782. Unfortunately, many of the monthly means compare poorly with other series until around 1786; this is particularly obvious in the first years at Sion House, when some quite unrealistic summer mean temperatures included 73.7°F (23.2°C) for the warm July of 1783. Manley (1953)[1] suspected that "at times the mercury column in his thermometer became broken".

A valuable initiative taken by Daines Barrington in the late 1760s was the production and distribution of a *Naturalist's Journal*, consisting of blank forms to enter observations of temperature, pressure and weather for four times each day, with ample space for comments on natural phenomena. I know of two such completed Journals, one containing Gilbert White's observations for Selborne (Hampshire) from 1768 to 1793, and the other used by Daines's brother, Bishop Shute Barrington, for Mongewell (Oxfordshire) from December 1773 to the end of 1823. The Mongewell data, available in the Royal Society Library, are at stated times though these are sometimes changed, (e.g. 8pm to 10pm, 8am to 9am) both for single days or over many months, the latter periods probably coinciding with Shute Barrington's absences in his job as Bishop of Durham. Unfortunately, there are serious gaps in 1784-85 and, in the evening, in 1788-91. The observations used a thermometer hung upon a tree about 3 feet from the ground near the Thames south of Wallingford. The journal includes notes on the river ("within banks", "got over the banks", "Thames continued frozen", etc.). Temperatures as low as zero Fahrenheit (-18°C) were observed.

The availability of Gilbert White's observations (Greenoak, 1986-89)[10] makes them a useful source of daily weather information, though to estimate the observation times it is necessary to use the originals in the British Library, which place the data relative to Daines Barrington's proposed observation times of 8am, 12, 4 and 8 pm (see e.g. Foster, 1988, Figure 6)[11] and Johnson, 1970, p. vi)[12]). White's frequent absences from home and uncertainties about the times of observations limit the value of the temperature record, but the space afforded by the *Naturalist's Journal* format allows inclusion of much interesting detail on natural phenomena and the effects of the weather, including snow cover. There is a lack of clarity as to whether the thermometer was indoors or "abroad" (outside). Probably, until December 1784, it was generally indoors, except when specified as "abroad" – for example, on 28 January 1776 when visiting his brother Thomas at South Lambeth, he enters: "S.Lambeth: 11 abroad" and also "Thermometer at Selborne: 7 abroad". As discussed later, Thomas White published a monthly weather report, with tabulations of daily data, in *The Gentleman's Magazine* for some years in the mid-1780s and, during his several visits to Selborne during this period, often used the Selborne observations in his monthly report. In a footnote to his August 1782 data, he described the thermometer location at Selborne as "on a shady staircase".

One of these stays at Selborne was from 22 November 1784 to 5 January 1785. He noted initially that the thermometer was "within doors" and then on the 8 December after snow through much of the 7th and 8th "Therm. abroad after this day". By the 9th, Gilbert White reports "Snow 16 inches deep on my snow plot: about 12 inches at an average". Temperatures fell to one degree below zero Fahrenheit (-18.3°C) at 11 pm on the 10th. He was surprised to find that "Mr Yalden's thermometer at Newton", 200 feet above Selborne, was 18 degrees (10°C) higher at this time (White, 1788)[13]. This led him to compare the thermometers and find "they were exactly together" – which increases confidence in his observations. In his Journal the thermometer column for the week from the 25th is headed "Abroad thermometer" and though this is not repeated in subsequent weeks differences in mean temperature from other stations suggest that this was often his practice thereafter. However, when Thomas visited his brother in October-December 1785, again using the Selborne data, he stated in a note "Thermometer within doors", though on a later visit in autumn 1786 he does not say the thermometer is indoors.

Thomas White's observations for South Lambeth are described in his first report in January 1782 (*Gentleman's Magazine*, 1783)**[14]** thus: "Three miles south of London. Thermometer placed in a shade, on the north side of a wall, abroad. Barometer about twelve feet above high water mark. Rain measurer placed seven feet from the ground. Observations made about eight o'clock in the morning".

