The waterspout which damaged waterside houses in August 1694 at Topsham, South Devon.
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A SUMMARY OF SUMMER SNOW SURVEYS IN SCOTLAND: 1965-1978

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Abstract: A summary is presented of annual summer snow survivals covering the period 1965 to 1978 inclusive, mainly relating to the Cairngorm area but with some Ben Nevis details. The summary includes temperature and precipitation from 1951-1979 inclusive for Glenmore Lodge on a mean monthly basis from January to May inclusive, besides means for the periods January-May, March-April, and March-May. Details are given of the wind regimes responsible for the snow drift and annual variations in the ultimate positions of snow fields and snow beds surviving into the summer months. There is also discussion of outstanding 'prolific' years and years of attrition when the hills are virtually bare of summer snow survivals.

PART 1

'Those who wish to pursue the events of individual seasons should go to the original sources, taking account of the quality of the observations, the prevailing winds and the departure of the temperature (and precipitation) above or below normal. Persistence of cold unsettled weather in spring (March-May) is likely to be the main factor leading to prolongation of the mountain snow cover even into July at the highest levels.'


Snow has always had a fascination for me and in 1954 I began to visit the high hills of Scotland, mainly for the walking but always with the hope of seeing summer snowfields. I had read Professor Manley's 'Snow Line in Britain', and various other notes in early issues of Weather by D. L. Champion, E. L. Hawke, D. N. McVean and F. W. Green on summer snow survivals in the Scottish mountains. I also recollected the Rev. R. P. Dansey's article in Symon's Meteorological Magazine of 1905 on what he thought was an incipient glacier forming on Ben Nevis (an exciting thought!)

Inspired by these various authors, I began to visit Scotland annually, usually toward the end of July, and compared the size of previous years. Perhaps a certain large snowfield one year was an atrophied remnant of the next year, whereas snowbeds could be seen in places surviving into high summer which were not apparent the previous year. What are the reasons for such variations? The answers are complex but provide much interest and fun; and this is where the sage advice which prefaces this article is followed. For one begins to correlate monthly mean temperatures and precipitation together with the all-important wind regimes which dictate the wind shift during the winter and spring accumulation periods. In this way the answer often becomes apparent, but there are some years which pose a puzzle.
I found this research an absorbing occupation as well as a delightful annual excuse to visit the highest regions of Britain embracing the Cairngorms, Ben Nevis and, in later years, Glenoe. An annual observational summary was accepted by Weather, and I still continue with this despite having reached the 'allocated span'. I have kept brief notes of the state of the principal snow sites in high summer, and whether they survived into the new snows of the following winter. These notes are perforce very brief and not always complete. Often, I have never heard subsequently whether various beds have survived, although in recent years I have found Iain Hudson's articles in the Journal of Meteorology very useful (Cairngorm snowfall reports, 1975, vol. 1, 284-286; 1976, vol. 2, 163-166; 1977, vol. 3, 306-310). An exceptionally warm autumn, as in 1969, can upset snow survival expectations. I have not overlooked the importance of an annual summary of mean temperatures and precipitation for the January-May months, because here lies the key to the proliferation or otherwise of snow survivals. This is also the importance of mean direction of wind-drift accumulation, for here again lies the key to the sitting of snowfields and snowbeds in a given summer. These data are appended by each annual summary for easy reference. It will be seen that these statistics cover the January-May months. This is the usual unbroken accumulation period; although snow falls on the high hills in October, November and December, these months are subject to periodic depletion. Thus I suggest that the January-May period is the vital one for determining the number and survival of snowfields through to the following winter.

PART 2

In Weather 1974 I gave a temperature and precipitation summary from Glenmore Lodge in graphical form from 1951 to 1973 covering the January-May period. There were also graphs for the vital March-April months, besides the March-May months. These figures are repeated in the present article for 1951 to 1978. For the period 1951-1964 I have not given any facts concerning snow survivals on individual sites because I was not making regular surveys then. From 1965 onwards I was able to record regularly although often I never learnt whether various snowfields survived to the succeeding autumn snows. Those that I knew had survived I have distinguished with a Z sign. In table 2 it will be seen that the approximate wind regimes have been appended against each January-May period. This is to demonstrate the

| TABLE 1. Summary of snowbed survival (July survey). | 0 = nil, 1 = prolific, 2 = moderate, 3 = few, Z = summer survival until new snows. |
| 1959 | 0 | 1970 | 2 |
| 1960 | ? | 1971 | 3 |
| 1961 | ? | 1972 | 3 |
| 1962 | Many survivors | 1973 | 2 |
| 1963 | Few survivors | 1974 | 2 |
| 1964 | One survived* | 1975 | 2 |
| 1965 | Large areas; many survivors | 1976 | 0 |
| 1966 | Few survivors | 1977 | 1 |
| 1967 | Many survivors | 1978 | 2 |
| 1968 | Few survivors | 1979 | 2 |
| 1969 | 0 | 1980 | 2 |

* Garbh Choishe, Braeriach
† Garbh Choise and Ben Nevis
position of certain snowfields resulting from the rarer E., S.E. and S. wind regimes which provide sediment accumulations on N.W., W. and N-facing slopes and hollows. 1972 and 1977 were notable years in this category, and 1966 and 1969 somewhat less so.

Table 1 shows a brief summary of snow-surviving rates for the years 1959-1978. At a glance can be seen the character of the years in three gradings, together with four years when there were virtually no survivals.

Table 2 shows details of the various nivation sites with wind regimes from 1965 to 1978. Against these years can be seen approximate mean-wind directions which dictate the various sites of drift accumulation. Also shown is a record of Glenmore Lodge monthly mean temperatures and precipitation for each year to enable one to distinguish the weather regime of the accumulation period covering January to May, together with means for both the March-April and March-May periods.

In a previous article (ref. 11, Spink, 1974) it was suggested that the March-April period provides the criterion of summer-snow survival through to the following winter, viz. when the monthly precipitation at Glenmore is equal or exceeds 80 mm together with a mean temperature of 4 °C or less. It will be seen that this rule holds very well. Notable years in this category are 1951, 1954, 1962, 1965, 1967, 1970, 1972, 1973 and 1977. Incidentally, in 1972 there were still occasional snowbeds as low as 700 metres in late July. Conversely, it can be seen at a glance which accumulation periods have precipitation and mean temperatures which are unlikely to result in survivals.

TABLE 2C. Precipitation (mm) and mean temperatures (°C) for Glenmore Lodge (altitude 350 m) 1961-1979

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(even when, following a prolific year there is a good 'carry over' of snow into the next winter). The following are notable years in this category: 1959, 1964, 1969, 1971 and 1976. Note particularly the dry March-April period in 1969.

Table 3 gives temperature and precipitation details for Glenmore Lodge for the years 1951-1964, but without wind data or details of the summer state of the snowfields. For good measure, at the foot of Table 3, can be seen the temperature and precipitation figures for the exceptional winter of 1946-47.
TABLE 3. Precipitation (mm) and mean temperatures (°C) for Glenmore Lodge (altitude 350 m)

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Precipitation and mean temperatures for Dalwhinnie
1947
°C     | 0.5 | -4.5 | -3.5 | 4.5 | 9.0 | 1.6 | 1.5 |
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As recorded at Dalwhinnie (a comparable station at Glenmore Lodge which was not a recording station at that time). The figures are remarkable and I understand the surviving areas of snow were massive and much survived into the autumn snows. I have been informed that as late as 6th September there were massive wreaths at the head of Coire Cas and Coire an Lochan in the Cairngorns with a snow-bridge across the March Burn; this suggests a wind-drift accumulation from E., S.E. and S., directions which are often responsible for the greatest deposits, as in 1972 and 1977. Indeed I suggest that these two years were the nearest approximation to 1947 as far as volume of summer snow-survivals are concerned.

Aesthetics. I feel that I must mention the aesthetic side of the summer snowfields saga.

