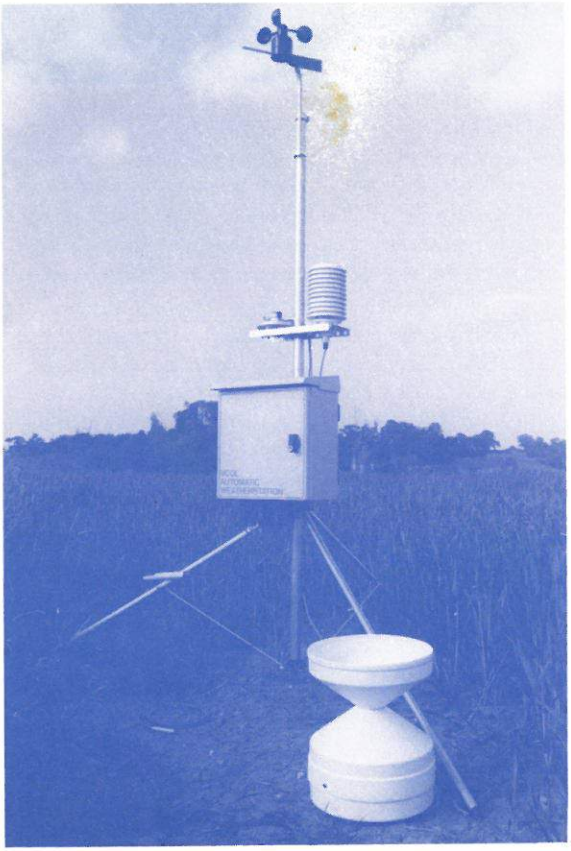
The JOURNAL of METEOROLOGY



AUTOMATIC WEATHER STATION
By Ventureprise Co-operative Ltd

Volume 14, number 142 **October 1989**

THE JOURNAL OF METEOROLOGY
LE JOURNAL DE MÉTÉOROLOGIE
Published in association with
The Tornado and Storm Research Organisation
a privately-supported research body, serving the national public interest
Edited by Dr. G. T. Meaden, 54 Frome Road,
Bradford-on-Avon, Wiltshire, BA15 1LD, England.
Telephone: National, 02216.2482; international, +44.2216.2482

Research papers, letters, news items, conference information, and other communications on all aspects of meteorology and climatology are to be addressed to the Editor.

Contributions for publication should be typed, or neatly handwritten, with double spacing and 25 mm wide margins. In the case of typescripts, a duplicate copy would be appreciated. *Every paper should commence with a short abstract* summarising its significant and/or original content. Recent issues of the journal should be consulted as a guide to the layout of papers. Metric units are strongly recommended. Line drawings may be prepared up to 2 or 3 times oversize, with a quality that is good enough for direct reproduction. They should be drawn with a black pen on good-quality white paper, with lettering symbols large enough to be legible after reduction. Figure captions should be numbered and collected in sequence at the end of the paper. Each table should have a number and a short title, and be on a separate sheet at the end of the manuscript. In the text, references should be made by giving the author's name and year of publication, e.g. Manley (1976).

The usual language of the journal is English but a few contributions will be acceptable in French, Spanish, Italian and German. Correspondence with the Editor's office may be in any of these languages.

Responsibility for the opinions expressed in the signed articles rests with their respective authors, who should also obtain copyright permission where necessary. Please note that page charges may have to be imposed for some articles involving special artwork, complex equations, or numerous photographs or diagrams.

Kindly note that, for citation purposes, the recommended abbreviation for the title of this journal is *J. Meteorology, UK.*

Subscriptions for 1990, Volume 15, *including surface post,* U.K. £45.00; rest of world £55.00; *including airmail* £65.00. *For personal subscriptions from individuals deduct £25.00 from each of these rates.* Subscriptions for students and senior citizens £15.00 only upon request.

Back issues are available for purchase either as complete volumes or singly. Volumes 1-9, £8.00 each; volume 10, £10.00; volume 11, £12.00; volume 12 and 13, £14.00 each; volume 14, £16.00. Single issues, *pro rata.* Please note that some issues are out-of-print, in which case double-sided photocopied sheets will be supplied instead.

Published by The Artetech Publishing Co., 54 Frome Road, Bradford-on-Avon, Wiltshire, BA15 1LD.

Printed by The Dowland Press Ltd., Frome, Somerset.

 ISSN 0307-5966

JOURNAL OF METEOROLOGY
"An international journal for everyone interested in climate and weather, and in their influence on man."
Editor: Dr. G. T. Meaden Vol. 14, no. 142, October 1988

THE 'MIRACLE OF THE SUN' AT FATIMA

By STEUART CAMPBELL
4 Dovecot Loan, Edinburgh EH14 2LT, Scotland.

Abstract: Drawn by reports of apparitions of the Virgin Mary many thousands of people gathered near Fatima one day during the First World War. At noon they were astonished to see changes in the appearance of the sun and the fact that they could look directly at it. The changes were regarded as a miracle and attributed to divine intervention. The various phenomena are explained as effects caused by a cloud of dust passing over central Portugal at the time. Possible sources of the dust are discussed.

On 13 October 1917 between 70,000 and 100,000 people are reported to have gathered in a small valley outside the village of Aljustrel near the larger village of Fatima in Portugal. Some came in the hope of seeing the Virgin Mary (or a miracle), some were intent on mocking the believers when, as they expected, no miracle occurred, and some were simply curious. They were drawn there by the story told by three children that they had seen and spoken with the Virgin on the 13th of each previous month since 13 May. The children claimed that the Virgin had asked them to come to the same spot on the 13th day for six months. Smaller crowds had gathered on previous occasions, but this was to be the last such occasion and a miracle was promised.

All the previous appearances had occurred at or about midday (apparent solar time), so well before that time the crowds had gathered. There was a cold north-west wind and all night and into the morning a drizzling rain fell. By 10.00 am the sky was completely overcast and rain fell in earnest.

At midday the children arrived and one of them cried out that the Virgin was coming. After appearing to have fallen into a trance she declared 'There she goes . . . *Look at the sun!*' There are various accounts of what happened next. The following is from the Lisbon newspaper *O Dia* (17 October 1917):

> At one o'clock in the afternoon, midday by the sun, the rain stopped. The sky, pearly grey in colour, illuminated the vast arid landscape with a strange light. The sun had a transparent gauzy veil so that the eyes could easily be fixed upon it. The grey mother-of-pearl tone turned into a sheet of silver which broke up as the clouds were torn apart and the silver sun, enveloped in the same gauzy grey light, was seen to whirl and turn in the circle of broken clouds. A cry went up from every mouth and people fell on their knees on the muddy ground . . .
>
> The light turned a beautiful blue as if it had come through the stained-glass windows of a cathedral and spread itself over the people who knelt with outstretched hands. The blue faded slowly and then the light seemed to pass through yellow glass. Yellow stains fell against white handkerchiefs, against the dark skirts of the women. They were repeated on the trees, on the stones and on the *serra.* People wept and prayed with uncovered heads in the presence of a miracle they had awaited. The seconds seemed like hours, so vivid were they.

The most detailed account was given by Dr Almeida Garret, a professor at Coimbra University, in a letter written to Dr Manuel Formigão, canon of the Patriarchal See of Lisbon and Professor at the Seminary and Lyceum of Santarem:

It must have been nearly two o'clock by the legal time (in fact it was one o'clock) and about midday by the sun. The sun, a few moments before, had broken through the thick layer of clouds which hid it and shone clearly and intensely. I veered to the magnet which seemed to be drawing all eyes and saw it as a disc with a clean-cut rim, luminous and shining, but which did not hurt the eyes. I do not agree with the comparison which I have heard made in Fatima – that of a dull silver disc. It was a clearer, richer, brighter colour, having something of the lustre of a pearl. It did not in the least resemble the moon on a clear night because one saw it and felt it to be a living body. It was not spheric *(sic)* like the moon nor did it have the same colour, tone or shading. It looked like a glazed wheel made of mother-of-pearl. It could not be confused, either, with the sun seen through fog (for there was no fog at the time), because it was not opaque, diffused or veiled. In Fatima it gave light and heat and appeared clear-cut with a well-defined rim.

The sky was mottled with light cirrus clouds with the blue coming through here and there but sometimes the sun stood out in patches of clear sky. The clouds passed from west to east and did not obscure the light of the sun, giving the impression of passing behind it, though sometimes these flecks of white took on tones of pink or diaphanous blue as they passed before the sun.

It was a remarkable fact that one could fix one's eyes on this brazier of heat and light without any pain in the eyes or blinding of the retina. The phenomenon, except for two interruptions when the sun seemed to send out rays of refulgent heat which obliged us to look away, must have lasted about ten minutes.

The sun's disc did not remain immobile. This was not the sparkling of a heavenly body for it spun round on itself in a mad whirl. Then, suddenly, one heard a clamour, a cry of anguish breaking from all the people. The sun, whirling wildly, seemed to loosen itself from the firmament and advance threateningly upon the earth as if to crush us with its huge and fiery weight. The sensation during those moments was terrible.

During the solar phenomenon, which I have just described in detail, there were changes of colour in the atmosphere. Looking at the sun, I noticed that everything around was becoming darkened. I looked first at the nearest objects and then extended my glance further afield as far as the horizon. I saw everything an amethyst colour. Objects around me, the sky and the atmosphere, were of the same colour. An oak tree nearby threw a shadow of this colour on the ground.

Fearing that I was suffering from an affection of the retina, an improbable explanation because in that case one could not see things purple coloured, I turned away and shut my eyes, keeping my hands before them to intercept the light. With my back turned, I opened my eyes and saw that the landscape was the same purple colour as before.

The impression was not that of an eclipse, and while looking at the sun I noticed that the atmosphere had cleared. Soon after I heard a peasant who was near me shout out in tones of astonishment: 'Look, that lady is all yellow!'

And in fact everything, both near and far, had changed, taking on the colour of old yellow damask. People looked as if they were suffering from jaundice and I recall a sensation of amusement at seeing them look so ugly and unattractive. My own hand was the same colour. All the phenomena which I have described were observed by me in a calm and serene state of mind without any emotional disturbance. It is for others to interpret and explain them.

The solar phenomenon was seen elsewhere in Portugal. The poet Afonso Xavier Lopes Vieira saw it from his home 40km away in São Pedro de Muel and it was also seen by many people at Alburitel, 15km from Fatima (see Fig.1). Fr. Inacio Lourenço, then nine years old, wrote that at about midday they saw the sun appearing pale like a ball of snow revolving on itself and zigzagging down towards the earth. During the 'miracle', which lasted for ten minutes, everything around him turned 'all the colours of the rainbow' (De Marchi 1950).

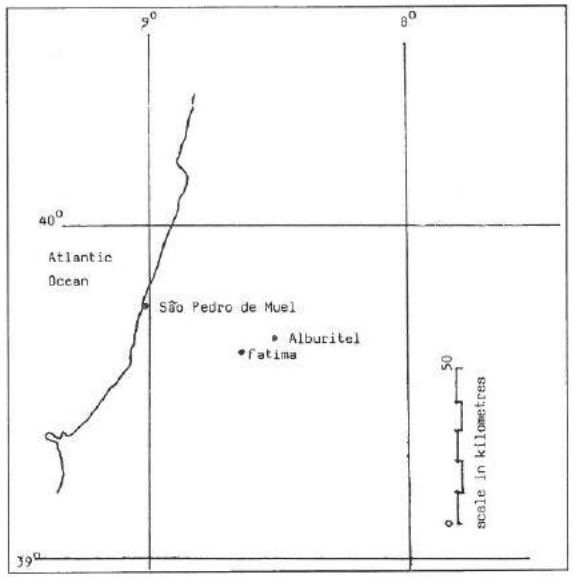


Fig.1: The location of the sites in Portugal from where the 'miracle of the sun' was seen.

In an appendix to De Marchi's book Jesuit Scientist Pio Scatizzi considered various explanations, namely a mist or fog in front of the sun, a rainbow and the aurora borealis. For the eyes to be able to look at the sun the mist could not have been light, yet a thick mist would not have allowed sight of a clear disc and it would have shown an aureole around the sun. The colours suggested a rainbow but that phenomenon is seen only in a direction opposite to that of the sun. The aurora cannot be seen in daylight and it is rarely seen at all from the latitude of Fatima (39°36' N). No solar or auroral phenomena were reported at the time from observatories. Scatizzi concluded that there was no question of an astronomical or meteorological phenomenon being responsible.

THE CAUSE OF THE 'MIRACLE'

In fact there is a meteorological explanation; all the phenomena reported are known to be produced by fine dust in the atmosphere. For example the sun can sometimes be viewed directly at sunset when the air is particularly dusty. Here we must consider a dust cloud travelling above Fatima, providing a filter through which the sun could be viewed. The same cloud can account for the colour changes which are due to the Mie effect. This is a diffraction phenomenon in which small particles scatter light preferentially with wavelength and direction, the extinction varying sinusoidally with light frequency when the diameter of the particles is about the same as the wavelength of light. A blue sun indicates that the cloud contained a large

number of particles of dust rather smaller than usual and grouped in a narrow size range. A typical diameter is 1.7 x 10^{-6}m for refractive index 1.3 (e.g. ice) and 1.0 x 10^{-6}m for refractive index 1.5 (e.g. quartz) (Paul and Jones 1951). The sun will look blue because the dust scatters much of the yellow and red light. Usually the sun looks yellow because the air molecules scatter blue light (via a different mechanism) more powerfully than light of other colours.