The time of observation changed to 1 pm from January 1786, possibly for consistency with Cary's observations in the Strand which also appeared in *Gentleman's Magazine* but without the time lapse of nearly a year of the South Lambeth data. From 21 June 1787, the record in *Gentleman's Magazine* was kept at a "village seventy miles SW of London", almost certainly at Fyfield, (?) Hampshire, where Harry White, another of Gilbert's brothers, lived. Whether this was because Thomas moved there or someone else, maybe Harry, took over the observing is not clear. Thomas White's records could have been very useful for filling in the gap in London data caused by the break in the Royal Society data and the clear errors in the Sion House record. However, comparisons with the Lyndon and Stroud records reveal quite implausible year-to-year variations. For example, the means for May to July differ from Lyndon's by 3.7°F, 3.6°F, 6.6°F and 0.9°F in 1782, 1783, 1784 and 1785, with similar differences from Stroud.

Another long English record is that of the Liverpool dockmaster William Hutchinson; the daily data are in Liverpool Central Library. From January 1777, he ceased indoor observations he had started in 1768 and commenced daily (12:00h) outdoor observations under a table on the roof of a four-storey house by the Old Dock (Manley, 1946)[15]. He added an 08:00h observation from late January 1778 and continued observing to July 1793. Manley (1946, p. 9)[15] suspected over-exposure to radiation, especially before 1781. The record is reasonably complete – for example, there are no missing morning temperatures in 1782-86 – but as well as the discontinuity in the early 1780s, temperatures are clearly too low for late 1786 and most of 1787.

Like Hutchinson's record, all those so far discussed suffer from uncertainties in the mid-1780s, whether due to a thermometer breakage (Lyndon), clearly discontinuous mean temperatures (Sion House and South Lambeth), possible changes in exposure (Stroud and Liverpool), missing data (Mongewell), changes between indoor and outdoor (Selborne) and the gap in the Royal Society record from 1781 to 1787. A record which may not suffer from such problems is that of William Godschall at Weston House, Albury, a few km east of Guildford (Surrey) which started on August 30 1782. His generally daily observations till December 1796 are untimed though Manley (*ms* in Met Office Library, Exeter) found an indication that they were "probably between 9 and 10 am". The differences between the Albury and Somerset House morning observations in 1787-95 support Manley's suggestion.

Other English records commence in the mid-1780s – at Lancaster and Brandsby (N. Yorks.) in 1784, and in London at Paternoster Row (Thomas Bent) and Pall Mall (William Heberden) in 1785 and the Strand (W. Cary) in 1786, as well as Somerset House in 1787. A series of observations by Thomas Heberden at Bridestowe in Devon from 1782 to 1786 is unfortunately very intermittent and also appears inconsistent with other stations' data, though after a few months at Whimple in 1787-88, a long series of observations in Exeter from May 1788 compares well with other data at least through to the end of the century.

The series of daily observations discussed here generally include data on other variables. Barometric height and wind were reported by all the stations except the early Bridestowe record, often with an estimate of wind speed. Rainfall measurements, usually once, sometimes twice per day appear in the records for some stations, though Selborne only from May 1779 and not, at least before 1795, for Hoy's stations, Mongewell and Bridestowe/Exeter. The detail of weather description varies widely. At one extreme, the Royal Society at Crane Court, Hoy's journals and Mongewell generally give one word descriptions at each observing hour – and Hoy only in the morning. Gilbert White at Selborne is only a little less terse but he sometimes adds informative notes.

For example, in a snowy spell in February 1777, the Crane Court journal has "Snow" as the weather description for both morning and afternoon on the 12th and 13th, but no comments. Selborne is similar, for four observations each day, with "snow, snow, snow, sleet" on the 12th and "snow, snow, snow, deep snow" on the 13th. But he also gives comments "Snow covers the ground" on the 12th and on the 14th "The snow is about five inches deep". Thomas Hughes' report at Stroud is divided into parts of the day thus: "12th Night: snow with light rain; Morning: very cold, snow with light rain" then blanks for "Day" and "Evening" probably indicating his absence – it should be said that Hughes' reports have most words abbreviated, the morning report above actually being written (as best as I can tell): "M^{g} v cold snow wth l R^{n}" and not very clearly written. A complete contrast to the brevity of the Royal Society reports is provided by Thomas Barker reporting on Lyndon's weather: "12th Winterly, very windy, cold and melting snow; yet considerable thick at night; 13th. Rather thawing, cloudy, windy cold & some snow; stars at night". The *Gentleman's Magazine* report from London, which gives indoor temperatures, wind direction and strength and barometric height is also quite descriptive: "12th: very churlish, snow or sleet most part of the day; 13th: strong snow all day, with little or no intermission."