On Cairngorm I get an immense thrill annually when I walk over to Ciste Mheurad (Margaret's Coiffin, site A). It is well hidden in a deep hollow facing E.S.E. and one suddenly comes across it. Then one sees at a glance the result of the previous winter's weather, and comparisons are made with the volume, area and depth of previous years. One continues past Site B nearby, which being shallow varies greatly, and then along the southern flank until one is above the western end of Loch Avon. The great plateau between Cairngorm and Ben McDhuill lies ahead with its many snowfields in a normal year. Then on to Ben McDhui, where lies, in my opinion, the most beautiful snowfield in the Cairngorns. Usually large and massive, it faces

south-east above Loch Etchachan. From the western side of Ben McDhuill one can look across the Lairig Ghru to the Braeriach Mass with its famous 'Old Man' Garbh Cholce snowfield, perhaps the most permanent in Britain. On Cairngorm must be mentioned the Coire Cas and Coire na Ciste field, often ski-able until June and July, and the beautiful Coire an Lochan field descends to the Lochan. There are also those snowfields which only appear after a south-easterly drifting, such as distant Lochnagar beyond Balmoral, the March Burn on the east side of the Lairig Ghru, and the Allt a' Choire Mhoir area on the western side of McDhuill and which can be very extensive.

On Ben Nevis there are the famous beds seen from the Allt a Mhuiltin valley which are visible beneath the fine granite cliffs below the Ben; they bear names such as Observatory Gully, Observatory Buttress, Point Five Gully, Gardyloo, and Tower Gully. In Glencoe one can name the late summer snows on Bidean in the high north-facing corries, as well as the snowbeds high on Binn a Bhuirdie, which provide good winter skiing but seldom survive a summer.

Finally, it may be of interest to record the years in recent times when Ben Nevis was clear of snow by the autumn. These were 1933, 1935, 1938, 1940, 1945, 1949, 1953, 1958, 1959, 1969, 1971, and 1976. In 1964 there might possibly have been one survivor following an exceptionally dry January- to May period.

REFERENCES
3. GATTY: Geographical Journal (1900).

UNUSUAL FALL OF ICE NEEDLES, 14 JANUARY 1980

A sparse and intermittent fall of ice needles occurred at Kew Observatory this morning, 14 January 1980, between 1055 (the time the phenomenon was first noted) and 1205 (when the cloud was breaking up). The screen temperature was between -3 and -2.5 °C, the wind was light south-westerly (230°71° at 1140), and the cloud was 8/8 stratus at 500 feet rising to 600 feet with no other cloud above it. There was no fog, the visibility being between 2500 and 4000 metres. Virtually no accumulation of the needles took place. The needles evaporating soon after reaching the ground. This is the first time that I have seen ice needles in the absence of fog.

Kew Observatory, Richmond, Surrey.

I. D. FINNEY
(for the Superintendent)

The most unusual feature of the fall of ice-needles that day (14 January 1980) was that similar falls also occurred at many other places in England hundreds of kilometres apart. The common factor was that the needles fell from lifted fog. For example, the editor witnessed falling ice-needles, mostly
3 mm in length, at Bradford-on-Avon and Trowbridge from 0945 to 0950 and around 1200 GMT. There had been riming fog until 0915 when the fog lifted to a level higher than the nearest hills (i.e. above 400 feet), and the rest of the day was sunless. Screen temperature was —4.6 °C at 0900 and —2.6 °C at 1300. Reports of ice-needles were also received from the Bath district.

On page 8 of the January 1980 issue of Climatological Observers Link are the following accounts of falls in Bedford and Oxford.

(1) While in Bedford on the 14th, and several hours before the belt of snow arrived, I saw ice prisms or crystals falling from low stratus which had lifted from early freezing fog. P. D. Chapman.

(2) In Oxford ice granules fell from freezing fog on the 14th; air temperature at the time —5 °C. Granules were pin-like and measured 3 mm long. This phenomenon was observed at Kennington and Cowley, south Oxford, between 0845 and 0900.

**A DAMAGING WATERSPOUT AT TOPSHAM ON THE RIVER EXE, IN AUGUST 1694**

On the following pages are reproduced an historic description of a waterspout which passed through the fishing port of Topsham, near Exeter in South Devon, nearly 300 years ago. The original appeared in the Philosophical Transactions of the Royal Society in 1695, and described the event which took place between 9 and 10 in the morning on 7 August 1694 old-style calendar (17 August 1694, new-style). The key to the various letters indicated on the engraving is to be found in the text.

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V. Mr. Zachary Mayne’s Letter, 1694. Concerning a Spout of Water that happened at Topsham on the River between the Sea and Exeter.

_I received yours, and should have given my self much sooner the Satisfaction of Answering it, had I not met with hindrances; I have taken pains to get the best Information that I could, and hope I have with some difficulty pickt out a little Truth out of a vast heap of Falshoods. My Informants are Perfons using the Seas, and are well acquainted with (Accidents shall I call them, or rather) Prodiges of this Nature, which are very frequent abroad, though rarely, I think 'tis said never seen before with us in our River, though some pretend to have seen of them in the Downs. The French call these forts of Appearances Trombs, I suppose from the Figure and the Noise that they make, that word signifying a fort of Humming Top. They are certain Elevations of Water during Storms and Tempet's, reaching from the Superficies of the Sea to the Clouds. They happen several ways, sometimes the Water is seen to boil, and raise it self for a considerable space round about a Foot from the Surface, above which appears, as it were, a thick and black Smoak, in the midst of which is observed a fort of Stream or Pipe resembling a Tunnel, which ariseth as high as the Clouds; At other times these Pipes or Tunnels are observed to come from the Clouds, and suck up the Water with great noise and violence. They move from the place where they were first gathered according to the motion of the Wind, and discharge themselves sometimess into the Sea, to the unavoidable_
unavoidable Destruction of such Ships as are in their way, if they be small Vessels, and to their great Damage be they never so big: Sometimes on the Shor, beating down all they meet with, and raising the Sand and Stones to a prodigious height. 'Tis said, that Vessels that have any Force usually fire their Guns at them loaded with a Bar of Iron, and if they be so happy as to strike them, the Water is presently seen to run out of them with a mighty noise, but no further mischief. Ours happened Tuesday last, the 7th of August, 1694, between Nine and Ten of the Clock in the Forenoon; 'twas then very near, if not quite low Water, which is look'd on as a special Providence, since had it been High Water, 'tis concluded its strength would have been much greater, and its confusions more fad. The Water that was near it seemed to fly hither and thither, as though 'twould fain make its escape from it: Yet I cannot find upon Enquiry that the Channel was at all wholly dry. There was also some Wind, though not so violent as it had been before; and when the Spout or Tromb began to move, it went with the Wind like a dark smock, and the Wind being then W. N. W. its course was E. S. E. I have sent you a rude Draught of the manner of its passage after it began to move, according to the best Information I could get, for I was not at home when it happened.

The marks + + + shew the River, the Letter O the Spout. The Letter S Mr. Seward's House (who was an Eye-witness of it) which it gently touched with little or no Damage, blowing only off a few Tiles. The Letter G the House of one Widdow Goldsworthy, which it in part uncovered, took off almost all the Thatch of her Garden Wall, brake down a large Limb of a Plum-Tree which stood at the higher end of her Garden, and which is more Remarkable than all the rest, it took off an Apple-Tree which was no way decay'd, and between fifteen and sixteen Inches about, within two or three Inches from the Ground, almost as exactly as any Saw could have done it, and carried it, as I judge, (for I did not measure it) between Twenty and Thirty Foot from the place where it grew, and that not forward in the Path that it took, but almost directly backward, which makes me conclude that it had a double Motion; the one external from the Wind strait forward, the other internal and circular, like the Fly of a Jack, which a Man may carry in his Hand, that will strike any thing either forward or backward as it meets with it. G with a Bar under it shews you Mr. Green's House, which was for the most part untiled, and backward in the Court there was a Linny that reft upon a Wall, which indeed it heaved a little out of its place, part of it hung on one side of the Wall, and part on the other; but not broken in pieces, nor much injured, it having been since restored to its proper place. The Letters WL shew you two Houses more that were very much damaged in their coverings, which is the more Remarkable, for that Mr. Moxam's House, marked M M, though it stood between the Injured Houses, and was much higher than either, had only two or three Quarries of Glass broken. E E E E shews the march of the Spout. The Letter X the Planks that were blown some upright, some several Yards out of their place. D a Ship newly launched, of about One Hundred Tuns, which was much shaken, but not hurt. K a Mast of near a Tun weight, thrown out of its place. W the Anchor that was torn out of the Ground, and carried seven or eight Foot with a Boat that was fastened to it, and blown up into the Air, that Boat was rent from the Head to the Keel. B another new Boat blown about six Foot high, and turned upside down.
down. A a Fisher Boat with one Man in it, which was near the place where the Spout was at first perceived, but through Mercy escaped. L A a Lane that goes from the River, in which some Houses suffered Damage, which shews that the Spout was divided in its march. 'Tis no small Mercy that no Man, Woman, or Child received the least Injury in their Persons. God shews us what he can do, happy we, if we understood his meaning, and comply with it; but alas, Mercies and Judgments are soon forgotten.