At Fatima the sun first turned white (pearl). This was due to dust scattering an amount of yellow light that nearly balanced the blue light that is scattered normally by the atmosphere. Then, as the cloud thickened, more yellow and red light was scattered, causing the sun to appear blue or violet (amethyst). Later so much yellow light was scattered that the sky must have turned yellow colouring complexions and the landscape that colour, and causing shadows to show yellow's complementary colour (blue). Two colour photographs, one showing a blue sun and the other showing the simultaneous reddened illumination (in Beijing, China), have been published (Meinel and Meinel 1983). The sun appeared to retreat when the dust darkened the image and to advance when it brightened again. The dust also caused the appearance of the sun spinning around. If the sun appeared to display translation movement this can only have been an illusion caused by thin (water) clouds moving in front of it. But where did this dust originate?

THE SOURCE OF THE DUST

Atmospheric dust can have several different causes – forest fires, volcanic explosions or sand/dust storms (for example). A blue sun was seen over Britain on 26 September 1950 when smoke particles from forest fires in Canada reached the UK on winds at 10-13km altitude (Wilson 1951) and in Canada itself, while the sun appeared blue or purple, the sky varied from pink and orange to yellow and brown (Elsley 1951). I know of no forest fires that could have accounted for smoke over Fatima. Shortly after the explosion of Krakatoa in August 1883 a blue or green sun was seen in various tropical countries. This was due to fine dust from the explosion reaching up into the stratosphere and being carried around the earth by the latitudinal winds (at about 12km). During 1917 (exact date unknown) the volcano Tarumai in Japan (41°41' N) erupted. Between 1914 and 1921 the volcano Lassen Peak in the USA (40°29' N) erupted continuously. None of these eruptions is recorded as being 'explosive' but the volcano Irazu in Costa Rica exploded on 27 September 1917, ejecting 10^7 to 10^8 m^3 of material 3 to 15km high. However Irazu is only 10°N of the equator and it is difficult to see how its dust could be blown over Portugal. A blue sun is seen frequently in China, where the cause is fine dust swept up over China from the deserts of Mongolia. A similar sight has been reported from parts of India (Meinel and Meinel 1983). The nearest desert is the Sahara, from where dust is known to be carried even as far as Britain.

On the morning of 13 October 1917 a rather deep depression lay over the North Sea with a high pressure cell over the Azores (see Fig.2). Although the available weather data do not include information on the upper air they can be

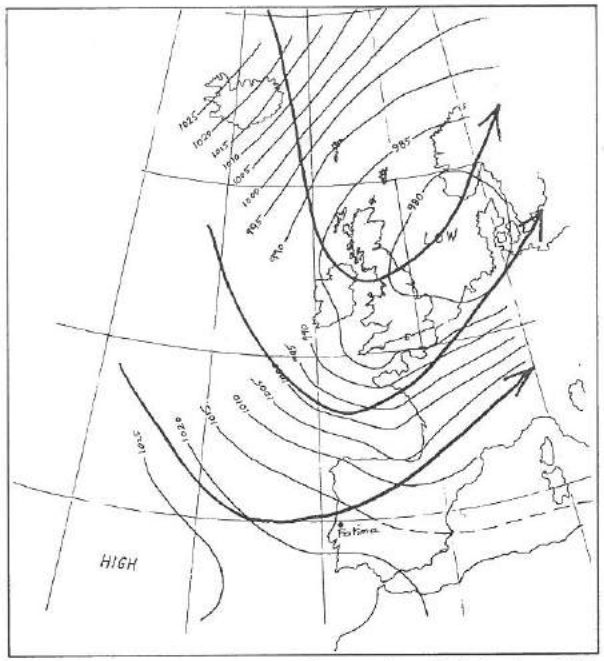


Fig.2: The synoptic situation on the morning of 13 October 1917 with (in thick lines) the probable upper flow streamlines at about 5km.

used to infer the flow at (say) an altitude of 5km and this flow is indicated on Fig.2 (i.e. a deep upper trough approaching from the west, with a westerly streamline over Fatima). Evidently dust in this streamline could not have come directly from the Sahara. However over the previous few days strong east or northeast winds had blown over Morocco. These winds may have carried dust out over the Atlantic only to bring it back in the upper flow across the Iberian peninsular in a circulation around the anticyclone.

CONCLUSION

The 'miracle of the sun' at Fatima (and elsewhere in Portugal) on 13 October 1917 was caused by a cloud of fine dust travelling in the upper air stream. Indications are that it was travelling from west to east and that it was at least 10 to 20km across. The regular particle size indicates that the cloud had been travelling for a considerable time (to allow size separation to occur). This means that it could have come from almost anywhere in the world, although more likely from a source at the same latitude as Fatima. A Saharan source may be regarded as unlikely and it may be concluded that it is more likely that the source was a volcanic explosion. More details of the volcanoes which exploded in 1917 might allow a more definite conclusion. It was the most

remarkable coincidence that the cloud passed over Fatima at the very time when a miracle was predicted.

Acknowledgements: I acknowledge the assistance of The National Meteorological Library, The National Library of Scotland, the Portuguese Embassy in London, the Instituto Nacional de Investigacão Cientifica in Lisbon, the British Geological Survey and Dr. K. J. Weston of The University of Edinburgh.

REFERENCES

DE MARCHI, J. (trans. I. M. KINGSBURY) (1950): *Fatima: the Facts*, Mercier Press, Cork.
ELSLEY, E. M. (1951): Alberta Forest-Fire Smoke – 24 September 1950, *Weather, 6*, pp. 22-24.
MEINEL, A. B. and MEINEL, M. P. (1983): *Sunsets, Twilights and Evening Skies*, CUP, Cambridge.
PAUL, W. and JONES, R. V. (1951): Blue Sun and Moon, *Nature, 168;* 554.
WILSON, R. (1951): The blue sun of 1950 September, *Mon. Not. R. Astron, Soc., 111*, 478-489.

(Note by the editor regarding the apparition at Fatima on 13 May 1917:
In a work yet to be published the editor has proposed that the initial Fatima vision on 13 May 1917 could have been a hillside manifestation of the luminous plasma vortex described in *The circles effect and its mysteries).*

METHOD OF DELIMITATION OF SEASONS EXAMPLE: THE STATION OF LARISSA (GREECE)

By P. MAHERAS and N. PITSOULIS
Institute of Meteorology and Climatology, University of Thessaloniki, Greece.

Abstract: The daily data of nine meteorological parameters were recorded by the station of Larissa over a period of 30 years (1956-1985). The mean rates of these nine parameters are calculated every five days. Objective set lengths for the season are found by applying the Principal Component Analysis of the mean rates of the nine parameters for the 73 five-day periods of the year. The summer period lasts 175 days (26/4 – 17/10) and the winter period 190 days (18/10 – 25/4). Spring and autumn extend more into the winter than into the summer. The two periods, dry summer and rainy winter, start and end suddenly, especially so during the last decade.

INTRODUCTION

Larissa is situated in Thessaly, Greece, to the South of Mount Olympus and 45km west of the Aegean.

Its Mediterranean climate is characterized by high daily and yearly ranges of the air temperature and by summer aridity. The annual rainfall is moderate, the winter maximum being during the two months of November and December. (Table 1).

In a recent paper, Maheras (1988), using the frequencies of the synoptic weather types that exist in Greece, produced an objective delimitation in the winter rainy period for Greece. The aim of this paper is two-fold: firstly, the objective delimitation of seasons in Larissa by using the most important climatic elements during a period of 30 years (1956-1985); secondly, the evolution of the seasons to be studied at the same station during the three decades of the study period (1956-1965, 1966-1976, 1976-1985).

DATA AND METHOD

The following daily weather-elements were used for the period 1956-1985 (30 years).

1. Mean temperature.
2. Maximum temperature.
3. Minimum temperature.
4. Mean relative humidity.
5. Daily precipitation.
6. Number of days of precipitation.
7. Number of days of frost.
8. Duration of insolation.
9. Fraction or percentage of insolation.

Firstly the mean rates of the previously stated nine meteorological elements for each five-day period were calculated. One year consists of 73 five-day periods. Secondly the average rates of the nine elements of the thirty year period and of the three decade periods were calculated. For each row of the 73 five-day periods a total of four analyses were performed by applying the technique of Principal Components Analysis. The first analysis was of the mean data of the thirty-year period and three other of the mean data of the three decade periods. The matrix of data for each analysis is the following:

A = n x p which becomes A = 73 x 9.

DELIMITATION OF SEASONS (PERIOD: 1956-1985).

Table 2 shows that the percentage of variance (%), explained by the first principal component (PC1) of the four analyses, ranges from 76% to 83% and that the highest percentage appears in the first analysis. In this first principal component the elements: 1,2,3,8,9 show strong positive loadings and the elements 4,5,6,7 show strong negative loadings. The variables are then set from negative to the positive: elements which define the winter rainy period (–), elements which define the summer dry period (+). The five-day periods are placed according to the same criteria. It is then possible to delimit the seasons using the first principal component. From Figure 1, which gives the scores of the 73 five-day periods with the first principal component, it is relatively easy to delimit the seasons and to reveal the exceptional five-day periods.

According to this scheme (Fig.1) it can be seen that the summer period starts at the beginning of the 24th five-day period and finishes at the end of the 58th five-day period; the total summer period lasts 35 five-day periods (175 days).

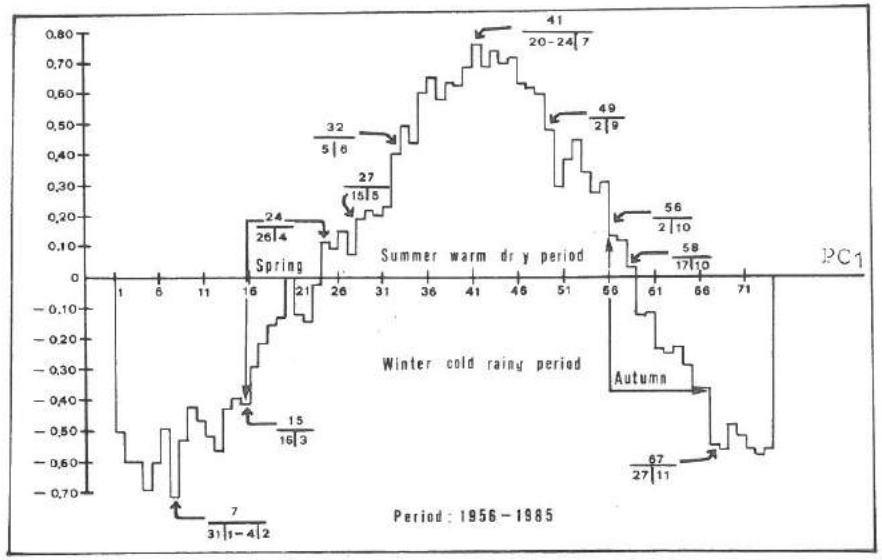


Fig.1: Five-day period scores of the first principal component (PC_1), used for objective delimitation of the seasons in Larissa – Greece (period: 1956-1985).

The winter period lasts 190 days, thus it lasts 15 days more. It commences on October 18th and finishes on April 25th. In relation to the synoptic delimitation of the same seasons (Maheras, 1988) it is ascertained that there is a difference of one five-day period between them. The synoptic summer period starts with the beginning of the 23rd five-day period. The other dates remain the same.

Table 1: Mean monthly and annual values of climatic data in Larissa (1956-1985)

	Jan *J*	*Feb* *F*	*Mar* *M*	*Apr* *A*	*May* *M*	*Jun* *J*	*Jul* *J*	*Aug* *A*	*Sep* *S*	*Oct* *O*	*Nov* *N*	*Dec* *D*	*Year* *A*
T	4.7	6.3	9.5	12.9	18.2	22.9	25.4	25.2	21.0	15.5	10.6	6.5	15.0
Max	9.3	11.7	14.7	19.6	25.1	30.6	32.9	32.9	28.0	21.8	16.2	11.4	21.3
Min	0.6	1.5	3.4	6.3	10.8	15.0	17.5	17.4	14.0	9.7	5.9	2.2	8.7
RH	81	78	76	73	68	56	52	53	63	73	82	84	70
RR	34	38	41	33	41	27	18	12	34	42	52	69	441
DP	11.9	16.2	11.8	10.7	10.3	7.5	4.8	3.8	8.0	9.4	11.8	12.1	118.3
DF	12.3	10.3	4.5	0.4	0	0	0	0	0	0	3.0	8.9	39.4
Ins	98	130	149	206	252	292	333	312	290	169	122	104	2457
%	35	42	44	53	59	69	77	76	67	52	41	37	54

T = mean temperature (°C); Max = mean maximum; Min = mean minimum; RH = mean relative humidity (%); RR = mean rainfall (mm); DP = days with precipitation; DF = days with frost; Ins = duration of insolation (hours); % = fraction or percentage insolation.

Both the summer period (warm, dry and sunny) and the winter period (cold, rainy and cloudy) can be subdivided into three parts. The period which extends from the 5/6 (32 five-days) until the 2/9 (49 five-days) forms the high summer period – very dry, very warm and very sunny. The summer sub-periods, the first from 26/4 until 4/6 and the second from the 3/9 until the 17/10 form the low summer periods. Using the same method, though with negative scores, the period from the 27/11 until the 16/3 forms the high winter period, the period from the 18/10 until the 26/11 forms the first low winter period and the period from the 17/3 until the 25/4 forms the second low winter period.

Moreover, it can be seen that the curve shows large heterogeneity during spring and autumn, so it is difficult to determine accurately these intermediate seasons. The opinion reached is that spring in Larissa starts on March 17th and finishes on May 15th; the period between 16/5 and 4/6 belongs more to the summer than to the spring. The autumn starts on October 3rd and finishes on November 26th; the period between 3/9 and 2/10 belongs more to the summer than to the autumn.