Note: I have digital daily data for some of the temperature series discussed in this note.

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BICENTENARY OF THE 'YEAR WITHOUT A SUMMER', 1816

A two-day meeting (Friday and Saturday) in May 2016 is being planned to mark the bicentenary of the so-called 'Year without a Summer'. The venue for this meeting will be the Whitby Museum.

In 1816, summer climate abnormalities caused average global temperatures to decrease by 0.4-0.7°C, resulting in major food shortages across the northern hemisphere. It is believed that the anomaly was caused by a combination of an historic low in solar activity coupled with a succession of major volcanic eruptions capped in April 1815 by the eruption of Mount Tambora, in the Dutch East Indies (Indonesia), the largest known eruption in over 1,300 years and possibly 10,000 years.

Details of the meeting will be announced in due course. Meanwhile, we are delighted to say that several speakers have already promised to give talks, not only on the infamous summer of 1816 but also on:

- the seafarer, explorer and scientist Luke Fox, who in the 17th Century tried to find a way through the North West Passage;
- the explorer and scientist William Scoresby Junior, whose papers, log books, instruments and botanical specimens were left to the Whitby Museum;
- whaling logbooks and climate research;
- the Dalton Solar Minimum of the early nineteenth century;
- a distinguished Whitby photographer of the late 19th Century and early 20th;
- post-Tambora sunsets in art;
- weather in the Gothic novel.

MISCELLANY

On Wednesday 5 November 2014 at 7.00pm in Reading Town Hall (Victorian Gallery), there will be a talk entitled *Two heroes of Antarctica: an explorer and a scientist compared*. This will be given by Mike Simpson, a grandson of Sir George Simpson, the meteorologist on Scott's *Terra Nova* Expedition to Antarctica and later Director of the Meteorological Office. Mike will look back at the expedition, adding family archive material and original photographs. This is a meeting of the South East Centre of the Royal Meteorological Society.

In respect of **The history of uses of aircraft for meteorological purposes**, the subject of three meetings of the History Group in recent years, readers may be interested in a paper published recently by Kirsty McBeath in the journal *Meteorological Applications* (2014, **21**, 105-116). It's on 'The use of aircraft for meteorological research in the United Kingdom'.

RECENT PUBLICATIONS

BOOTH, B.J., 2014. 'The origins and early years of South Farnborough meteorological office', *Weather*, **69**(2), 31-37.

CHENOWETH, M. and MOCK, C.J., 2013. 'Hurricane Amanda', *Bulletin of the American Meteorological Society*, **94**(11), 1735-1742.

DAVIES, H.C., 2014. 'Setting, substance and scrutiny of FitzRoy's *Weather Book*', *Weather*, **69**(2), 51-55.

HART, R.E. and COSSUTH, J.H., 2013. 'A family tree of tropical meteorology's academic community and its proposed expansion', *Bulletin of the American Meteorological Society*, **94**(12), 1837-1848.

SANCHEZ-LORENZO, A., *et al*, 2013. 'New insights into the history of the Campbell-Stokes sunshine recorder', *Weather*, **68**(12), 327-331.

SANDLIN, L., 2013. *Storm kings: the untold history of America's first tornado chasers* (New York: Pantheon Books, 266 pages). ISBN 9780307378521.

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THIS IS YOUR NEWSLETTER

Please send comments and contributions to:
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The next newsletter will be published in late June 2014. Please send items for publication to Malcolm Walker by 15 June 2014.

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. He would also welcome comments and letters for publication.