THE WEATHER AT OXFORD DURING 1979

By C. G. SMITH
Radcliffe Observatory, University of Oxford

The weather of 1979 at Oxford will be remembered for the very cold snowy winter, the severest since 1963, and the wet stormy December which caused widespread flooding. Taking the year as a whole, rainfall was well above average, the excess mainly coming during the months of March, May and December. July and September were notably dry and to some extent compensated for a late, cool, wet spring. The sunshine total for 1979 was very close to the long-period average, and there was a welcome surplus of sunshine in the second half of the year to compensate for the deficit during the first six months.

The year began with a deep snow cover and very low temperatures. With some brief interruptions severe conditions persisted for much of January and February. Both these months were the coldest at Oxford since 1963. The frequent falls of snow and the alternation of freezing and thawing conditions caused much damage to road surfaces in the district. Unlike some other cold winters, rainfall (which includes the water-equivalent of snow) was above average in both January and February. Cold unsettled conditions continued throughout most of March, which had more than double the average rainfall and a large number of days on which snow fell.

Apart from two fine warm days over the Easter holiday period, the 14th and 15th April, spring was late, cold and unsettled. Conditions during April were not very different from average, but May was wet and rather cold with air frost occurring on two days at the beginning of the month. The first warm sunny spell of the year, with temperatures exceeding 20 °C, was brief and lasted from 12th to 15th May. Much of the rainfall in May fell during heavy showers on days with low temperatures. The weather remained generally cool and cloudy until mid-June when daily temperatures approached the seasonal normal more frequently.

After a heavy fall of rain on 24th June, which produced nearly half the month's rainfall, a long dry spell set in which lasted until 26th July. This spell of 33 consecutive days without rain was the fourth longest such spell on record at Oxford. July was the sunniest, driest and warmest month of the year; on six days the maximum temperature exceeded 25 °C. August was cooler and wetter with a long spell of cloudy days and a notable gale in mid-month at the time of the Fastnet yacht race, but taking the month as a whole conditions were not very different from average. The same comment might well be applied to the summer as a whole if one includes September.

September was generally dry and sunny but temperatures fell rather lower in the second half of the month. There was no rain at Oxford between the 13th and 18th September; this dry spell must have been welcome to farmers after such a late cold and wet spring. As in some other years October was a mild month with many quite warm days and low wind speeds. Rather similar conditions prevailed for much of November which was also drier, warmer and sunnier than average. There was a cold spell from 12th to 20th November during which there were two quite sharp air and ground frosts.

The character of the weather changed abruptly in December which was a wet, stormy month with more than double the average rainfall. The first half of the month was very mild and wet. During the week 8th to 14th December rainfall amounted to 77 mm and both the 13th and 27th had daily falls exceeding 30 mm, beating the previous record daily fall for December which occurred on Christmas Day 1927. The second of these falls, coming at a time when the soil was saturated and rivers already well above winter level, produced widespread flooding in the Thames and Cherwell valleys. The weather turned colder after the 16th and there was a light fall of snow on the 21st. From then until the end of the year night frosts were frequent and the year ended on a more seasonal note.

The main features of the year's weather are summarised in the attached table which gives monthly totals and averages and departures from the long-period mean values. The total number of 24-hour periods having 0.2 mm rain or more was 174 days. Falling snow or sleet was seen on 34 days, and there were 120 ground frosts. The extreme maximum of 29.5 °C occurred on 27th July and the extreme minimum of —9.8 °C on 28th January.

ANALYSIS OF THE 'PWDR SER' SAMPLE OF 3 FEBRUARY 1980

In an earlier issue of J. Meteorology (vol. 3, 312-316, December 1978) we reported the case of a gelatinous substance, said to be the size of a football, which was seen 'gliding' into a Cambridge garden during a rainstorm. The origin of the jelly was never discovered, chiefly because it disappeared overnight from the lawn on which it settled. This type of natural curiosity was given many centuries ago the name pwdr ser. This is a name of Welsh origin which is discussed in the note which follows the present article. As explained in our earlier paper (volume 3, page 315), the name pwdr ser has been loosely ascribed to all such mysterious jelly-like lumps of matter found lying in the open, whether or not they have been seen to fall from the sky by an eye-witness. Hence, it is probable that there exist several different origins for the diverse jellies and gels discovered in the past. As meteorologists, we are primarily concerned only with the phenomenon of pwdr ser when it is
Chemically: it is hard to perform quantitative tests, but my efforts suggest the following:
- pH around 0.5 — 7.0
- Tests for protein, carbohydrate, ketones, nitrite, sulphate, and chloride all proved negative as far as I could test.

The lack of protein bothers me, for I would suspect protein as the main constituent of the gel, especially if this sample were to be of animal origin. The gel itself was highly miscible with water, and appeared to contain some indication of filamentous structure. It was, however, formless, in that it contained no integral cells. All cellular material was quite extraneous. The apparent absence of protein was perhaps because the method I used was not sensitive enough. With a little more time I could try to get some sort of protein trace evident (probably by acid hydrolysis, or digestion with a protease) and subsequent amino acid determination (qualitative) with ninhydrin. I used the rather crude, but quick Millon's reagent test. Biuret would be better and more critical.

Conclusion: I have to admit to offering only very tentative conclusions. I have never seen anything of this nature before. Fungi certainly are often associated with gelatinous states, but usually following breakdown and subsequent deliquescence of cellular material. The lack of pigmentation and cell content tends away from this association. I would quite independently support the idea of material regurgitated by an animal, the material originating from a freshwater environment. I am worried by the lack of protein, since, if the mass were the discarded gel from amphibian egg masses, I would expect to find evidence of protein. The presence of the parasitic worm would support this thesis, although it may be entirely coincidental. Note that I am not really suggesting that the gel has been regurgitated by an amphibian, but that I suspect that it may be of amphibian origin. In short, I think that the idea of regurgitation, by some other predacious, of gel derived from amphibia is much more likely.

T. J. TURVEY

Here, we shall allow the problem to rest for the time-being. If in the future anyone should happen to discover gelatinous substances 'in the field' or, as in the Cambridge event of 23 June 1978, to witness such matter gliding down through the air, we would appreciate receiving a sealed bottle of it for further research and examination. Mailing address for the Pwdr Ser Experiment is: Cockhill House, Trowbridge, Wiltshire, U.K.

G. T. MEADEN

THE MEANING OF PWDR SER

In a communication with our Barmouth correspondent Mr. Robin Harper, Mr. Bryn Griffiths of the University of North Wales at Bangor made the following remarks on the origin of the name Pwdr Ser. For four years Mr. Griffiths had been at work compiling an English-Welsh Dictionary under the auspices of Yr Academi Cymreig and the Welsh Arts Council.

The Welsh name you quote (Pwydr Ser) should read Pwydre Ser, with the e pronounced as in Carye. It is the Pembroke shire pronunciation of what would be, in more standard Welsh, Pwdrredd Ser or Pydrredd Ser, literally

seen to fall from the sky. Our questions are then: (1) of what is it made? and (2) how did it get so high into the air and so far from its place of origin? This accounts for our basic interest in the Cambridge event of 23 June 1978 and for the present inquiry.

We now investigate the recent event of 3 February 1980 which is classified broadly as 'Pwdr Ser' although its 'fall' was not witnessed. We hope that its understanding will help resolve some of the earlier unexplained occurrences, including perhaps the Cambridge event. The story is as follows.