It is interesting to note that the 41st five-day period (20-24/7) forms the driest, warmest and sunniest period of the year and conversely the seventh five-day period (31/1-4/2) forms the coldest, rainiest and cloudiest period of the year.

THE THREE DECADES

First Decade: It has been ascertained that during the first decade (Fig.2) the summer period started at the beginning of the 28th five-day period (16/5) and

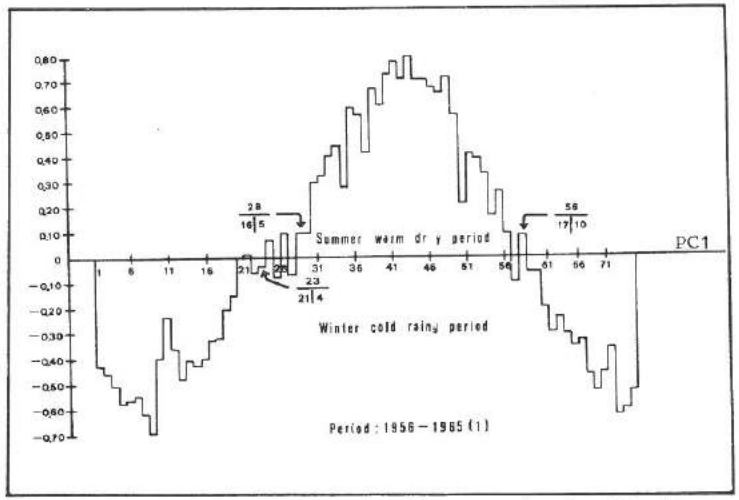


Fig.2: Five-day period scores of the first principal component (PC_1), used for objective delimitation of the seasons in Larissa – Greece (period (1): 1956-1965).

finished at the end of the 58th five-day period (17/10). The winter period started on the 18/10 (58th five-day period) and finished on the 25/4 (23rd five-day period). It must be noted that the period included between the 26/4 and 15/5 was impossible to be determined, due to the scores becoming successively positive and negative. The summer therefore lasted 5 months and 5 days, while the winter lasted for 6 months and 10 days, which is the same duration as the winter period over the thirty-year period.

Finally the 20-day period (26/4-15/5) could be characterized as a transitional period between the winter and the summer period.

Moreover, it is to be emphasized that the curve shows intense score fluctuations both during the winter and the summer period. This demonstrates the high variability of the weather, mainly during the months of February, May, June, September and December.

Second Decade: The summer period lasted from the 23rd five-day period (21/4) until the 57th five-day period (12/10), thereby lasting a period of 5 months and 25 days (Fig.3). This is of the same duration as the summer period over the thirty-year period; however in the second decade it started and finished five days earlier. It is obvious that the winter period started on the 13/10 and lasted until the 20/4. The form of the curve shows the score fluctuation to be of a lower intensity in relation to the previous (first) decade, especially during the summer period. Finally, it is worth noting that the high summer period shows tardiness in appearance.

Third Decade: The summer period started abruptly (Fig.4) at the beginning of the 24th five-day period (26/4) and finished at end of the 58th five-day

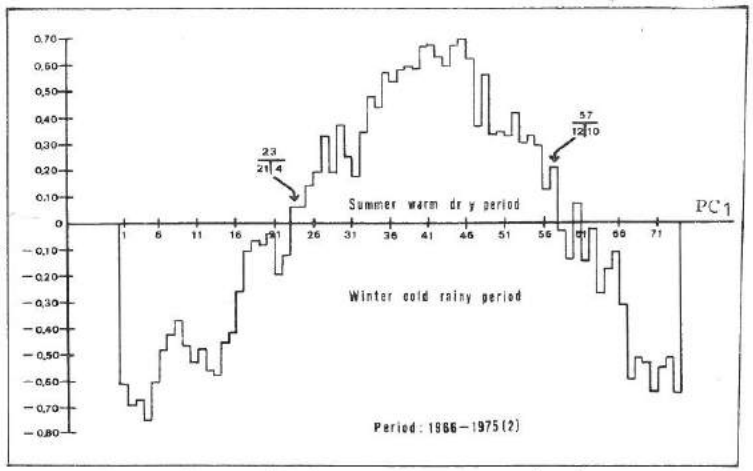


Fig.3: Five-day period scores of the first principal component (PC_1), used for objective delimitation of the seasons in Larissa – Greece (period (2): 1966-1975).

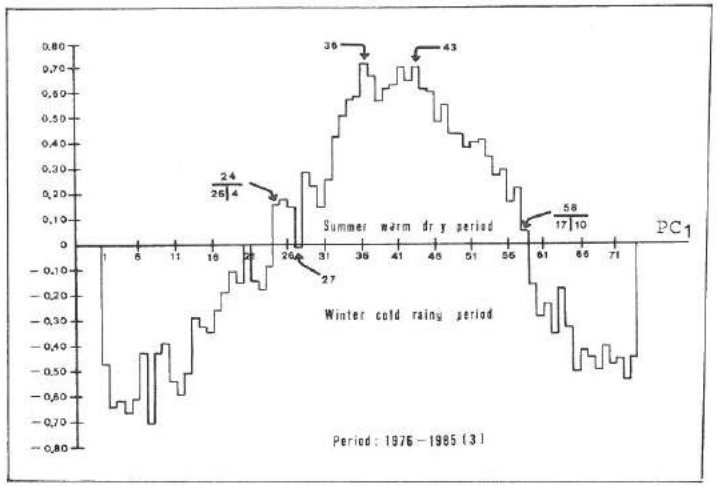


Fig.4: Five-day period scores of the first principal component (PC_1), used for objective delimitation of the season in Larissa – Greece (period (3): 1976-1985).

period, its duration being the same as that of the summer period over the thirty-year period. From the form of the curve three distinctive points can be distinguished:

(1) Both the high summer period and the high winter period appear relatively early.
(2) The variability of the weather is larger at the beginning of the summer period and also in the middle of the winter.

	PC1 1956-1985	*PC1 1956-1965*	*PC1 1966-1975*	*PC1 1976-1985*
1. Mean Temperature	0.987	0.974	0.980	0.982
2. Max. Temperature	0.888	0.974	0.984	0.989
3. Min. Temperature	0.978	0.954	0.960	0.964
4. Mean Rel. Humid.	-0.966	-0.945	-0.963	-0.963
5. Precipitation	-0.614	-0.590	-0.403	-0.553
6. Days of Precip.	-0.844	-0.722	-0.805	-0.601
7. Days of Frost	-0.799	-0.695	-0.792	-0.757
8. Duration of Insol.	0.976	0.938	0.960	0.947
9. Fraction of Insol.	0.973	0.956	0.976	0.966
Eigenvalues	7.5	6.9	7.1	6.9
Percentage Variance	83	77	79	76

(3) The exceptional situation of the 27th five-day period (11/5-15/5) shown in the curve (negative score). For the same period, Sulman (1982) reports that an aggravation of the weather in Southern Europe and the Middle East was observed. Namely, it is a matter of a singularity which is also observed in Greece. Its appearance appears to be related to the maximum frequencies of the synoptic weather types Dor (Maheras 1988) during this five-day period. The weather type Dor prevails when a high cold pool covers the Southern Balkans including Greece.

CONCLUSIONS

It is possible to determine the objective delimitation of seasons by using the Principal Component Analysis. Whichever period is used, decade or thirty-year period, both periods whether cold-rainy and dry-warm have well-fixed limits. Generally, the cold-rainy period has a longer duration than the dry-warm period. In addition the limits of high summer and high winter are relatively well fixed, as well as the limits of the equivalent low summer and low winter periods. On the contrary, the limits of the intermediate seasons of spring and autumn are difficult to determine accurately due to the high variability of the weather during these seasons. It is noticeable that spring and autumn extend more into the winter period than into the summer period. This is acknowledged by the population of Greece who personally experience the weather daily.

Winter and summer start and finish suddenly, especially during the last decade.

Also typical is the fact that the shorter the period, summer or winter, the higher its intensity.

Finally, the summer dry period displays its intense characteristics earlier than the cold-rainy period.

REFERENCES

MAHERAS, P. (1988): The synoptic weather types and objective delimitation of the winter period in Greece. *Weather*, 43, 40-45.

SULMAN, F. (1982): *Short and long-term changes in climate. Vol.I*, CRC Press., Inc., p.163.

TWO WHIRLWINDS ON SCOTTISH LAKES (LOCH NESS AND LOCH ASHIE)

This is a postscript to my article "Whirlwinds, sea serpents and the Loch Ness monster", published in the October 1987 issue of this journal (Vol.12, pp.269-271). In that article I mentioned two reports of whirlwinds on Loch Ness, but both were very vague. Later I remembered that there was a colour photograph of a whirlwind on Loch Ness on the back cover of issue 129 of *The Unexplained* (1983). The photograph was sent in by a reader, 14-year-old Ian Rendall, who took it from a bus on the north-western shore of the loch. It

shows a white blur of spray, estimated by Mr. R. J. W. Gardiner, of the Loch Ness and Morar Project, to be between 100 and 150 yards (90 to 140 metres) from the camera and 10 to 15 feet (three to four metres) in diameter. The photograph was submitted to Ground Saucer Watch, an American organisation specialising in the analysis of photographs of alleged UFOs. They studied computerised images produced from the photograph, one of which shows a clear vortex structure. Ground Saucer Watch thought this indicated a whirlpool, but this does not explain the spray, and the phenomenon is clearly a water devil. The weather at the time, judging from the photograph, was fair, with partial cloud cover.

Another water devil has been reported to TORRO from Loch Ashie, 3km east of the north-east end of Loch Ness. Mr. Jeffrey R. Butcher was bird-watching at NH 622337, at the southern end of the loch. "The day was fine, hot and sunny . . . There was no real wind; the surface of the loch was very smooth . . . I heard a sound of wind rushing through trees, which I registered as being odd because of the still conditions . . . I saw the edge of the trees moving quite violently just for a moment before they returned to stillness. Then the grass about 10 yards away began swishing and moving. I felt no movement of air at all. It was only as the disturbance moved out over the water that I realised it was some kind of whirlwind. The water surface was whipped up into waves about three or four inches high across a circle of diameter about a yard. It progressed across the loch in an east-north-east direction at a fast walking pace, about four or five miles per hour . . . Because of the still conditions of the rest of the surface the movement of the disturbance was very easy to follow with binoculars until it was nearly at the opposite shore". An observer who had witnessed only the disturbance in the water could be forgiven for thinking it was due to some animal.

From his bird-watching diary Mr. Butcher was able to date the event as 31st May 1985. At 1200 GMT on that date most of Britain, including the whole of Scotland, was within the central isobar of a large anticyclone centred off eastern Scotland.

MICHAEL ROWE

LITERATURE REVIEWS AND LISTINGS

Book Reviews

LIVING ICE: UNDERSTANDING GLACIERS AND GLACIATION. By Robert P. Sharp. Cambridge University Press 1988, x + 225pp., £15.00.

Those who were interested in glaciers during the 1960s are likely to find certain aspects of this book familiar (e.g. some of its photographs and diagrams). This is because it has grown out of Sharp's widely popular *Glaciers*, which first appeared in 1960.

Living Ice is almost three times longer than its predecessor, chiefly due to its greater scope. Whereas in both books the accounts of glacier characteristics and movement are of a similar length (though the organisation of material differs), only *Living Ice* considers the nature and products of glacial erosion and deposition. There has also been a significant expansion of the final chapter (now called 'The past and the future') and the glossary has been much enlarged (some might say over-enlarged, given that words like granite, igneous rock and joint are included).

Despite its greater scope, *Living Ice* has very definite limitations. The reader is given no idea of the nature and impact of glacier hazards, such as ice avalanches and glacier outbursts. Nor is there any coherent account of historical glacier fluctuations. Equally, little attempt is made to go beyond the North American scene and when the author does so the results can be less than satisfactory (e.g. his remarks about European glacial sequences, p.180).

If one accepts these limitations, this is in many ways a very good book. The author has obviously striven to be clear, not only by including a glossary, but by indicating in boldface type the words of the text which are defined in that glossary. Another nice touch, which will be widely appreciated, is the section headed 'recapitulation' at the end of each chapter. The many diagrams are well produced, though the black and white photographs tend to be on the dark side: by contrast, the 8 colour plates are superb. These several virtues, together with the author's clear written style, will help fulfil his aim "of exciting laypersons' interest in natural phenomena that professionals find fascinating". Equally likely, many students and professionals will come to regard this book as being not only very useful but also good value for money. In the meantime, we must continue to await the modern English-language book which treats glaciers in a comprehensive fashion.

GLACIER FLUCTUATIONS AND CLIMATIC CHANGE. Edited by J. Oerlemans. Kluwer Academic Publishers, Dordrecht/Boston/London 1989, ix + 417pp., £64.00.

This is another book consisting of papers from a symposium, in this case one dealing with glacier fluctuations and climatic change, held at Amsterdam in June 1987. Almost inevitably, therefore, it does not attempt a comprehensive overview of its subjects. Indeed, unlike some symposia publications, the book has no general introduction to the subject nor does it contain an overview paper. Equally, there is little organisation of material into topic areas and no index. The lack of cohesion is further underlined by the wide-ranging nature of the 26 papers which make up the volume. They thus include contributions from every continent and timescales which vary widely, being at their most extensive in the first paper ('Episodic palaeozoic glaciation in the Cape-Karoo basin, South Africa'). Indeed, it is the time element which was perhaps the main factor dictating the arrangement of papers within this volume. Specialists will undoubtedly find much of value here, but the interest of more general readers may be limited to just two aspects of the book. First, those of its

papers which are fairly broad and synthesizing (e.g. 'Historic glacier variations in Scandinavia'), and secondly, those which contain some especially stimulating point(s) (e.g. 'The decline of the last little ice age in high Asia compared with that in the Alps', which demonstrates that glacier retreat in the two areas has not been in phase during this period'). Certainly, many non-specialists will wish to avoid the mathematics and modelling which feature particularly in the second half of this book.

SURREY IN THE HURRICANE. By Mark Davison and Ian Currie. Froglets Publications Ltd., Brasted Chart, Westerham, Kent, TN16 1LY 1988, 120pp., £7.50.

This has the same format as the extremely popular *In The Wake Of The Hurricane* (reviewed *Journal of Meteorology* September 1988), though it examines a smaller area in more detail. It shows how "Surrey stood squarely in the path of the most frightening storm ever known and suffered terrible devastation". There is also mention of how the county "is patching up its many wounds and replanting carefully and lovingly for the future". Some of the proceeds from the book's sale will go to The Surrey Wildlife Trust and other county woodland appeals.

L.T.

Book Reviews

CIRCULAR EVIDENCE

The puzzle of the circles which arrive in British cornfields every summer has in the space of a few years become one of the world's best-known 'modern' mysteries. Most non-scientific observers find themselves attracted to the problem not just because they enjoy the visual treat of contemplating the regularity and beauty of the circles but because the circles bring to the viewers, at least in their imaginations, all manner of weird and fantastic solutions to the question as to 'why the circles are there'. Not surprisingly, some of these solutions imply origins which are not of this world, that is to say they include paranormal and extraterrestrial effects. This is well brought out in the book *Circular evidence,* published by Bloomsbury Press in July 1989 at £14.95, in which the authors Patrick Delgado and Colin Andrews certainly allow for this possibility. Thus on page 168 in answer to the self-raised question as to whether UFOs could have created the circles, we find:

'"They could be" . . . UFOs are claimed to be capable of producing the most extraordinary behaviour and phenomena. Their control of force fields unknown to us may well result in rings and circles. It may well be within the capability of a UFO to manipulate a rotary force field which is enclosed in a sharp cut-off electromagnetic shield. It is also possible that UFOs are only visible when they wish to be in our light spectrum, so the forces they may control could be demonstrated with our without their presence'.

This brief extract from *Circular evidence* tells us much about the authors

knowledge, methods and opinions, because Messrs Delgado and Andrews introduce UFOs in the 'mechanical' sense implying that a UFO is something which can control and manipulate 'force fields unknown to us' – and which further suggests some sort of guiding intelligence. This belief is again emphasized on page 169 where the authors, after several years work and five chapters of writing, arrive at their awesome conclusion: 'This would seem to support the theory that the circles are created by an unknown force field manipulated by an unknown intelligence'.

This can hardly be said to be a substantial or decisive result considering the effort that has been applied to the research, yet it is almost inevitably the consequence of starting such a quest armed with only a superficial knowledge of scientific concepts, laws and practices. This regrettably leads Mr Delgado (who wrote the chapter) and Mr Andrews into an irrational and arrogant rejection of the application of the normal laws of physics and meteorology in the way that this reviewer has consistently utilized them, and to embrace instead the questionable realms of thought of the paranormal and the hopelessness of the pseudo-scientific.

But what results when conventional scientific reasoning and analysis are freely applied to the problem of the circles? What does the logical meteorologist uncover? He recognizes the circles for what they really are; in place of the possible marks of 'alien beings using force-field unknown to us' (quoting from P. Delgado, November 1987 issue of *Flying Saucer Review*, p.5), the meteorologist sees imprints resulting from previously-unrecognised atmospheric processes, and representing a new effect which can be regarded as providing a research tool whereby the delicate impressions – so exquisitely traced in the corn – open up hitherto-unsuspected possibilities for atmospheric vortex research.

The proof for this is becoming increasingly plain, and will soon be overwhelming, but readers of *Circular Evidence* are denied the faintest hint of this. Instead we are told on page 158 – typically without any evidence, (many strong statements are made in this book without supporting evidence) – that circle formation is "weather-condition free". In fact, the authors inhabit a world of their own in which observations inconsistent with their fantasies get overlooked (see below). Admittedly, this might on some occasions be unintentional – the result of an inability to appreciate the significance of some of the clues passing before their eyes (the authors are not physicists or meteorologists) – but some omissions, as we shall show, are deliberate because evidence which they certainly did possess has been knowingly suppressed (again, see below). Can we deduce a reason for this? It seems that either it emanates from an unstoppable desire to force a paranormal solution into the place of a natural one, or it is because the authors are astute enough to realize that high-volume sales depend upon feeding one mystery with further mysteries in order to distance the solution rather than to approach it. This technique improves sales to a credulous public, but is unnatural and unworthy of investigators who would wish to claim they are scientists.

Notwithstanding these adverse comments the book does have its good points. The authors grandly state that their purpose "is to present the facts, facts that you can verify by walking into a circle and checking for yourself" (p.166). In chapters 2 and 3, which occupy 30 pages between them and are the best in the book, this is done quite well. Entitled 'Circle formation' and 'Circle details' these chapters are objectively descriptive and non-controversial. However, because the majority of readers will never walk into a circle to check facts for themselves (especially freshly-formed, virgin circles), they rely upon writers to present the true facts *all the time*, and also to provide an exact history of research into the subject in which pointless irrelevancies like holes scraped in the earth (most probably by rabbits (p.44)), alarm bells (p.44), the gelatinous mass (p.35), and others, have been deleted.

So let us commence by putting right some facts about the history of the authors' team where the details provided are unclear. Delgado's interest with the circles began in August 1981 (the 1981 item on p.21 in Colin Andrews's chapter was written by Delgado, not Colin). Mr Andrews' involvement began in August 1985 with the Goodworth Clatford quintuple event although it seems he had perhaps earlier seen some circles from a distance. The item describing the quintuplet of July 1985 on Matterly Farm, Gander Down (north-east of the Cheesefoot basin in Hampshire) was written by Mr Delgado and not as implied on p.31 by Mr Andrews who did not know its exact location until he asked me over a year later (he never saw these circles himself although they were prominently placed in his own county and easily seen from the A31 road), Colin Andrews and Pat Delgado did not know one another until Mr Andrews contacted Mr Delgado in summer 1986 at *my* suggestion, so perhaps it is an uncorrected misprint on p.11 where Delgado writes that "Colin Andrews contacted me in 1983". Again, in Chapter 1, the long chapter describing interesting circle formations, the Corhampton event of 1984 (p.29) refers to 'two research organisations' which 'carried out a survey of cereal farmers in Hampshire and Wiltshire'. Unnamed in the book, although they should have been, these were BUFORA and TORRO, and the study was done from January to May 1987. Hence, despite appearances brought about by the wording, Colin Andrews' visit to Corhampton was in May 1987 (not 1984), meaning that the second circle mentioned on p.29 referred to the rapeseed circle of June 1987 (this matter is in fact later clarified by the authors on p.53). In fact, one may add that neither author carried out any on-site circle-measuring surveys before 1985, nor visited circle sites in counties other than Hampshire until 1986.

Chapter 1, although over a hundred pages long, is the easiest to read. Much of it consists of striking colour photographs taken at a variety of circle sites. The colour pictures number some 60 in all. They are often praised as the book's greatest strength, and indeed they are spectacular. About ten of the best aerial shots or high-pole shots were taken by Mr F. C. (Busty) Taylor of Andover. Unfortunately, the colour rendering of many is incorrect although this does not matter too much with crop photographs because the crops can

assume so many different hues. The publishers Bloomsbury are to blame for this. Try comparing for example the photograph taken above Bratton's fields on pp.100-101 with the photograph of the same circles reproduced on the cover of *The circles effect and its mysteries.* In the plane piloted by Mr F. C. Taylor that day were the pilot's son Nigel, my daughter Isabelle and myself, and the two pictures were taken almost at the same time. Neither Andrews nor Delgado were in the plane, so this accounts for the writers' error in relating the story of the combine harvester visible in both photographs. The combine had stopped work because of rain, and it did not restart harvesting until at least two or three days later (contrast this with the account on p.99). The discovery of the Winterbourne Stoke circles of 1987 (see pp.102-105 and the photographs on p.14 and the back cover) took place on the same day (22 August 19877, so this represents another event regarding which the authors of the book were not even in the plane despite the repeated use of "we" in their story. Another oddity is the photograph of the spurred circle near Whiteparish (p.54). As with all pictures in the book the authors did not attribute photographs individually (they simply gave a blanket acknowledgement on p.7; but this picture, *mirabile dictu,* was taken by *me!* and used without my permission. (I had given a print, taken from a transparency, to a member of the group about a month after that flight).

Many of the stories told in this long chapter are quite amusing, and highlight the zeal of the investigators, but several profound errors are present. As some have already been mentioned, just one other will be given now. On pp.81-82, when speaking of Mr Cooper and his dogs at Bratton the writers confuse two events which involved different farmers three years apart: namely (1), the story of the barking dog was in relation to the Bratton circles below the Westbury White Horse in August 1980 (see Ian Mrzyglod's Probe Report 1980); these are important circles in the history of circle research which Messrs Delgado and Andrews omitted because they were not circles investigators at that early date (although they did put some other early cases into their book which came to light retrospectively); and (2), the Bratton quintuplet of 1983 following which Mr Alan Sheppard's brother of Westbury (not Mr Cooper of Bratton) tried some pole-and-chain experiments with the national press in attendance. Another curiosity, but of inconsequential importance, is that although practically every account of circles in this chapter begins by explaining how they were found or brought to the attention of the group, the exceptions are just those cases where this reviewer was the discoverer (the Westbury pair 1987 (pp.73-4), and the Beckhampton triple and quintuplet 1987 (pp.78-79)), to which we may add the ringed starburst circle at Chilcomb, Hampshire, on pp.97-8 first reported by Paul Fuller.

Passing over the short second and third chapters which we have mentioned above and the simplistic chapter on photographic and measurement techniques (chapter 4), we arrive at the fifth chapter "Theories". This is 16 pages long and quickly attracts the attention of the inquisitive reader. 'How

are these circles and rings created?', it begins. Whatever the real answers may be, no-one will find out by studying the pseudo-scientific bunk which constitutes a good fraction of its 16 pages.

The first part of the chapter, though, is done well enough – the 1½ pages explaining why the circles are not hoaxed – but then comes the first deliberate mistake. On p.155 we are told: "After extensive enquiry and prolonged personal observation, we have no evidence that these circles are created except at night". To be able to state this, the authors were obliged to ignore the two eyewitness accounts which have been extremely well publicised by this reviewer in various articles, and this includes the eyewitness account perfectly well related by the horseman in the BBC film of 1988 in which one of the authors took part. (Since then, unknown to the authors, the quite splendid daylight account of Mr R. Barnes has come to light (ref. *J. Meteorology,* July/ August 1989 issue)). Yet Delgado and Andrews deliberately stress their standpoint by repeating on p.156 that 'the evidence is overwhelming that circle creations only occur at night'.

Another grossly misleading generalization is that 'with the exception of two possible cases . . . there have never been reports of sounds associated with the appearance of circles. *It must have no lights or illumination associated with it'* (p.158, but with my italics). As readers of *The circles effect and its mysteries* will know, I spend half the book talking about the acoustics and luminosities which seem often to accompany the circles effect. It is therefore plain that Messrs Delgado and Andrews (especially Pat Delgado who wrote this chapter which was accepted and approved by Colin) had no suspicion about even these most fundamental happenings involved in the circles problem, for again we find on p.158 that 'the force's specification requirement to record a flattened, swirled circle' includes *'silent and total darkness operating'.*

The authors' inability to analyse the accumulating evidence objectively is further displayed by their conclusions on p.158 that circle-formation is '. . . topographically conditionless and weather condition free' (see *The circles effect and its mysteries* and below for the answer to this), while on p.159 their confusion takes another form because we are told: 'The descriptions and details given so far may have given the reader the impression that we think the creating force of the circle operates only from above the earth's surface. Everything described could, of course, be the outcome of a sub-surface force, with a pulling down instead of pushing down force'. Evidently worried about the origin of contra-rotated flattened circles and the steepness of the circular walls, the investigators search for a tentative answer and state that 'all known forces have a field which, in some instances, can only be contained and prevented from giving extraneous effects by some form of metal shielding. The precise vertical walls of some circles could lead the observer into imagining that a tubular shield of some form is lowered into the crop, inside which the swirled flattening takes place' (another hint at solid UFO's!).

Next, what do the authors have to say about electromagnetism? Being engineers (P. Delgado, electro-mechanical design, and C. Andrews, electrical),

they see electromagnetic possibilities as only able to arise from the introduction of machinery; this proves how ignorant they are of the literature on vortices, for otherwise they would know that electromagnetism can occur naturally. So they write on p.162: 'To construct a flattened, swirled circle by some form of electromagnetic force a conductor would have to be placed vertically on the ground or protruding from the ground. If this conductor, while carrying a DC current, was capable of having its diameter increased, then maybe the crop stems could be induced to lie flat. To create a circle with a ring around the outside, the circle could be swirled clockwise with the current flowing along the expanding conductor in one direction. The current could then be switched off to leave the standing band. With the conductor's diameter continuing to expand, the current is switched on, but flowing in the opposite direction to create the opposite rotation for the flattened ring's swirl. It can be seen this theory is capable of creating many of the configurations so far discovered'. And then: 'Imagine the amount of equipment that would have to be carried into a remote field in order to create a 20-metre diameter circle' (p.161). Hence, for this and some additional reasons electromagnetic effects are not well entertained by these authors.

They next move on to consider forces originating from inside the earth. These are listed without much enthusiasm on pp.163-4. 'Maybe somewhere in this list of the earth's forces is the clue we are looking for. Whatever it is, and however it is derived, it seems to be intelligently controlled". Nine alternatives are listed, to which is added unsurprisingly "ley-line forces".