On the afternoon of Sunday 3 February 1980 at Hemel Hempstead, Hertfordshire (U.K.), Mr. Philip Buller found lumps of a colourless gel lying close together on his lawn. The lumps lay so near to one another that their common origin was not in doubt. The total volume was considered to be approximately sufficient to fill a yoghurt carton, say 75 ml. Over the telephone Mr. Buller described the gel to me immediately after its discovery; I suggested that he should seal some of it into two bottles, one to keep and one to send to me for examination. He kindly did this, and I received a 10 ml sample of the gel the following Wednesday. Although odourless when discovered, it had by Wednesday acquired a disagreeable smell. This led me to suppose that it was a problem in the realm of natural history rather than physics or chemistry, so I passed the specimen on to Mr. T. J. Turvey, Senior Biology Master at Monkton Combe Public School. He willingly undertook a careful analysis, and provided the following, revealing report:

This gelatinous mass revealed the following contents:
(a) a small proportion of plant debris; traceary and vessel elements typical of angiosperm remains. This would suggest some connection with material which contained such remains, or possibly contact with gut contents of a herbivorous detritus feeder.
(b) various typical freshwater algae were present, living. Species difficult and tedious to identify, but included two or three different species of both branched and unbranched filamentous green algae. Solitary and grouped, non-flagellate unicellular green algae. All these algae were in a non-reproducing state, but appeared to be viable and showed good chloroplast definition with no signs of undue senescence. Thus these could not be gut contents of a freshwater environment, but rather suggest fairly recent association of the mass with a freshwater environment.
(c) desmids and diatoms were present. Diatom sp. Navicula was suspected. Similarly the blue-green alga Anaabaena was observed, in small, isolated colonies.
(d) three species of roundworm (Nematoda) were observed, all living, there being a fair number of each species present. These were free-living nematodes such as are commonly found in freshwater or in the soil.
(e) a few ciliated protozoans (Class: Ciliata) were observed, and genus Colpidium was positively identified. Again, characteristic of freshwater environments.
(f) numerous bacteria were present in the gel, accounting for the odour.
(g) The most interesting observation was of an eight-segment worm possessing chitinous mouthparts and a muscular pharynx, suggesting an internal parasite. This was not a nematode. It was dead and definition was poor, although it showed no signs of decomposition.
star-rot (it is a characteristic of South-Western Welsh to drop the final dd). The focus classicus discussion of the phenomenon is in Nature, vol. 83, 492-494 (1910), and reproduced by Wm. R. Corliss in A sourcebook of strange phenomena (available from Mr. Corliss, at Glen Arm, Maryland, 21057, U.S.A.) [see also J. Meteorology, vol. 3, 312-316, December 1978]. Other Welsh names are, or were, Cheyda awyr (literally, sky-omit) and Griffid ser (star-spawn). The dictionaries traditionally identify it as Nostoc, a kind of 'short lived fungus'; but in the Penguin dictionary of British natural history, (page 210) Pwyde ser, or (page 250) star-slime, is referred to as 'a substance found lying on the ground and formerly associated with shooting stars, but now known to be the gelatinous remains of the oviducts of frogs and toads'. I have spoken to two people from Llanuwchllyn who have seen this substance, although they had no idea what it could be.

Finally, Mr. T. J. Turvey contributed the following additional remarks about Nostoc and slime-moulds.

Nostoc is a well-known blue-green alga (Class: Myxophyceae; Order: Nostocalea; Family: Nostocaceae; Genus: Nostoc). The association with gelatinous masses arises through the fact that the colonies of such cells form within a gelatinous thallus. However it is unlikely that very large masses would be found. The order is aquatic. Similarly, there is no connection between gelatinous pwwr ser and the slime-moulds (Myxomycetes), which do not produce gelatinous colonies. In the motile phase, they exist as amoeboid, 'solitary' cells, which aggregate to form the more static and fruiting phase.

SOLAR HALO COMPLEX, 29 SEPTEMBER 1979

On the morning of 29 September 1979 a solar halo complex was widely seen in Kent and the London area. Mr. Huw M. Holland-Jones (46 Dalbin Road, London SE18) who witnessed it at Shooter's Hill said it was the most comprehensive display that he had seen in 20 years of observation. Later in the day, between 13 and 14 hours it was seen over Holland 300 to 400 kilometres to the east.

Mr. Holland-Jones' description was as follows.

At 0730 GMT the sky over London was veiled by a layer of cirrostratus (7/8), the sun being about 15 degrees above the horizon. Since the previous day a centre of high pressure had transferred from central England to the Dogger Bank. Across France and extending towards Austria and into the U.S.S.R. was a weak and slightly waving cold front. It was probably cirrostratus to the north of the front that caused the magnificent halo display. Mean sea-level pressure at 0730 at Shooter's Hill was 1027 mb, temperature 7.5°C, and wind light, easterly.

The 22 and 46 degree haloes almost reached to the horizon. The very bright upper arc of contact to the 22 degree halo had a strong wavy appearance (with long horns), and there was a further faint arc just above it (Parry arc). The 46 degree halo also had a well-defined upper arc of contact. Both haloes were bright and well-coloured, with red and yellow towards the sun and green and violet away from it. The parhelic circle extended a full 90 degrees to the north from the sun, and also a long way to the south, and there were mock suns associated with the 22 degree halo. The display was superb until 0830 GMT after which the cirrostratus began to break up.

From Tunbridge Wells, Kent, Miss Cicely Botley observed a similar display from 0750 GMT until mid-morning. Miss Botley particularly mentioned seeing a faint Parry arc and a very bright upper arc of contact (22°) with very long horns. Mr. J. H. Morris, also at Tunbridge Wells, described the display in Climatological Observers Link. Besides all the features described above, Mr. Morris also mentioned a strong lower arc of contact to the 22° halo, seen from 1030 to 1130 GMT, and an upper arc of contact to the 46° halo (seen between 0715 and 0900 GMT). At Sandhurst, Mr. J. M. Heighe reported seeing a parhelion to the 46° halo.

Solar halo phenomena were also reported from Holland at (a) De Blt [13-1330 h] and at (b) Wouw [around 1400 h]. The sketches reproduced in the figures (a and b) are from Weerspiegel, volume 6, no. 10 (1979), courtesy P. P. Hattinga Verschure.
UNUSUAL CIRRUS FORMATION ASSOCIATED WITH HALO COMPLEX

On 29 September 1979 a spectacular halo display was observed at Tunbridge Wells by Botley and Morris. Although a rare 46° parhelion was observed at Sandhurst the display was less impressive here, and the most interesting feature seen was the remarkable 'S-shape' hooked structure of the cirrus clouds. Two colour slides of these were taken but I have sketched the cloud pattern alongside the relevant wind data extracted from the mid-day Crawley radio sonde ascent (see figure 1c). The cloud structure was very regular and it will be noted that there was a steady change in wind direction from westerly at the top and base of the cloud to due south in the intermediate region. This means that, because individual columnar ice-crystals take up a preferred attitude with respect to the airflow, they would change their orientation by 90° twice if falling through the complete 17000 ft layer. On 29 September there must have been crystals which enabled solar rays to pass through their side faces, end faces and all intermediate permutations needed to produce the complex phenomena which were observed.

In the Berkshire halo display (Goldie and Heighes) a somewhat different wind pattern was noted in the 1800 Camborne ascent where the wind steadily veered from 230° at the cloud top to 340° at its base. This gave a continuous steady change of 110° over the complete 16000 ft layer and there were some unique features not reported on 29 September, namely the Goldie arc and the Heighes-Pilbury arc (White).

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JOMAR, College Road, College Town, Sandhurst, Berks
J. M. HEIGHES

VARIOUS STORM EVENTS

TORNADO IN ESSEX

The following tornado event was reported in the News of the World, 6 January 1980. The tornado probably took place on 21 December 1979. A 20-second whirlwind scythed through Fossebrook Farm near Ingatestone, Essex, wrecking a barn and ripping a concrete beam weighing nearly a ton from the ground.

Farmer Roger Buckenham said the storm that hit his land went un-noticed by anyone else in the area. "It was incredible," he said. "I've never seen anything like it. It looked like a big black funnel. It came on very suddenly. I saw the trees start to bend double and then it began to hail and snow. There was a terrible roar that lasted for about ten seconds. I thought the devil had come. It just ripped my barn apart." Mr. Buckenham's stepson, 16-year old Trevor Sherman, also saw the storm.

JANUARY HAILSTORM IN SUSSEX

From the Worthing Gazette: Hailstones as big as marbles (15 mm diameter) fell on parts of Worthing on Wednesday (23 January 1980) during a freak storm. Ice was piled several inches deep in parts of Worthing, Sompting and Lancing. The storm was accompanied by thunder and lightning which set off fire alarms in the town centre.

DAM BURST IN INDIA

On Saturday 11 August 1979 over 1000 people were drowned when the Machchu Dam burst in Gujarat State, N.W. India. A wave of water up to 4 metres high hit the nearby town of Morvi, washing away two-thirds of the houses in its path. A railway bridge also collapsed. The wall of water was heavily laden with mud and silt. Gujarat State had been lashed by heavy monsoon rains for a fortnight, and had had nearly incessant rain for a week.