Finally the authors arrive at atmospheric forces, regarding which they briefly look at half a dozen (pp.166-168). What do they have to say about *air,* for which they manage to devote, albeit negatively, a whole page to the subject of atmospheric vortices or 'whirlwinds'? Not unexpectedly a travesty of a description results. "Much has been written trying to explain how it is possible for a whirlwind to create circles" (typically, no references are given, no names are cited). "Unfortunately for this theory, many of our circles have been in locations remote from any hills" (p.167). As usual, no figures, no facts are forthcoming for such a sweeping and damaging statement, so the bias is maintained to the end, and the reader is cynically misinformed. Yet serious investigators know that vortices are able to act downwind of hill-obstacles to a distance of 6-7km and more. In fact, this reviewer can state that all known circles that he has seen personally in the ten years 1980-1989 (600+) have been within reach of hills. His statements regarding the behaviour and characteristics of *descending* vortices have been clearly presented, and Delgado and Andrews between them have received copies of all papers. Yet these authors, who pretend to be scientists and claim to present the reader with all the facts so that the reader 'can decide for himself', choose to reject the theory on the basis that the ascending vortices of hot-weather whirlwinds (which have nothing to do with the problem) 'cannot be responsible for creating our circles and rings, especially the latter. It is an insult to anyone's intelligence, after considering all the facts, to be asked to believe these beautiful, precise

circles are created by a mass of swirling wind. It has even been suggested that five precisely positioned whirlwinds have created the marvellous five-dot dice-pattern groups". So Messrs Delgado and Andrews, unable to understand what is happening and incapable of presenting a reasoned argument, resort to cynicism as a final resort to misguide their readers. In what they have written there is so much that is erroneous, so much that is confusing and misleading, that many readers will be unable to tell the true statements from the false. Through misdirected enthusiasm the writers spoil their case, leaving even intelligent laymen uncertain about which facts to believe. So in the end the result is that the only facts that doubters can be *sure* about are the photographic ones. Having zero knowledge of meteorology, the authors have never tried to relate *true local* weather conditions to *exact* formation dates. The one indicated, feeble attempt to do this, made for the circles at Bratton which were found on 8 August 1987, was bungled (not only was it wrong to apply Boscombe Down data from south Wiltshire to this West Wiltshire site 35km away but the date of formation was not exactly known).

Finally in the chapter on 'theories', on p.169, a provocative attempt is made to blind readers with science. This page of waffle manages to weave the work of the great Heisenberg, Planck, and Einstein into situations that they could never have envisaged, and may be read for amusement by any physicist wanting a hearty laugh if he can afford a minute of his time. Nevertheless, the result of this exercise is startling (bottom of p.169) for it brings us to the conclusion referred to at the start of this review by clarifying what the Delgado-Andrews 'idea about the circles' is at last, namely: "This would seem to support the theory that the circles are created by an unknown force field manipulated by an unknown intelligence". This amazing and wholly unsupportable conclusion is totally at odds with Delgado's personal statement on p.154 that after eight years of investigation (1981-1988) "I just don't know how the circles are created". If these investigators had been paid to do the work, this would have been a dismal achievement to report to their financial backers. As it is, they are not professional scientists but enthusiastic amateurs energetically deploying surveying equipment and expensive cameras – and to judge by what they have written in this book, and by what they have omitted, have no obvious wish to apply the proper scientific method.

The book, in short, although fairly expensive, contains some things of great scientific interest despite its major errors and inconsistencies – some deliberate, some unintentional. Unfortunately, as some faults are obvious and some are not, the anxious or sceptical reader will be unsure about how much to believe. There is no index and the only references cited relate to some (not all) of the UFO reports in a sixth final chpater. The excitement of discovery comes over well in the book, but the intention seems to be to attract the multitude and maybe deceive the gullible. While the book's photographs are extremely important – and such photographs need to be studied by every researcher in the atmospheric sciences in the world – much of the text is valueless from a scientific standpoint, although publishers and authors may think that hardly

matters because the book, aided by an animated media campaign, is already commercially successful.

From a future historical perspective, one may be able to perceive some of the unusual opinions about the circles, including those intimated by the writers of this book, as providing a contribution to the study of modern myth-making. This aspect of the subject may then develop a usefulness to psychologists wishing to observe how myths commence and prosper. On the other hand, if regarded as a meteorological research topic the study of the circles is a real and challenging one and is certain to have far-reaching implications. It is without doubt one of the most exciting new topics to appear in any of the observational sciences in recent years, and is one to which serious well-funded university scientists should direct attention. Finally, because discussions about a paperback printing will inevitably arise, this reviewer would urgently recommend to the publishers that considerable revision of the error-riddled text by these 'honoured consultants' to *Flying Saucer Review* is to be advised before the idea of re-publication is entertained.

G. T. MEADEN

CONTROVERSY OF THE CIRCLES. By Paul Fuller and Jenny Randles. BUFORA, 1989. Available from 37 Heathbank Road, Stockport, Cheshire, SK3 0UP, £3.95.

In a brief introduction the authors say that this paperback booklet of 112 pages 'forms BUFORA's position statement on the question of the mystery crop circles prior to the 1989 season', and (further on) that it is a middle-of-the-road stance that has been adopted. As such, the book makes for healthy reading after the excesses intimated by the authors of *Circular evidence,* and provides a suitable antidote for the maladies of the latter.

The book commences with a 28-page chapter on the 'social history of the circles'. Then come a sequence of five chapters which summarise the circles's characteristics, and objectively look at the 'hoax' theory, the 'UFO' theory, the 'vortex' theory, and the results of the 1987 BUFORA/TORRO survey. The 'hoax' theory and the 'hypothetical force, craft or intelligence-controlled UFO' theory are found wholly wanting; instead, considerable support is adduced for Meaden's atmospheric vortex mechanism as the cause of the mystery circles. The implications that this theory has for explaining away many case-studies, already well investigated by serious UFO research enthusiasts but not previously fully understood, are well recognized, and this has resulted in the late insertion of a short ninth chapter which discusses three typical cases. As the authors say on p.96; 'IF Dr Meaden is correct, then we will face a novel scientific phenomenon which could have many important consequences for the field of ufology. To illustrate this, here are three cases, of differing types, reported to ufologists as UFOs . . . Other ufologists will surely recognize reports which seem to fit. Indeed that is the point. We are not dealing with a few isolated examples. We may indeed have a potential scientific explanation for MANY well known and highly attested sightings'.

At £3.95 (postage included) the book is a bargain. Its contents need to be digested by everyone who wants to know more about the truth of what has been happening in circles research in Britain these past years.

G. T. MEADEN

WORLD WEATHER DISASTERS: DECEMBER 1988

1-31: Cold wave in south and south-east Yugoslavia.

7th: Bus skidded off icy road in east of country leaving five dead and 51 others injured.

17th-21st: Heavy snow in south east of country, many roads blocked, power supplies disrupted, at least 100 villages cut off, blizzards described as worst for years in Makedonija, on the 19th the temperature in town of Bitola fell to -27°C., temperatures in some of the affected areas were the lowest in 63 years.

27th: Fifty vehicles trapped by drifts up to two metres deep, 200 occupants rescued. *Lloyds List, International Herald Tribune, B'ham Evening Mail.*

1: High winds uprooted tree which fell across railway line about 3.2km outside Alghero, Sardinia, a two-carriage train hit tree and first carriage was derailed, leaving the driver dead and three passengers injured. *L.L.*

2-3: Winds up to force 9 (strong gale) lashed the coasts of southern Italy and Greece. *L.L.*

3: Heavy rains and mudslides in western and southern Colombia. In Victoria Caldas province, a mudslide, following 10 hours of rain, left three dead and nine others missing, at Cachaguez, in Narino province, a landslide of mud and rocks fell on a hamlet, leaving seven people missing. Colombia experiencing its wettest rainy season for 20 years and many thousands of acres of land under water. In Girardot, 160km south west of Bogota the Rio Magdalena river rose 8 metres above normal and threatened to burst its banks. *L.L.*

3-7: Inclement weather in many areas of Great Britain:-

3rd: Thick fog in areas of England.

5th: Gales in areas of Britain, especially in south west areas of England, where gusts up to 121km/h reported, along with heavy rains, many roads blocked by fallen trees and telephone poles. A disabled trawler sank in heavy seas off Norfolk, leaving two fishermen dead.

7th: Fog and ice caused road accidents in many parts of country, leaving two dead and a number of others injured. *B.E.M., D.T.*

5: Motor ferry *Rosalia* sank in heavy seas in San Bernardino Strait 30km off Surigao, Philippines, some 400 people reported drowned. *L.L.*

5: Dredger *Bowsprite* capsized in heavy seas, 22.5km north of Nieuwpoort, Belgium, leaving two crew dead and two others missing. *L.L.*

8-10: Gales, thunderstorms and torrential rains in Mediterranean Sea around Malta and Greece, details on following page:-

Malta: Hit by winds of Force 10 (storm) which caused widespread damage to commercial or industrial premises and yachts and other craft. A number of ships in difficulty in seas around Malta, at least one, the Mv 'Four Star I' sank, leaving two crew missing.

Greece: Hit by gales, thunderstorms, heavy rain on the 9th and 10th, leaving one person dead and five others missing. *L.L., B.E.M.*

8-10: Brush fires in southern California, U.S.A., fanned by winds gusting to 113km/h, the fires burned across some 3200 acres, one fire in the suburb of Porter Ranch destroyed 15 homes, damaged 25 others and forced the evacuation of 8000 people, the high winds brought down trees and power lines, cutting off electricity to 328,000 people in southern and parts of central California. *L.L., Sunday Telegraph.*

9-11: Storm caused floods, landslides and heavy seas in Manado region, and Sangihe-Talaud regency, north Sulawesi, Indonesia. In Tahuna town, in Sangihe-Talaud regency 127 houses destroyed, in Manado, about 80 houses damaged, a fishing vessel sank in storm, leaving six fishermen missing, floods along the Ranoyapu Amurang river left one missing, the rains caused a landslide which left two dead in a village in central Manado. The storm was accompanied by a storm wave which was three metres high in places. *J.P.*

10: Vessel, the *'Camfair',* sank in heavy seas off Isabela province, Luzon, Philippines, one crew member rescued, fate of other crew not known. *L.L.*

10-20: Cold wave in eastern half of the U.S.A., from the Great Lakes to the South, and extending to the north east states, by the 13th six deaths reported, by the 20th another six had died of exposure in New York City, where temperatures as low as -15°C were recorded. *D.T., I.H.T.*

15: A research vessel, the *Posillipo* sank in stormy seas in the Bay of Napoli, off Italy, leaving one person dead and two others missing. *L.L.*

15: Drilling platform *Rowan Gorilla I* capsized and sank in storm in lat. 39 57N, long. 52 48W, about 850km south east of Halifax. Nova Scotia, Canada, winds in storm were force 10 to 12 (storm to hurricane) and seas up to 13.72 metres high, insured loss of platform put at $90 million. *L.L.*

15-16: Gale in northern California, U.S.A., winds up to 165km/h reported, trees and power lines brought down, about 12 houses and dwellings destroyed, lorries blown off roads, in the south of the state up to 180mm of snow fell in the Tejon Pass, north of Los Angeles, on the 15th two people died when dozens of cars crashed in 10 accidents along icy stretches of road in Cajon Pass, 90km east of Los Angeles. *L.L., D.T.*

15-19: Over 300mm of snow fell on Salonika, northern Greece, many villages isolated in other northern areas of Greece. *I.H.T.*

16: Snow and high winds throughout Italy, forcing airports, schools and offices to close. Some parts of Sicily and Calabria saw their first snow in 10 years. *B.E.M.*

16: A ship the *Bintang Samudra I* sank in stormy seas off Masalembo, east Java, Indonesia, leaving eight people missing. *J.P.*

16-18: Torrential rains and floods in western and central Java, Indonesia, 2,000 houses destroyed, at least 44 deaths reported in central Java, 8 others died in Jakarta and nine others died in landslide near Bogor, some 60km from Jakarta, giving a total of 61 dead in the floods and landslides. The floods in central Java districts of Pemalang, Pekalongan and Semarang described as worst in 25 years. In addition to houses destroyed many thousands of others flooded, rail and road transport disrupted as bridges, rail lines and roads swept away. *J.P., D.T.*

17-18: Cyclone "Ilona" hit coast of Western Australia, Australia, the cyclone moved inland 111km south east of Karratha, the cyclone, which caused no casualties, caused damage to trees, signs, fences, roofs and power lines, in port of Dampier a number of boats were either sunk or damaged, with damage put at A$1 million. *L.L.*

18: Ferry boat, the *RCJ* sank in stormy seas between Mindoro and Semirara island. Philippines, leaving 51 people missing, two others rescued. *L.L.*

20-21: Heavy rains, the worst for 58 years, in Sao Paulo, Brazil, leaving seven people dead, in the 24 hours up to 1200GMT on the 21st 152.4mm of rain fell on the city. A mudslide in the suburb of Sao Bernardo do Campo left six dead, the other death was when a youth was swept away by floods in the north of the city. *L.L.*

20(reported): Cold and dry weather in Brazil has cut the 1989-90 coffee crop. *L.L.*

22: Fierce winds in the Faroe Islands and north west Norway:-

Faroe Islands: Winds up to 233.45km/h reported, bringing down power lines, blowing vehicles off roads and ripping fishing vessels from their moorings, no casualties reported.

Norway: Winds up to 108km/h reported which brought down power lines and disrupted air, sea and road traffic. A huge wave swept car out to sea, leaving one dead and one other missing. *L.L.*

23-24: Unseasonably heavy rainstorms swept across northern Egypt leaving seven dead, two houses collapsed in Cairo, leaving one dead and two injured, two were electrocuted in Delta town of Tanta and four died in flood-related road accidents. Rail and road traffic disrupted. Strong winds and waves as high as 3.5 metres high forced fishermen to remain in harbour at Alexandria and Port Said. *L.L.*

24: Tornado hit Franklin, Tennessee, U.S.A., leaving one person dead and six others injured, tornado touched down eight times along a 32km track, 15 buildings destroyed, 40 others damaged, damage put at $30 million, winds in tornado reportedly up to 322km/h, the tornado was 46 metres wide at the base, but much wider at the top, the tornado hit before dawn. *L.L.*

26-27: Snowstorm in Mid-West region of U.S.A., brought snow and sleet from Rocky Mountains to Ohio, up to 300mm of snow in Chicago, Illinois and in Minnesota, air and road traffic disrupted. *I.H.T.*

26-27: Heavy snow in areas of the Middle East, up to 0.5 metres of snow fell on Amman, Jordan, snow in other areas of Jordan and Syria blocked roads. *I.H.T., D.T., B.E.M.*

27(reported): Heavy rains caused widespread flooding in seven regencies in South Kalimantan, Indonesia, thousands of hectares of rice paddies inundated, no casualties reported. *J.P.*

28: M. container vessel, the *Lloyd Bermuda* capsized and sank in stormy seas some 320km off the New Jersey, U.S.A. coast, leaving one person dead and six or seven others missing. *L.L.*

31: Heavy rains touched off landslide in a rural area of Blitar regency, east Java, Indonesia, leaving six people dead. *J.P.*

31.12/3.1.89: Forest fire at Jaureguiberry, Canelones department, 77km from Montevideo, Uruguay, approximately 1000 hectares of forest burnt, no casualties reported. *L.L.*

ALBERT J. THOMAS

WORLD WEATHER DISASTERS: JANUARY 1989

1: Mudslides damaged 168 homes in shanty towns near Caracas international airport, Venezuela, leaving six dead and 20 others missing. *Daily Telegraph.*

1: Landslides in the Ciamis regency, west Java, Indonesia, destroyed at least 99 houses and damaged 70 others, a mosque was also destroyed, dozens of hectares of rice fields devastated. *Jakarta Post.*

2-3: Cyclone "Delilah" hit New Caledonia, in the south Pacific, with winds up to 193km/h and heavy rains, northern and eastern parts pf New Caledonia worst affected by cyclone, which left two people dead. Roofs ripped off building, trees uprooted and fruit plantations devastated. *Lloyds List.*

3: M. launch *Jem II* sank in stormy seas of Agho Point, Romblon, central Philippines, leaving 40 dead and a undetermined number of others missing. *L.L.*

3: Blizzards and high winds disrupted sea, air and road traffic in various parts of Greece, several villages in north-western areas isolated by snow, winds in the Aegean up to 88km/h. *International Herald Tribune.*

3: High winds and heavy seas closed port of Alexandria and nearby port of Sidi Kerir, Egypt, shipping disrupted. *L.L.*

5: Cold and snow in many areas of Near East, first snow in 50 years fell in the desert regions of Khur and Biyabanak, eastern Iran, snow also fell in the Lebanon, Turkey and southern Jordan, temperatures also below normal in area. *D.T., I.H.T.*

7: Tornadoes in the U.S. states of Illinois, Indiana and Kentucky, worst hit was town of Allendale, Illonois, where 53 homes were destroyed, 28 severely damaged and 30 more affected, nine businesses, police department, fire department, town hall and school also destroyed, at least 50 people injured, tornado hit at 1733 hours, the tornado moved into Indiana, where three people were injured and some 60 buildings were destroyed or damaged in the St. Thomas area. In south-central Kentucky a tornado

struck outlying areas of Franklin, causing an estimated $10m to $12m damage to businesses and homes. *L.L.*

7(reported): Drought in Guinea Bissau, west Africa, coupled with a locust plague has caused food shortages. *D.T.*

8-9: Cyclone "Gina" hit Western Samoa, south Pacific, causing damage estimated at $5 million on group's largest island, Savai'i, roads, bridges and houses destroyed, many people made homeless. *L.L.*

8(reported): Heavy snowfalls and strong winds in Georgia S.S.R., at least six people dead and severe damage reported to buildings, power lines and rail and road links. *L.L.*

9: Heavy fog disrupted road and air traffic in northern Italy for the third consecutive day, a number of airports closed. *I.H.T.*

9-10: High winds and heavy seas closed port of Alexandria, Egypt. *L.L.*

10-31: Intense cold, with storms in Alaska, U.S.A., brief details below:–

10-12: Storms in the Bering Sea, winds gusted to 97km/h and waves 7.6 metres high reported, a number of ships reportedly in difficulties, the storm also hit mainland Alaska, closing airports and causing widespread disruption in some towns.

28th: A fishing vessel, the 'Vestfjord' sank in 60 knot winds and nine metre high seas off Kodiak Island, leaving six dead.

Throughout period record low temperatures reported and on the 31st a record high barometric pressure was recorded 31.84" at Northway, eastern part of state. Storms in the Bering sea having seen winds gusting to 274km/h, about 15 fishing vessels have been lost, damage put at many millions of dollars. *L.L., D.T.*

11: Hurricane force winds in southern California, U.S.A., no major damage reported. *I.H.T.*

11-19: Cold wave in northern India and Bangladesh, reported to be the coldest weather in Bangladesh for 20 years, 145 people died in India and Bangladesh. *D.T., Birmingham Evening Mail.*

13: Gales in Atlantic, two ships affected, one, the *Yarrawonga* holed by heavy seas about 1208km west of Lands End, crew of 32 rescued and ship later taken in tow by a salvage tug, the other ship, the Fv. *'Big Cat'*, grounded and sank in storm force 10 winds at entrance to Valencia harbour, county Kerry, Eire, leaving one crewman dead and two others missing. *L.L., D.T.*

13(reported): Lake Prespan, southern Yugoslavia, reported at lowest level for almost 80 years. *D.T.*

14: Fv. *Changmyung No.* 7 sank after colliding with ro-ro m. ferry 'Car Ferry Queen' in dense fog about 8km south east of Yosu Island, South Korea, 12 crew members missing. *L.L.*

15: Cyclone "Calasanjy" hit southern areas of Madagascar causing widespread damage to towns and villages with winds up to 200km/h, about 25% of town of Maintirano damaged, communications disrupted. *L.L.*

16(reported): Cargo vessel *Al Yakoob* capsized and sank in strong winds and heavy seas on voyage from Karaci to Dubai, leaving seven people dead. *L.L.*

18: Launch capsized in storm near Dubai, leaving one dead and at least three others missing. *L.L.*

18-23: Heavy monsoon rains, floods and landslides in Sumatra, Indonesia, on the 18th a flash flood hit Solok Selatan, in west of island, leaving six people dead, floods reached two metres deep in areas as three rivers overflowed, thousands of acres of paddy fields under water, on the 19th a landslide left 20 people dead at Ulu Air, 150km from Padang, in west of Sumatra. The worst floods for about 50 years hit Bengkulu province leaving 27 people dead and 12 others missing, the floods washed away 882 houses, 264 others collapsed, 968 damaged and 3,590 others flooded, at least 39,318 head of cattle dead, these floods hit on the 20th. Floods on the 22nd in Aceh regency left one peson dead, with thousands of cattle also dead, and on the 23rd a storm hit Solok and Tanah Datar regencies, causing high waves on Lake Singkarak, the storm and waves destroyed at least 222 houses and thousands of acres of paddy fields, 130 familes evacuated, no casualties reported. *J.P.*

19: Tropical storm "Winona" caused some damage on island of Saipan. *L.L.*

23(reported): Forest fires in Uruguay due to severe drought, particularly on south-east seaboard, no casualties reported although some material damage. *L.L.*

24(reported): Drought from 1988 continues in areas of U.S.A., especially in Kansas, southern Nebraska, Texas and eastern Colorado. *I.H.T.*

25-31: Heavy monsoon rains and floods in the central Philippines, more details in the February return. *L.L.*

26: Large forest fire in north-west Italy near the Mediterranean Sea. *L.L.*

28-29: Cyclone "Firinga" hit Reunion island and island of Mauritius in Indian Ocean.

Reunion: Winds gusted to 250km/h causing widespread damage, estimated at $80 million, four persons killed, 60 injured and 6000 people left homeless, southern part of island worst hit, trees uprooted, houses destroyed and telephone lines brought down.

Mauritius: "Firinga" left one dead and seven injured, hundreds of trees and uprooted, 125 homes damaged and up to 15% of sugar crop ruined. *L.L.*

30-31: Cold wave in Canada, fountains froze in normally mild Vancouver, snowstorms in worst affected western part of country left at least 11 dead. *D.T., B.E.M.*

ALBERT J. THOMAS

LETTERS TO THE EDITOR

MYTHS AND MYSTERIES IN THE MAKING

One mark of a 'successful' artist is the ability to create convincing and insoluble mysteries. These can take many forms: in painting, for example, perhaps the Mona Lisa's smile rivals the narrative mystery of the 'Marie Celeste' in terms of its timeless fascination.

During the early to mid-1970's in British Schools and Colleges of Fine Art, two fashionable forms of expression for creative individuals were 'Land Art' and 'Concept Art'. From exponents of the former, Richard Long became temporarily famous, with books and articles on his circle and spiral constructions written by highly-regarded critics. These construction forms were made from local materials, and then photographed, often from a high or aerial viewpoint (because the scale was sometimes quite large) which added an air of authenticity and of mystery.

'Concept Art' appealed to theoretically-inclined art students who wished to believe that their original *ideas* were the most important factor in Art. Then, subsequent making of the material artwork, followed by the process of documenting it in words and photographs could be done by labourers and critics respectively, preferably at the publishing house's expense.

With this background, it would not be surprising to learn that, historically speaking, the 'crop circle issue' first made news around 1975 when 'Land' and 'Concept' art forms were fashionable. The writer attended Art Schools at Swindon and Maidstone between 1972 and 1976 with several farmer's sons and daughters as fellow students, leading to a strong suspicion that the 'YFC Connection' regarding hoaxes is more than just a tenuous one!?

It is to be hoped that the percentage of hoaxed crop circles to genuine ones will be soundly investigated and evaluated by CERES, leaving the 'mystery-making' to such talented artists as Messrs. Andrews and Delgado, whose recent storybook entitled *Circular Evidence* is, following advance publicity in the *Sunday Telegraph* magazine, selling 'like hot cakes'. These astute operators are probably well aware that an important part of their financial success comes from keeping the mysteries unexplained; maintaining the subject in the headlines; and keeping the gullible talking?

19, Inholmes Common, Woodland St. Mary, near Newbury, Berks. W. S. PIKE

(I am afraid that crop circles did not make news until August 1980 (*Wiltshire Times;* followed by *J. Meteorology* in March 1981, etc). Only a very few hoaxed or experimental circles have ever been made. The data bank of genuine circles now extends to over 650 individual cases, of which some 250 occurred this summer between 9th May and the middle of August. – Ed.).

TORRO TORNADO DIVISION REPORT: October to December 1988

Three tornadoes were reported in Britain during the last three months of 1988, two during the unsettled weather in early October and one during a northerly outbreak on 20th November. No tornadoes were reported in December for the fourth consecutive year.

TN1988October5. *Near Barham, Kent (TR 2150)*

This tornado, which apparently happened at night, lifted a mobile tea bar into the air and carried it over a car, and overturned a trailer (unidentified press cutting). No other details have come to light.

A low, 995mbar, was just off Aberdeen at 1200. The 500mbar chart was fairly similar.

tn1988October6. *Pity Me, County Durham (NZ 2645)*

The *Northern Echo* of 7th October (sent by Mr. Mike Cinderey) described how a tornado wrecked fences, sheds and hedges in the village of Pity Me, just north of Durham. A car was lifted off the ground and a greenhouse disappeared. The damage was contained within a strip less than 300 metres wide. Force: probably T2. At the Potters Haugh sewage works (location unknown) workers arrived to find the sides and supports of a sectionalised garage missing.

A deep low, 965mbar at 1200, was located off northern Scotland. The cold

front had crossed all parts of Britain by about 1200. The 500mbar chart was similar, with a trough over the North Sea.

TN1988November20. *Sutton-on-Sea, Lincolnshire (TF 5281)*

A tornado struck two bungalows in Highgate Avenue, Sutton-on-Sea, at 1830 GMT. "We thought it was a low-flying aircraft", said Mr. William Stevens. Four wooden fence panels were uprooted, and one landed on the roof, dislodging tiles. A greenhouse had all the glass blown out. "Mr. Stevens thought the whirlwind must have come in from the sea. Something similar happened to houses about 100 yards away in Trusthorpe Road earlier this year" (*Skegness Standard,* 25th November; another report is in the *Grimsby Evening Telegraph,* 21st November).

A small depression moved south on the margin of an anticyclone near Iceland, to be centred north of Paris, 1005mbar, at 1200. It was a cold day, with rain or snow in many places. At 500mbar Britain was covered by a strong northerly or north-westerly flow between a ridge over the eastern Atlantic and a trough over Finland.

Additions to previous reports:

WS1987August22. *24km S.W. of St. Catherine's Point, Isle of Wight (SZ 3258)*

Mr. G. Butler saw a waterspout 15 miles (24km) S.W. of St. Catherine's Point at about 0800 GMT. The grid reference is about SZ 3258. The spout was moving S.E. and was observed for about one mile. The height was estimated as 1000 feet (300m) and the diameter as 50-60 feet (15-18m). "The shape was compared to the bottom end of an atomic explosion extending straight downwards from the cloud base. He said the spout looked very powerful and was much larger than the two in October (i.e. 11th October 1987; see *J. Meteorology, 13,* 248, July-August 1988).