BALL LIGHTNING

Jim Philpotts, a retired eye surgeon, of Little Warren Road, Guildford, Surrey, awoke from an afternoon nap to see a green and orange glow filling his hallway. Hovering at the foot of the stairs was a fireball, but as he approached it, it vanished. Mr. Philpotts, 67, said: "There was a bang like a lightbulb exploding, and there it was, a foot across (30 cm diameter), a few inches above the ground. Then it just faded away leaving a strong chemical smell." News of the World, 16 December 1979.

LIGHTNING DAMAGES AIRLINER

Moscow, Jan. 30 — A lightning bolt that struck an Aeroflot-Grazdanskij Wozduzhnyj Flot Tu-154B over Armenia ripped away wing plates, burst open a fuel tank and knocked the 'plane out of control but the pilot managed to fly it to safety, Soviet Press reports said today. The newspaper Socialist Industry and the Tass News agency said quick action by the pilot saved the lives of 150 passengers on board the jet. The aircraft, cruising at 8,500 ft, was preparing to land at Yerevan airport in Armenia when suddenly there was a crashing blow on the port wing, Tass said. An electric charge ripped open the external plating of the port wing, hitting a tank with three tons of kerosene and ejecting the whole of the fuel, Tass said. A hunch formed in the lower surface of the wing, upsetting the normal streamlined contour, and the 'plane twisted sharply and uncontrollably to starboard because of the imbalance in weight between the fuel tanks. A crack developed in the port wing and parts of the metal skins covering the wing were torn off by air currents. — United Press International, Lloyds List.

FASTNET RACE INQUIRY CRITICISED

Harsh criticism of some aspects of the Fastnet Race organisation, and the special inquiry which followed the loss of 15 lives in last summer's race, has come from America. Safety arrangements and the use of radios are questioned, there are claims that numbers should be limited, smaller boats excluded, some qualification should be compulsory, and an observation that the inquiry could have been more conclusive.

The comments, contained in the March 1980 issue of Yachting, the American magazine, were made during a specially-organised discussion on the official report of the inquiry.

The yachtsmen felt strongly that there should be fewer restrictions concerning radio transceivers and sophisticated navigational aids. But there
was generally more praise than criticism.

Commenting on the American criticism, Mr. Donald Parr, the R.O.R.C. commodore, emphasised that several radical alterations to safety regulations had already been introduced for this season and could be said to go beyond the recommendations of the special inquiry.

MISSOURI FLOODS POSE ELECTION PROBLEMS

Last April (1979) the Mississippi and Missouri rivers were in heavy flood. For example, at St. Louis, where the flood stage is 30 feet, the Mississippi on Easter Sunday was at 37.7 feet. Thousands of homes were under water, as were many hundreds of roads. In Grafton, Illinois, an aldermanic election was due to be held on Tuesday 17 April. Mr. John Peldyak, of Alton, Illinois, sent us the following clipping from the Alton Telegraph of 16 April.

Grafton, Illinois. "Windy," Nairn has a question for Illinois legislators: What do you do about the municipal election in your city when two of the three polling places are under water?

Nairn is incensed that there is no provision in Illinois law to permit a municipality to postpone or cancel an election when it is hit with a crisis such as the one facing Grafton, where 85 families have been evacuated because of the flood. Two of the three polling places, Jacoby's Funeral Home and St. Patrick's Church, are surrounded by flood waters and the only way to get to them for Tuesday's aldermanic election is by boat, says Nairn. He has been forced to move both polling places to other locations. In the case of the Second Ward, the polling place was moved from Jacoby's to the public school and in the Third Ward, from St. Patrick's to the garage of Paul Van Brown on Springfield Street. Nairn said the election law only provides for moving a polling place to another location within the precinct, but does not provide for postponing or canceling an election until flood waters recede. "We can't have the voters floating around in boats," says Nairn, who feels there should be some legislation to take care of such situations. He says it would be difficult to get elderly voters into a boat to go to a polling place.

WORLD-WIDE WEATHER DISASTERS: February 1980

1-2: High winds and heavy seas off Japan; on 1st gravel carrier Taisei Maru No. 31 capsized off Izumiohtsu, Osaka Bay, leaving three missing; on 2nd, MV Nissen Maru sank off Shinya Saki, northern Honshu, leaving nine missing. Lloyd's List.

1-3: Cyclone 'Dean' hit Port Hedland, Western Australia, with winds gusting to 210 km/h; many houses unroofed and some demolished. L.L.

2-4: Storms in Scotland and northern England, worst-hit areas included Grampian and Tayside in Scotland and Yorkshire, Durham, Tyne and Wear, and Northumbria; on 4th avalanche on Pen-y-ghent (one of Yorkshire's three peaks) left three injured, over same period heavy rain in southern England with roads flooded in Kent and Sussex. Sunday Telegraph. Daily Telegraph.

5: Heavy seas off northern Portugal, one huge wave smashed small fishing vessel, the Cordeiro de Deus, on to rocks near Porto, all 13 aboard believed dead. L.L.

6-10: Severe cold in Uttar Pradesh, north India, 4 died and one missing as avalanche hit resort, leaving another ten injured; in French Alps, 3 dead, villages isolated; one died in Switzerland. D.T.

7: Freighters Pacific Trader sank in Gulf of Alaska due to heavy weather, leaving three dead. L.L.

7: Rivers Rhine, Mosel and Danube in West Germany on flood due to heavy rains, no major damage reported. International Herald Tribune.

8: Torrential rain brought floods to many areas of Wales, cottages at Ystrad Gynlais, south Powys, flooded, inhabitants evacuated; meanwhile in Scotland, snow blocked several roads. D.T., L.L.

9-10: Heavy rainstorms in Riyadh, Saudi Arabia, parts of city under one metre of water, damage to new construction sites etc. L.L.

11: Landslide, touched off by heavy rain, engulfed 20 homes at Hele, near Ilfracombe, north Devon, no casualties, but 14 of homes will have to be demolished. D.T.

11-15: Heavy rains caused serious floods in Khuzeistan, south-west Iran; river Karun over-flowed, a dam collapsed near Shustar, flooding wide area, leaving at least 29 dead in town; altogether floods affected 4,300 villages, leaving 150,000 homeless and at least 200 dead. L.L., L.H.T.

11 (reported): Avalanches in southern Norway, one near Sirdal, left five missing. D.T.

13-23: Serious floods, mudslides in California, U.S.A. after a series of rainstorms, which left up to 300 mm of rain in Los Angeles, and up to 500 mm elsewhere in state; serious damage to property and crops in southern California where damage was estimated at $500 million; 111 homes destroyed and at least 290 damaged, at least 28 dead; on 19th a tornado hit Fresno, causing widespread damage at airport and leaving hail 75 mm to 125 mm deep in surrounding fields; in early part of storm-period storms from California hit Nevada (16th-17th), causing damage estimated at $90 million with 3 deaths, and Utah, damage estimated at $1 million; floods also hit northern Baja California, Mexico causing widespread damage and leaving 3 dead. L.L., D.T., L.H.T.

15 (reported): Heavy floods in western Java, Indonesia after three days of heavy rains, thousands of people left homeless and some 840 acres of rice fields destroyed. On eastern side of Java a cyclone destroyed over 100 houses, uprooted trees and left 800 homeless, no casualties reported. L.L.

16: MV Barrandina and Tollan collided in dense fog in river Tagus at Lisbon, Portugal, Tollan sank with loss of four lives. L.L.

17: Cyclone 'Enid' hit Pilbara region of Western Australia, with winds of 220 km/h; in town of Shuv Gap, 3 apartment blocks destroyed, leaving 200 houses less than 30 years old, and 300 houses, estimated at $2,000,000, minor damage in town of Marble Bar, no casualties. L.L.

17: Thunderstorms, accompanied by violent gusts of wind, hit Israel, flooding low-lying areas; in morning snow fell for an hour, hail later in day. Hail south of Tel Aviv shattered windows, in Tel Aviv heavy rains flooded streets and cut power lines, in Galilee region lightning bolt left one dead, one injured in rural area. L.L., L.H.T.