A low pressure area was centred over England, 1005mbar, at 1200. Severe thunderstorms occurred in various parts of Britain. Mr. Butler said that "the lightning was constantly striking the sea, giving off hissing noises, and the rain was very heavy" (information from Mr. Peter Matthews).

tn1987summer/autumn. *Compton Bishop, Somerset (ST 3955)*

Miss Helen C. Boileau experienced a probable tornado in the autumn "two or three months before" the storm of 16th October 1987. "It tore the ventilators off the big greenhouse, throwing them over the back and breaking them and glass; blew the door and two large panes out of a Dutch house; lifted a rafter in another house, leaving the glass standing and taking 50 tiles off the house, which were never found".

YUWS1987October13?. *Jugoslavian coast.*

While on holiday in Jugoslavia Mr. Gwyn Thomas and his wife saw eleven waterspouts. It is not clear whether all were visible at once, nor whether they

all reached the sea surface. Mr. Thomas arrived back in Britain three days later to find that S.E. England had just been devastated by the storm of 16th October 1987, which suggests that the waterspouts occurred on 13th.

tn1987November12. *Langstone, Throwleigh, Devon (SX 673901)*

At about 1100 GMT a very localised strong wind struck a greenhouse belonging to Mrs. V. E. Green, almost destroying it. Glass was strewn around Mrs. Green's garden and some was in her neighbour's garden 60 metres from the greenhouse. Glass was also lodged in the thatch of the house. The neighbour's greenhouse was untouched, but some nearby oak trees had their tops broken off. The storm was accompanied by hail, which flew past the windows horizontally.

A strong westerly airflow covered Britain. A deep low (965mbar) was centred over N.W. Scotland at 1200.

M. W. ROWE, G. T. MEADEN

TORRO THUNDERSTORM REPORT: October-December 1988

By KEITH O. MORTIMORE
Thunderstorm Division, Tornado and Storm Research Organisation, 77 Dicketts Road, Corsham, Wiltshire.

Thundery activity in October was near to normal over England and a little below over Wales, Scotland and Ireland. All but one thunder-day occurred between 5th and 19th and during this spell some individual stations exceeded their expected totals for the whole of October. Three days were reported quite widely over East Anglia but, surprisingly, most parts of Kent, Surrey, Greater London and East Sussex were thunder-free, except in the Dover area of Kent where three days were reported. At Eilesborough (Bedfordshire) thunder was heard on as many as four days.

Thunder-days in October 1989 were as follows: (averages refer to the period 1951-1980).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total	Ave.
England					X	X	X		X		X	X	X					X	X											X		10	10.2
Wales						X						X						X														3	5.4
Scotland						X	X																									2	5.9
Ireland						X						X	X					X														4	5.6
Total					X	X	X		X		X	X	X					X	X											X		10	12.5
Netherlands					X	X	X		X	X		X	X																		X	8	8
Belgium					X		X	X				X							X													5	

With a large low-pressure area covering the British Isles on 5th there was a report of thunder over the Irish Sea off Merseyside in the early hours, and in the late morning and afternoon some thundery showers affected south-eastern

counties of England. Heavy showers with hail and thunder in places developed widely on 6th, particularly along a trough that crossed all parts from the west during the day. At Chiseldon, near Swindon (Wiltshire) a boy was hurt when lightning struck a house and travelled down the TV aerial. With stormy conditions continuing to affect the U.K. on 7th a number of thundery showers moved off the Bristol Channel during the morning to affect northern parts of Somerset and Avon and in the evening lightning was observed over the eastern English Channel. There was also some morning thunder in the north of Scotland. Southern England had a lot of heavy rain on 9th and thundery outbreaks affected parts of Cornwall in the early afternoon, moving across southern counties to reach the south-east in the evening. During the evening of 11th some thundery showers affected parts of Dorset and a house was damaged by lightning in Bournemouth. With an upper cold pool over the country showery conditions predominated on 12th and thunder was reported quite widely over central and eastern counties of England and in parts of Wales and Ireland. A few scattered thundery showers drifted north across England during the night and early part of the morning and after a brief quiet period more widespread and sometimes severe storms developed over southern England, again drifting slowly north. During an early morning storm a house at Cradley, near Halesowen (West Midlands) was struck by lightning. Large holes were ripped in the roof and a pregnant woman was hit on the head by a flying portable television set. At Anchorsholme, near Blackpool a bungalow was struck around breakfast-time damaging a refrigerator, television set and telephone and at Elswick Village two houses also experienced lightning effects. At Dovercourt, near Harwich (Essex) a disabled woman was badly shocked when lightning struck her bungalow in the evening causing considerable damage to the electrics. In the early hours of 13th there were thunderstorms at Tynemouth and at Malin Head while in the late evening lightning was observed from Kilmallock (Co. Limerick).

During the early hours of 18th heavy thundery outbreaks moved north from France into southern England between Devon and the Isle of Wight and these moved steadily north and north-west to affect Wales and parts of north-west England during the day with some renewed activity in the south in the evening. At Caernarfon (Gwynedd) lightning struck a sycamore tree in the garden of a house, furrowed the garden, shattered a stone surround at the base of the tree, followed the root system outwards and knocked out the electricity and telephones in the adjacent house. A garage was also set on fire. At Windermere (Cumbria) lightning damaged timing equipment at power-boat races. At Heswall on Merseyside a morning storm with rain of tropical intensity was reported. A cold front moved north-east across England and Wales on 19th. Thunderstorms developed ahead of the front over central England in the late afternoon tracking north-westwards to Merseyside and Lancashire and another area of storms moved from France into south-east England in the evening. In the south-east some lightning damage and flooding were reported in places but the most damaging activity affected the Liverpool area where

between 30mm and 50mm of rain were recorded. At Sefton Park Nurseries 56.5mm of rain fell, much of it in around 60 to 75 minutes. Flooding was severe and reached two metres in depth in places. The most severe activity was confined to the Liverpool and north Wirral areas and many parts outside this area saw little rain. Finally, on 30th, Gorleston-on-Sea reported a very localised storm in the early hours when a 20-minute storm was accompanied by some electrical activity. This outbreak was totally unexpected and very local and considering the close proximity to high pressure TORRO would like to receive information from other stations in the area.

NOVEMBER

There was very little thundery activity in November with only two thunder-days in England and a single day in Scotland. Wales and Ireland were totally thunder-free.

Thunder-days in November 1988 were as follows:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total	Ave.
England																				X	X										2	10.0
Wales																															0	5.1
Scotland											X																				1	7.1
Ireland																															0	5.9
Total											X									X	X										3	13.8
Netherlands												X								X											2	6
Belgium																															0	

On 11th thunder accompanied hail showers in the Northern Isles of Scotland and during the evening of 20th north-easterly winds carried thundery snow showers off the southern North Sea across parts of Essex, Kent and East Sussex. Thundery snow showers again affected coastal areas of Essex and Kent on 21st.

DECEMBER

There was only one thunder-day over England in December and a single day was reported from Ireland. Wales was again thunder-free but Scotland has as many as five days, only two short of the normal. Much of the activity in Scotland was confined to the Northern Isles.

Thunder-days in December 1988 were as follows:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total	Ave.
England			X																													1	8.4
Wales																																0	4.6
Scotland				X														X				X	X	X								5	6.9
Ireland			X																													1	6.1
Total			X	X														X				X	X	X								6	12.5
Netherlands				X	X	X	X												X			X										6	4
Belgium																																	

In late afternoon of 1st there was thunder in the Isle of Man and at Blackpool as an active occluded front crossed the area having earlier produced thunder at Belmullet in Ireland, and on 4th there was a thundery shower at Eskdalemuir in the southern uplands of Scotland. On 18th the Northern Isles were affected by a number of thundery showers during the day and Shetland was similarly affected on 22nd and 23rd. Finally, the last activity of 1988 occurred in the early hours of 24th when thunder accompanied a hail shower in the far north-east of the Scottish mainland.

Product News:

VENTUREPRISE CO-OPERATIVE LTD

In June this year Ventureprise Co-op Ltd. of Coventry and Weather-Data of Grendon Underwood merged companies. Ventureprise has been making a fully automatic Weather Station for some years now and has had considerable success penetrating the market. Weather-Data has made an impact selling lower priced, less complex systems and has considerable experience in making and selling special packages to suit individual requirements.

By combining in this way we have consolidated our marketing and design service so that we can be even more competitive. We now manufacture a wide range of meteorological equipment from the simple but useful "100 Series" right through a full and increasingly complex range of products to a fully Automatic Weather Station.

Where possible we shall be using the sensors made by Weather-Data to further enhance the performance and price of our products. By manufacturing our own sensors we are able to conform to shorter delivery dates and to offer a better service facility. We shall, of course, still be selling our range of sensors to other manufacturers. Where customers have a preference for a particular range of sensors we shall, of course, fit these sensors to our systems.

The combination of the two companies enables us to give our current and future customers a wider choice of equipment and options so that almost any application may be monitored, stored, and analysed using Ventureprise products and services.

Ventureprise may be contacted on Coventry (0203) 714160 or by Fax (0203) 691224. Ventureprise Co-op Ltd. Unit 9, Kensington Court, Kensington Road, Coventry, CV5 6GG.

VENTUREPRISE WIND ROSE PROGRAMME

Wind rose is a computer program designed to run on any IBM compatible computer. It has been developed especially to meet the needs of people engaged in pollution research or monitoring pollution in our environment. The end result is an on-screen picture of the spread of an airborne pollutant. This programme may also be directed to a plotter for a full-colour graphics chart giving the distance and direction of a given spill in, say, a 24-hour period. The

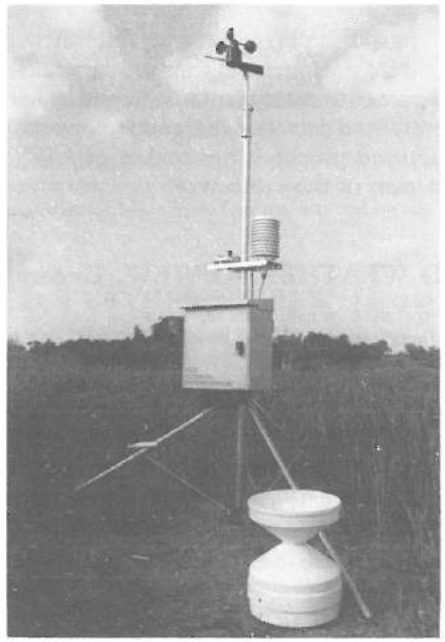


Fig.1: Automatic Weather Station by Ventureprise Co-operative Ltd.

"run" portion of the programme may be used for other mobile pollutants e.g. in our rivers.

Windrose works by collecting data from the Ventureprise AWS which has been logged inside the weather station each minute and computes the effect of various changes in meteorological phenomena. These data are processed by the programme to give an image similar to the one attached to this description. On the chart you can see that from 'Ground Zero', in this case the site of the weather station, the wind which had been blowing from the ESE to WSW had spent a certain percentage of time in various directions represented by the shaded part of the compass rose. A visual idea of the spread of wind can be determined by looking at the shape of the vectored areas. At the end of each vectored area is a number, this shows the actual distance that the wind travelled during the period of this graph. The programme may also be configured to show other relevant factors such as the relative humidity or air pressure necessary in noise-pollution measurements.

The data are easily presented in a court and would give a novice a visual view of the problem facing the EHO or the responsible chemical or industrial concern. The information can be saved to disc and utilised in many other ways by various members of the department and indeed by other departments of the organisation.

TO SUM UP

It is a simple system to install (supplied on disc). It will greatly reduce the time spent by senior dept personel and therefore increase efficiency and cost effectiveness. It will give consistent results. It would be useful during litigation to have visually-represented data. It is designed to operate on IBM compatible machines. It may be used on the other makes of AWS provided that they output their information in the same way.

WORLD WEATHER REVIEW: December 1988

United States. *Temperature:* warm from E. Montana and N. Michigan to Texas and Mississippi; S. Florida, Hawaii; marginally on W. coast; +3degC in S. Nebraska and N. Kansas. Cold elsewhere; -2degC from E. Oregon to S.W. Utah. *Rainfall:* mostly dry. Wet in Hawaii, coastal California, S.E. New Mexico to N.E. Illinois; Louisiana to C. Ohio; N.E. Montana to N.W. Michigan; much of Nevada, Wyoming and E. Colorado. Over 200% locally in C. Hawaii, S.W. Missouri E. North Dakota, N.W. Minnesota, C. Colorado. Dry elsewhere; under 50% in E. coast states, S. Texas, S.E. California to W. Colorado and W. Nebraska; S. Washington to N.W. Utah.

Canada and Arctic. *Temperature:* warm in Alaska, W. Canada, W. coastal Greenland; +6degC in interior Alaska and near Mackenzie estuary. Cold in C. and E. Canada, S.E. British Columbia, Iceland and E. Greenland to Franz Josef Land; -4degC in Baffin Island and Franz Josef Land; -5degC in N. Quebec and Jan Mayen; -6degC in Spitzbergen and Bear Island. *Rainfall:* wet in most of Alaska, parts of extreme S. Canada, much of Greenland, W. Ireland, Bear Island. Over 200% in N.W. and S. Alaska, S.W. Saskatchewan, Bear Island. Dry in E. Alaska, most of Canada, N.E. Greenland, E. Iceland. Under 50% in much of N. Canada, S. Alberta, N.E. Greenland, E. Iceland.