17: Heavy seas washed man and his daughter off rock at Parthreath, Cornwall, both died.
18: Dense fog caused 100 vehicle pile-up on Normandy Toll Autoroute some 8 km west of Paris, France, leaving 2 dead, 20 injured. L.L.
19 (reported): During Olympic Games temperature down to -5 °F, with biting wind, at Lake Placid, New York State, U.S.A.; more than 150 people affected by frostbite. D.T.
20-21: Serious bushfires in and around Adelaide, south Australia; destroyed 35 homes and 120,000 acres of bushland, 100 people injured; temperatures up as high as 38 °C. L.L.
22: Fv. Norfolk Spinner grounded in heavy seas and dense fog at entrance to Aberdeen harbour, Scotland; 3 dead. B.E.M.
23 (reported): Widespread floods have made about 200,000 homeless in seven Brazilian states over the last few days; states include Maranhao, Para, where river Tocantins; worst-hit state was Goias, where 100,000 people were without shelter, floods also in Bahia State and as far south as Sao Paulo state. L.L.
25: Fv. Mar de Averio hit sandbank in storm off Aveiro, central Portugal, and sank leaving 5 dead. L.L.
25: Fog and ice in many areas of southern England; on A31 near Farnham, Surrey nearly 50 vehicles piled up, and on M4 near Severn Bridge 15 vehicles piled up in six separate accidents. D.T.
26: Mt. Eisho Maru No. 51 sank in heavy seas off Hokkaido, north Japan, leaving 2 dead and four others missing. L.L.
27: Storm, described as 'tornado' sank ferry Twilight 401 in Tan Chiang Jiang river in south China province of Guangdong, estimates of dead ran as high as 244. L.L.
27 (reported): Heavy rains caused heavy flooding in Qatraneeb area, about 80 km south of Amman, Jordan; twenty houses and rail lines in area destroyed, no casualties; snow also fell, first snow in Jordan for 60 years. D.T.

Book Announcement

The Great Drought of 1976

The great drought of 1976 is already becoming part of our folk memory. For most town dwellers it meant little more than inconvenience — parched lawns and unwashed cars. In the country, however, it reached the proportions of a disaster. It effects were felt much earlier and much more severely, and it became on occasion a matter of life and death.

Evelyn Cox and her husband own a farm in Herefordshire, where they also train show jumpers. The author is not a countrywoman, and perhaps for that very reason her account of that traumatic summer has an extra dimension. She tells in fascinating detail the story of the increasing hardship caused by the water shortage month by month; of their efforts to spin out and augment the dwindling supply; above all, of their efforts to protect the animals from as much suffering as possible. It is told against the lively and sometimes amusing background of a small rural community reacting to the stresses of a very exceptional year.

For country people who were seriously affected by the drought, this book will be a fascinating reminder and point of comparison. For town dwellers who look back on the long hot summer with nostalgia it will throw a new light on some of the unexpected realities of country living.

TORRO Thunderstorm Report: September — November 1979

By KEITH O. MORTIMORE
Tornado and Storm Research Organisation
77 Dickeats Road, Corsham, Wiltshire

September
During the early hours of the 1st scattered thundery activity affected western Ireland and, late in the morning, the Kintyre area of western Scotland. Early in the afternoon an active cold front reached western Ireland, and local thunderstorms developed on or just ahead of it, as it moved slowly into central Britain by the end of the day. Storms were far from widespread but rainfall was heavy in many places and thundery activity was quite sharp locally. During the early hours of the 2nd the cold front moved across East Anglia and south-east England with further local storms, and later, storms spread to Belgium, Denmark, the Netherlands and Germany as the front continued its progress into Europe. There was also a storm on the 2nd at Galway in western Eire. A ridge of high pressure spread across the U.K. on the 3rd, diminishing any remaining shower activity, but storms continued to affect Scandinavia and the Low Countries. As a showery trough crossed western and northern Britain on the 6th, thunder was heard at Aldergrove in Northern Ireland and on the north coast of Scotland. Between the 7th and 9th thundery outbreaks were reported in various parts of the near continent, and these areas were similarly affected on the 14th, while there were morning storms at Frederikssund in Denmark on the 15th. A few local thunderstorms developed in two areas of Britain on the 19th. Thunder was heard late in the afternoon in east Cambridgeshire and west Norfolk during the passage of a frontal wave; it also occurred around the same time at Tiptoe in west Scotland and at Bexbrook in Northern Ireland during the passage of a cold front that preceded an outbreak of cooler north-westerly winds. This cold front was also responsible for an isolated thundery outbreak at Munchen-Riem in West Germany on the 20th. A trough that moved south across Britain on the 21st caused thundery activity in some northern, central and eastern areas. After thunder near Stranraer in the morning, scattered activity moved south during the afternoon and early evening to affect mostly eastern counties, particularly the north-east, but there were some outbreaks in Staffordshire, Bedfordshire, west Suffolk and Surrey. There were several waterspouts observed off Falmouth. Later in the afternoon renewed outbreaks occurred in east Yorkshire, and lightning was observed from an aircraft 35 km off Lossiemouth. On the continent storms were widespread in the Netherlands. Isolated thunderstorms continued to affect parts of Kent early on the 22nd and three more large waterspouts were observed in the Straits of Dover soon after dawn. There were scattered storms in the Netherlands.

In Great Britain and Ireland thunder was heard on seven days during September, which is well below the normal of 16; only one station, Galway, reported as many as two days. On the continent, the Netherlands had thunder on eight days, and several other Dutch stations had three days.

October
A weak cold front moved north-east across Britain on the 1st with a little rain in places but there were a few heavier outbreaks in parts of Yorkshire.
where scattered, mostly slight, thunderstorms developed in places. With a warm southerly airstream covering Britain on the 3rd a thunderstorm developed at Bracknell in the afternoon and there was a larger area of thundery activity in the Stoke-on-Trent area later in the day. There was also an isolated evening storm in Belgium. On the 4th, scattered thunderstorms developed in the afternoon within a large area of heavy rain over Scotland. Storms moved steadily north from central Scotland, where Aberdeen was affected for several hours, to reach the Orkney Isles around mid-evening. Storms were also quite widespread in the Low Countries on the 5th. As heavy rain moved across south-western counties on the 6th a few brief storms developed in parts of Cornwall. A further area of heavy rain moved north-east across Britain during the night of the 8th/9th. Shortly after midnight scattered thunderstorms broke out in parts of Wiltshire, Hampshire and the Isle of Wight, and during the early hours of the 9th very isolated outbreaks moved from the north-west of England to affect Lincolnshire and Yorkshire around dawn, the most widespread activity being confined to these north-eastern areas. Some places saw further thundery outbreaks on the 10th. Merseyside was affected early in the day and the Stoke-on-Trent area in the evening. Although many places had further rain or showers on the 11th, thunder was restricted to an evening storm at Guernsey in the Channel Islands and there were scattered outbreaks in the Netherlands. Warm southerly winds continued to blow over the U.K. on the 12th and early in the evening an area of thunderstorms moved into the Channel Islands and out to sea. These storms were most strongly isolated in nature but were accompanied by good displays of lightning in some areas and, due to their slow movement, lasted for an hour or more in places. Outside this area, thunder was reported between Southend and Chelmsford in Essex, particularly in the Buckley area.

With the low pressure system moving to the west becoming more complex and tending to move south-east across the south-west, thunderstorms developed in a number of places on the 13th, the main area lying from south-west England through south Wales to the Midlands and north-east England with an isolated outbreak in Sussex. Some of these storms were severe, notably in the Nottingham area where rain reduced visibility to around 500 metres and caused flooding one metre deep in parts of the city. In the south-west of England storms persisted into the early hours of the following morning. Further thunderstorms developed on the 14th but these were more widespread from the Channel Isles through Devon, Cornwall and south Wales to Merseyside and parts of west Lancashire. In south-western counties the storms on the 14th persisted until after midnight, while fresh outbreaks in Cornwall and south Devon moved north during the early hours of the 15th to affect north Devon and south Wales by dawn and thereafter north-east to many southern and central areas of England and Wales and to parts of Lancashire and Cumbria during the day. Storms in central and northern and central areas were very isolated but in southern areas they were much more widespread and quite severe in places with some hail. At Pontardawe, south-east of Swansea, there was torrential rain and the chimney of a house was struck by lightning, while at Teynham in Kent lightning set fire to a church. It has already been stated that storms further north were more scattered but there was a severe and long-lasting storm in the north Staffordshire/south-east Cheshire area. At Burslem a storm lasted for nearly five hours and the observer remarked on the frequency of forked lightning to earth. Thunderstorms continued in the vicinity of the Bristol Channel into the early hours of the 16th, and after a temporary lull there was renewed activity in south-west England and west Wales in the afternoon and evening. During a severe storm at Mt. Batten in south Devon 25.3 mm of rain and hail fell in 42 minutes with 20 mm falling in 15 minutes. Later in the day 80 discharges to earth were counted during a prolonged storm at Pembroke Dock. A mobile westerly flow spread to most of Britain on the 17th and, following the passage of an occluded front across Scotland, there were late evening thunderstorms at Monk and over much of Argyll. Following the longest thunder-free spell of the month, storms spread across Devon and Cornwall in the afternoon and evening on the 25th and there was a report of thunder in the Scilly Isles early on the 26th. Showers developed widely on the 31st and were particularly heavy in the north where brief thunderstorms were reported in parts of western Scotland.

In Great Britain and Ireland thunder was heard on 16 days, one day more than the normal for October. Although some thunder was recorded in many places during the month, most was recorded in the south-west with five days in west Cornwall and with three or four quite widely over the rest of Cornwall, Devon and Dyfed in south Wales. There were only six days in the Netherlands and few storms were recorded at TORRO stations in other countries on the continent.

**November**

The 1st was generally a showery day, and the showers were particularly heavy in northern and north-western areas of Britain. Thunder was already accompanying many of the showers in exposed areas quite early in the day with reports from the Northern Isles and the west coast of Scotland and north-west Ireland; there was an early storm at Accrington in Lancashire while during the middle of the day storms developed around the Firth of Forth. A line-squall was reported at Pitreavie and heavy hail fell at Dunfarmline. A tornado occurred near Daventry, at Braunston. There were also a few scattered storms on the near continent and the countries of Denmark and the Netherlands were again affected on the 2nd. A trough embedded in a strong unstable westerly airstream crossed many areas of Britain later on the 4th. Showers turned thundery in parts of Eire in the afternoon and early evening and an area of thunderstorms affected the greater Bristol area later in the evening. Thunder again accompanied some showers in north-west Ireland and western Scotland on the 5th, and the Netherlands reported a few storms early in the day, while quite widespread activity affected the near continent again on the 6th. The Netherlands saw very isolated outbreaks on the 7th and 8th while on the latter day there was an evening storm in the Merseyside area of England.

With the winds now turning more northerly, colder and still showery weather advected southward to many parts on the 9th. Some of these showers were again accompanied by thunder in places, particularly within a broad trough lying over England and Wales. One area of thunderstorms tracked from the north Chilterns, east of Benson, to London. It was reported that a massive cumulo-nimbus moved south-east over London with rain, hail and one or two reports of snow and with winds gusting to 35-40 kt in places. There were
also local outbreaks at Huddersfield, Merseyside, Anglesey and the Mull of Galloway. Lightning was also observed from the Sussex coast. The Low Countries were affected by widespread storms and an aircraft was seen to be struck by lightning over Huizen in the Netherlands. Showers were confined to the north and west on the 10th, but there was again thunder in the Northern Isles and at Manchester. The Netherlands also reported thunder in places. On the 11th thunder was restricted to parts of the north coast of Scotland, and on the 12th, to the Den Burn area of the Netherlands; on the 13th there was a storm at Lambermont in Wales. Lambermont had another thunderstorm on the 14th and there were scattered storms in coastal areas of West Sussex and in the Netherlands, while later in the day lightning was observed from several parts of the south coast. On the 15th some showers were accompanied by thunder at Jersey in the Channel Isles, in parts of west Wales, at Tynemouth in the north-east and in the Low Countries. Funnel clouds were observed from Lossiemouth in Scotland. Thunder on the 17th was confined to the Northern Isles during the morning and lightning was observed from Stornoway in the evening. A pre-dawn shower at Inchtalagan on the 18th was accompanied by thunder and there were scattered storms in the Low Countries.

Thunder was heard in Great Britain and Ireland on 13 days during November which is exactly the normal for November, but activity was scattered over the country and few places recorded more than one day. Although storms were recorded on one day fewer in the Netherlands, activity was quite widespread on some days. Four or five days were recorded at several stations.

WORLD WEATHER REVIEW: November 1979

United States. Temperature: warm E. of Mississippi (+3 deg. in N.E.) and in S. California; cold in most of country, —4 deg. in Idaho and Wyoming. Rainfall: dry from L. Superior, W. to Pacific, then S. to California, then E. to Texas; wet in E. and C. states.

Canada and Arctic. Temperature: extremely warm in Alaska and N.W. Canada, +10 deg. in lower Mackenzie Basin; warmest November (and autumn) on record in most of Alaska and adjoining regions; at Inuvik in the anomaly of +10.3 deg. was nearly twice the previous greatest since records began in 1926 (+5.7 deg. in 1952). Most of Arctic cold, although anomaly generally only —1 deg. Parts of N. Canada had record low minimum in 2nd week. Rainfall: wet in Alaska, N. Canadian Arctic islands (over 200% widely in both areas). E. coast of Canada, N.E. Greenland, W. Iceland. Dry across the greater part of Canada, Newfoundland, S.W. Greenland, E. Iceland; under 50% over a very large area covering the whole interior of Canada except from Winnipeg to Quebec; under 25% widely to E. of Rockies.

South and Central America. Temperature: warm in Brazil and adjacent regions, but cold areas were more widespread and had large anomalies: —2 to —4 deg. in N. Mexico and much of Argentina; —4 to —6 deg. in N. Argentina. Rainfall: wet in S. Mexico, W. Indies, N. Venezuela, N.E. Brazil and generally S. of Equator, except Paraguay and Chile. Over 200% widely in W. Indies. Extreme S. Mexico, N. Venezuela, N.B. Brazil, N.E. Argentina. Dry in most of Mexico, much of Amazon Basin; W. Mexico rainfall. Floods and landslides caused at least 17 deaths at El Playos, Colombia.

Europe. Temperature: warm in N.E. Sweden, European Russia, and from Bulgaria to Romania, W. to Austria; otherwise cold, except locally in Eire, U.K. and N. France; —1 deg. in N.E. France and N. Italy. Rainfall: wet generally, over 200% in parts of N.W. Britain, from S. Germany through Denmark to E. Sweden and S.W. Finland, from S.E. Italy to Greek, also E. Romania; floods in Albania in mid-month, 250 mm in 3 days. Dry in S.E. of European Russia and from Ireland to N. and E. France and N. Italy; under 25% in S. Ireland, locally rainless in extreme S. Spain. Sunshine in Germany high in N.W., low in E. and S.


U.S.S.R. Temperature: warm W. of 100°E., except Taimyr Peninsula, +3 deg. E. of Urals; very cold in E., —4 to —6 deg. widely from Gulf of Ob to N. Kamchatka, coldest November (and October) on record at a number of stations. Rainfall: wet in much of European Russia, 80°-125°E. and in N.E.; dry from Crimea to Caspian and Aral Seas and L. Balkhash; a band E. of Urals, and N. coast from Gulf of Ob to New Siberia Islands then S. to Sea of Okhotsk.

Middle and Far East. Temperature: warm from Turkey to N. Saudi Arabia, Pakistan, India (+4 deg. in centre), Burma, Bangladesh, Malaysia, most of Indonesia, Japan. Cold in Iran, whole of China (~4 deg. in extreme N. and S.), Korea, Vietnam. Rainfall: wet in most of Turkey, most of India (over 200% in much of W.), Bangladesh, Japan, locally in N. China. Tel Aviv had 120 mm in late November, 23% of annual average; in Jordan this storm gave the heaviest rain in 35 years, paralysing the country. Dry in Pakistan, most of China, Korea, nearly all of S.E. Asia and Indonesia. Under 50% in a large area of S.E. China, Burma, S.E. Asia and New Guinea, and many places under 25%.

Australia. Temperature: warm everywhere, +2 deg. in and S. of centre. Rainfall: wet in S. half, except parts of New South Wales, over 300% in South Australia; dry in N., mostly under 25%, rainless on N.W. coast.

WORLD WEATHER REVIEW: December 1979

United States. Temperature: warm everywhere except Gulf of Mexico; +3 deg. from L. Superior to Idaho. Rainfall: mostly dry; wet only in Florida, Texas, round L. Huron, and L. Michigan and locally on W. coast; under 50% in many W. and N. states and in Appalachians; under 25% in Rockies.

Canada and Arctic. Temperature: warm nearly everywhere in Canada and in S. Greenland; +5 deg. in large area W. of Hudson Bay. Cold in Polar Basin, Alaska, N. Greenland, N. Canadian Arctic islands, Iceland; —5 deg. in Bering Strait and Spitzbergen. Rainfall: wet in British Columbia, Canada
N. of Arctic Circle, C. Greenland, most of Alaska, round Gulf of St. Lawrence; over 200% along 70°N in Canada. Dry in most of Canada, N. and S. Greenland, most of Iceland, parts of S. and W. Alaska, most of Polar Basin; under 50% in S. Canada from Winnipeg to Rockies, and in Spitzbergen.

South and Central America. Temperature: warm in N.W. and S. Mexico, S. Brazil; cold in N.E. Mexico, N. Argentina. Rainfall: wet in C. Mexico, from Bolivia and S. Brazil to C. Argentina; over 200% in both areas. Dry in N.W. and S. Mexico, C. Brazil.

Europe. Temperature: generally warm, especially in a band from N.W. Spain to Moscow; +4 deg. in S. Germany; +5 deg. near Urals. Cold only in Scandinavia; —3 deg. in W. Sweden. Rainfall: wet in a band centred on 50°-55°N, over 200% in parts of England, from N. France to Denmark and in a few places in W. Russia; wet also in N.E. Sweden and N. Finland. Dry in two areas; much of Norway, Sweden and N.W. Russia; and in Mediterranean areas and through Balkans to Ukraine. Under 50% in W. Norway, S. Iberia, S. Italy, S.E. Greece, Romania, N.E. of Crimea. Sunshine in Germany low except locally in S.; under 50% in N.W. and as low as 15% (5 hrs.) at one station.

Africa. Temperature: warm near N.W. coasts and in South Africa; cold in most areas N. of Equator. Rainfall: wet from Senegal to S. Algeria and from Natal to S. Mozambique; dry in most of South Africa, Sahel and on Mediterranean coasts.


Middle and Far East. Temperature: warm in Turkey, Pakistan, India, Tibet, most of China, Japan, Korea; +4 deg. in S.E. China; cold in most of Middle East, C. China. Rainfall: wet in Lebanon, Israel, S. Turkey, E. Saudi Arabia, Iran, W. Pakistan, locally in N. and C. India, from Bangladesh to N.E. China. Dry in W. Saudi Arabia, most of India, W., N.W. and S.E. China, Japan, Korea; under 25% in parts of Japan, Korea and S.E. China, while much of the area from the W. coast of India to Kashmir then N.E. to N. China was rainless.

Australia. Temperature: warm everywhere; +2 deg. in C. and S.E. Rainfall: mainly dry, under 25% in Northern Territory, S.E. and on N.W. coast; wet in parts of south.

M. W. ROWE

DEluge on 2 December 1979 in New Zealand

On the 2nd heavy rain fell in many western and southern districts of the South Island. The heaviest falls were mainly during the afternoon and evening. At Otaia 215 were recorded in 12 hours and at the Hermitage, Mount Cook 537 mm in the 24-hour period to 9 a.m. on the 3rd, this being the highest one day total recorded in any month at this station since October 1942 (559 mm). The Waimakiriri and Rakaia rivers reached their highest peak since 1957 after this period of heavy rain.

February 1980 Weather Summary

Apart from the first week, when depressions tracked east across central and southern Britain, persistent high pressure over the continent led to a preponderance of southerly winds in the vicinity of the British Isles. These brought prolonged very mild weather, with a three-week period free of frost over many southern districts. In parts of the south it was the warmest February since 1961. However, Atlantic frontal systems occasionally penetrated from the west, so that the weather was often fairly unsettled, especially in the west. Some central and south-western regions had more than twice their normal rainfall for February, although much of this precipitation fell in the first week. It was mostly a dull month, especially in central districts of the British Isles. Thus the winter, December to February, comprised of frost over many and snow in middle and London it was the mildest winter since 1974-75. Many places were dry with some sunshine on 1st February, but active troughs crossed southern and central districts from the west on the 2nd, bringing wet weather to many areas, with a fair amount of snow on the high ground from the north Midlands to the southern Uplands of Scotland. The south had a much milder day, but it was cold over the northern half of Scotland with a few snow showers. The temperature fell to —11° C early in the day in the Cairngorms. Further depressions and troughs moved rapidly east across central and southern Britain between the 3rd and 6th, giving a lot of rain in many places but while the south-west remained consistently mild, the cold weather over northern Britain occasionally came further south to affect other parts. As a result, there was snow in many places on the northern edge of the depressions, especially on the 3rd and 4th over northern England and southern Scotland, chiefly the upland areas. Strong easterly winds caused considerable drifting and Dundee was virtually cut off for a time. The weather became less cold generally on the 5th, and much milder weather in the south west spread north east across all of the British Isles during the 8th, as rising pressure over the continent brought an end to the sequence of eastward-moving depressions. For most of the next fortnight, pressure was low between Scotland and Iceland and high over Europe and Scandinavia. The first half of the month was very cold over Scandinavia, but milder weather reached Scandinavia on the 14th. Over the British Isles, the period 8th to 23rd was very mild, and largely free of frost. There was still a fair amount of cloud, especially in the west and times, notably in the west and times, on the 8th and 9th, but many southern and eastern districts became drier with some sunshine, the 10th being especially sunny in the south-east. On the 13th the temperature reached 13° C as far north as the Aberdeen area, and on the 15th, 15° C was recorded in Central London. Next morning there was some frost and fog in parts of eastern Britain, while central and south-western districts had rain. A further build up of pressure over the continent led to a sharp spell-like Sunday (17th) in many areas.

The third week of the month saw a trough edge slowly and erratically eastwards across the country, taking from midday on the 17th to midday on the 22nd to travel from western Ireland to eastern England, and then only with the aid of a push from further troughs from the west. At first during this week, rain was confined to western districts, often the extreme west, with the east mostly bright and dry. There was some frost early on the 20th, but the days were mild nearly everywhere. Rain spread to central Britain on
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**TEMPERATURE TABLES: FEBRUARY 1980**

**MIN**: The lowest recorded temperature for each city.

**MAX**: The highest recorded temperature for each city.

**MEAN**: The average temperature for each city.

**HIGHEST**: The highest average temperature for each city.

**LOWEST**: The lowest average temperature for each city.

**AG**: The number of days with average temperatures.

**G**: The number of days with high temperatures.

**F**: The number of days with low temperatures.

**S**: The number of days with average temperatures.

**ENGLAND**

- Pennyroy, Cornwall: 10.9
- St Mary's, Cornwall: 9.9
- Denbury, Devon: 9.9
- Gurney St, Somon: 8.2
- Yarnouth, Avon: 5.0
- Dundie Hill, Avon: 7.9
- Comrat, Wilts: 9.1
- Trurobridge, Wilts: 9.5
- Coford, Wilts: 9.7
- Sandhurst, Berks: 9.8
- Rotherham, Berks: 9.7
- Newport, Wight: 9.5
- Proles, Sussex: 9.3
- Brighton, Sussex: 9.5
- Ealling, Kent: 9.2
- Gillingham, Kent: 9.2
- Worplesdon, Surrey: 9.2
- Guildford, Surrey: 9.6
- Epsom, Down, Survey: 8.3
- Kew Observatory: 9.7
- Sidcup, London: 9.9
- Hampstead, London: 9.0
- Loughton, Essex: 7.8
- Leigh, Essex: 9.3
- Buxton, Norfolk: 8.3
- Ely, Cam shire: 8.7
- Ludrum, Beds: 9.9
- Oxford (Radcliffe): 9.9
- Buckingham: 9.0
- Birmingham University: 8.1
- Kentington: 8.3
- Hinckley, Leics: 8.2
- Cosby, Leics: 8.3
- Newark, Notts: 8.0
- Nottingham: 8.8
- Wingerthorpe, Derby: 7.3
- Keele University: 7.1
- Melr Heath, Staffs: 8.2
- St Helens, Side: 9.4
- Sheffield, S.Yorks: 9.7
- Cottingham, H'side: 9.8
- Pickering, N'Yorks: 7.1
- Darham University: 6.8
- Canada: Halifax: -1.7

**AT ATHENS HELLINIKON AIRPORT**

- January: 14.0
- February: 14.0
- March: 17.2
- April: 18.8
- May: 23.9
- June: 29.7
- July: 30.9
- August: 30.9
- September: 28.6
- October: 22.1
- November: 18.5
- December: 15.9

- 1979 AT ATHENS HELLINIKON AIRPORT
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FRONT COVER: The waterspout which damaged waterside houses on the River Exe at Topsham, South Devon, in August 1694.