Europe. *Temperature:* warm from British Isles and S. Norway to Poland, W. Romania, N. Jugoslavia, N. Italy and parts of N. and E. Spain; near Urals; +3degC from parts of United Kingdom to N. France and W. Germany. Cold elsewhere; -2degC in and near Finland; S. Italy, S. Jugoslavia, N. Greece; -6degC in N. Finland. *Rainfall:* mainly wet; over 200% in E. Finland; locally in N. and S. Poland, N. Czechoslovakia and N.E. coast of Black Sea; C. and S. Germany, N. Switzerland, N.W. Austria, near S. Urals. Dry from Mediterranean to S. Romania, S. Hungary, most of France and British Isles; parts of C. Norway and N. Sweden. Under 50% in W. Jugoslavia, N. and S. Italy, S. and W. France, Portugal, Spain, much of British Isles. Rainless in S. and E. Spain. Provisional sunspot number 179.

Africa. *Temperature:* warm in Madeira, Canary Islands, interior Egypt, S.W. Cape Province; very locally in N. Algeria; +1degC at least locally except in Canary Islands. Cold from Morocco to Libya and in most of South Africa and adjacent areas; -1degC general. *Rainfall:* wet on coast from N.E. Algeria to Egypt (over 200% in many places); South Africa, W. Botswana, most of Namibia; over 200% in most of Cape Province and Lesotho; N.E. Natal; much of Namibia. Dry from Madeira and Canary Islands through Morocco to interior Egypt; E. Botswana, N.E. Transvaal; locally in S. coastal Cape Province. Under 50% from Canary Islands to Egypt.

Asiatic U.S.S.R. *Temperature:* warm or very warm except in extreme N.E. (-4degC); +3degC almost everywhere; +11degC from C. Yenisey basin to W. Lena basin. *Rainfall:* wet from Taimyr Peninsula to Afghan border; Lena basin; round L. Baikal; over 200% fairly widely in all these areas. Dry elsewhere; under 50% in S.W. Turkmenistan, many places near Chinese and Mongolian borders, and in N.E.

Asia (excluding U.S.S.R.). *Temperature:* warm in interior Turkey, Arabia, Pakistan, Bangladesh, Mongolia, Korea; most of India, China and Japan; +3degC in N. and W. Mongolia, W. China, N. Korea; +6degC in N.W. China. Cold from coastal Turkey to Israel; W. India, S.E. Japan; much of Thailand, Malaya, Borneo and Philippines; -1degC in all these areas except perhaps Japan. Possibly also cold in parts of E. China (sources disagree). *Rainfall:* wet from parts of Turkey to N. Arabia; N. Pakistan, C. and extreme N. India, E. Mongolia, parts of E.C., S.E. and N.E. China (all over 200% at least locally); N.W. Japan, N.W. Sumatra, S.E. Sumatra to Sumbawa; most of Borneo. Dry in W. and N.E. Turkey, S. Arabia, S. Pakistan, W. Mongolia, Philippines, Thailand, Malaya, C. Sumatra, N.E. Borneo; most of India, Bangladesh, China and Japan. Under 50% widely in all these areas except perhaps Borneo.

Australia. *Temperature:* warm in E. half; +2degC in S.W. Queensland. Cold in W.; +2degC in interior S.W. *Rainfall:* mainly wet; over 200% on N. and N.E. coasts and from S.E. New South Wales to most of Western Australia. Dry in S. Queensland and locally on extreme S. coasts.

M. W. ROWE

WORLD WEATHER REVIEW: January 1989

United States. *Temperature:* mainly warm (including Hawaii); second warmest in last 35 years; +5degC from C. Nebraska to Ohio; +7degC in Iowa. Cold from California to S. Idaho and N.W. New Mexico; -6degC from N.E. Nevada to C. Utah. *Rainfall:* wet from S.W. Utah through E. Montana to N. Wisconsin; extreme S.E. California through C. Colorado to C. Iowa; most of Texas to S. Ohio and W. Maryland; C. Florida; N.W. and S.E. Hawaii. Over 200% in northern N. Dakota, N.W. Minnesota, C. Colorado, S. Texas, E. Kansas, W. Missouri, N. Louisiana, E. Florida, S.E. Hawaii; locally in E. Nebraska and extreme S.E. California. Dry elsewhere; under 50% from E. Washington to N.W. Utah and most of California; most of Wyoming to extreme S.W. Minnesota; S.E. Mississippi to S. Virginia; S. New York to coastal Maine; C. Hawaii.

Canada and Arctic. *Temperature:* warm in Canada S. of a line from Slave Lake to St. Lawrence estuary; marginally in Iceland; +6degC in C. Alberta. Cold elsewhere; -5degC in nearly all of Alaska; Baffin Island and Spitzbergen; -9degC in W. Alaska. *Rainfall:* wet in coastal British Colombia, S.W. Alberta, S. Saskatchewan, S. Manitoba, Ontario, S.W. Quebec, Newfoundland, Iceland, Jan Mayen; probably much of Mackenzie basin; locally in W. Alaska and W. and E. Greenland. Over 200% locally in S.W. Alberta, S. Saskatchewan, S. Manitoba, N. Iceland. Franz Josef Land near normal. Dry elsewhere; under 50% in S.E. British Columbia, C. Saskatchewan, L. Winnipeg (but not Winnipeg itself), E. and N. Alaska, N. Quebec, N.E. Greenland, Spitzbergen; probably Canadian Arctic islands.

Europe. *Temperature:* warm or very warm everywhere except Greece, C. and S. Italy (all -1degC), N. Urals (-4degC), S. Jugoslavia; locally in Portugal and N.W. Spain; +3degC from Eire to N. Sweden and S. Urals; +5degC from S. Norway to N. Sweden and N. Ukraine; +7degC at Leningrad, Moscow, Minsk and in C. Sweden. *Rainfall:* wet from W. Scotland and Faeroes through Norway, N. Sweden and Finland to most of European Russia except in and near Ukraine; S.E. coastal Spain. Over 200% in W. Scotland, Norway, N. Finland and near S. Urals. Dry elsewhere; under 50% in a very large area from Spain and Portugal to E. Scotland, S. Sweden, Ukraine, Balkans and S. Italy. Below the 1931-60 extreme in various places from E. Scotland and S. Sweden to parts of Italy and most of the Balkans. Provisional sunspot number 162.

Africa. *Temperature:* warm in E. Algeria, Tunisia, S. Cape Province, N. Transvaal, Canary Islands; locally in coastal N.W. Morocco (all locally +1degC except Canary Islands). Cold generally from Morocco to Egypt; N. Natal through N. Cape Province into much of Namibia and Botswana; -2degC in E. Morocco, N.W. Algeria, S. Egypt. *Rainfall:* wet from most of South Africa into Namibia and W. Botswana; N.W. Morocco; over 200% in C. and N. Cape Province. Dry from E. Botswana to E. Natal; coastal Cape Province; generally from Madeira and Canary Islands to Egypt; under 50% widely in all these areas.

Asiatic U.S.S.R. *Temperature:* mostly warm; +3degC from S. Urals and Aral Sea to Sakhalin; +7degC near L. Baikal. Cold in S. Turkmenistan, from C. Urals to Taimyr Peninsula, and in N.E.; -5degC round Gulf of Ob; -9degC near Bering Sea. *Rainfall:* mostly wet; over 200% from E. Caspian and Aral Seas to upper Yenisey basin; upper Lena to lower Amur basin. Dry from E. Taimyr Peninsula to lower Lena basin; Kolyma basin to Sakhalin; S. of Aral Sea; near Mongolian border; under 50% widely in all these areas.

Asia (excluding U.S.S.R.). *Temperature:* warm in N. Pakistan, S. India, N. and E. China, Mongolia, Korea, Japan; Thailand to Philippines, Java, Borneo and Sumatra; +4degC in N.E. China and N. Korea; +5degC in E. Mongolia. Cold from Turkey through Middle East to S. Pakistan, N. India and Bangladesh; S.W. and W. China; -3degC from C. Turkey to C. Arabia; -7degC in S. Turkey. *Rainfall:* wet in N. Pakistan, N.W. India, E. China, C. and S. Korea, S. Japan, C. Thailand; much of Philippines, Sumatra, Borneo and Malaya. Over 200% in all these areas except perhaps first one and last three; very widely in E. China. Dry from Turkey through Middle East to S. Pakistan, most of India and Bangladesh; W. China, Mongolia, extreme N. Korea, N. Japan, N. and S. Thailand; locally in Malaya, Borneo, Sumatra and Philippines. Under 50% at least locally in all these areas except perhaps last two; very widely from Turkey to Bangladesh.

Australia. *Temperature:* warm in N. (mainly +1degC); cold in S. (mainly -1degC). *Rainfall:* wet in S.W. (over 200%) and locally on S.E. and N. coast; otherwise mainly under 50%.

WEATHER SUMMARY: June 1989

Mean June temperatures were mostly a little below the normal over Scotland but over the rest of Britain it was a rather warm month with mean values up to one degree Celsius above the normal. Jersey in the Channel Islands recorded a maximum of 29.4° as early as 12th but generally highest temperatures were reached between 17th and 20th. In Wales 28.4°C were recorded on 17th and 18th at Cardiff Weather Centre and Aberdovey on Cardigan Bay respectively and on 19th it was the turn of Scotland and Cumbria to record their highest values with 28.1° at Aspatria, 29° at Keswick, 28.0° at Glasgow and 30.4°C at Inverdruie (Highland). On 20th the temperature reached 30.5° at Leeds Weather Centre and at Finningley near Doncaster with 30.2° in the London area and at Cottingham (Humberside). Lowest maxima included 7.5° at Cape Wrath and 7.6° at Lerwick on 1st, similar values in these parts on 2nd and 10.0°C at Guildford (Surrey) on 6th. The 13th was generally the warmest night of the month with minima around 19° in parts of the west-country, the highest being 19.4° at Yatton (Avon). In north Wales Prestatyn reported 18.8°C. During a cold start to the month screen temperatures below freezing were recorded in favoured localities. At Cellarhead, near Stoke-on-Trent, the temperature fell to -1.1° on 4th with -0.5° at Birmingham on 2nd, -0.6° at East Hoathly (East Sussex) on 5th and -0.9° at Eskdalemuir (Dumfries and Galloway) on 9th. On the last day of the month Inverdruie recorded -8°C. Lowest grass minima included -6.0° at Leuchars on 1st, -7.5° at Cellarhead on 2nd, -6.0° at Marham (Norfolk) on 5th and -6.5° at Glenlee (Dumfries and Galloway) on 8th. Rainfall totals were very variable but generally southern and south-western parts were very dry with less than 50 percent of the normal in a number of spots. Elsewhere rainfall was locally as much as 150 percent of th normal, especially in parts of East Anglia, northern England and central Scotland. In the wetter parts of the country some quite high 24-hour totals were recorded. At Broadford (Skye) 56.1mm fell on 24th and contributed to a combined 48-hour total for 24th-25th of 87.2mm. On 26th 52.9mm fell at Aughton (Merseyside) and 43.1mm at Blackpool, and on 30th Manchester recorded 34.7mm, Middleton (Derbyshire) 38.2mm and Nantmor (Gwynedd) 46.0mm. At Eastbourne (East

Sussex) 25.8mm fell on 5th. Sunshine totals were above average over much of the U.K. and for the second month in succession more than 300 hours were recorded on the south coast of England.

With a complex low pressure area covering Scandinavia and the Baltic the first nine days of the month were quite cold and showery and under clear skies ground frost developed widely at night with air frost in some places. Some of the showers were heavy with hail and thunder and snow fell over the high mountains of Scotland and Cumbria. A severe hailstorm in the Gillingham area of Kent on 6th produced a 12cm covering on the ground. Low pressure to the north-east was replaced by an anticyclone on 10th and with a large depression developing over the mid-Atlantic southerly winds brought a welcome rise in temperature. Although a good deal warmer it stayed generally unsettled and frontal systems spread rain across most parts from time-to-time, though central and south-eastern areas had some sunny spells with temperatures rising into the twenties. The 12th was a particularly warm day but on 13th, as a cold front crossed the country from the west, thunderstorms and heavy rain affected the north-west of Britain. High pressure built over the U.K. on 14th and for the next six days it was mostly fine, sunny and very warm. The 20th was the hottest day of the month but a cold front spread much cooler air to all but the far south-east by the end of they day. Pressure rose from the south-west from 21st bringing a return to fine and sunny weather to southern and central counties and temperatures returned to more comfortable levels. Northern Britain remained quite cool with rain or showers at times and in the north-west some of the rain was very heavy. Some rain finally reached the south-east on 27th and thereafter all parts of the U.K. had spells of rain during the final days of the month.

K. O. M.

TEMPERATURE AND RAINFALL: JUNE 1989

	Mean				*Grass*					
	Max	*Min*	*Max*	*Min*	*Min*	*Rain*	*%*	*Wettest*	*RD*	*Th*
BELGIUM: Uccle	21.5	11.0	28.8(20)	4.3(1)	-1.7(1)	53.0	79	14.8(4)	10	-
„ Rochefort	21.2	7.9	29.0(20)	-0.2(1)		70.7	92	17.0(3)	13	-
„ Houwaart	23.1	7.7	31.0(20)	0.4(1)	-1.0(1)	53.1	86	12.2(4)	17	3
DENMARK: Fanø	19.9	10.8	27.8(19)	1.9(1)		18.2	37	4.8(28)	9	2
„ Frederikssund	21.4	11.4	29.8(26)	5.9(1)	0.6(1)	31.5	61	9.1(5)	7	2
GERMANY: Berlin	22.3	11.0	31.0(26)	5.7(5)	3.5(5)	37.1	51	9.6(5)	11	5
„ Hamburg	21.4	10.6	29.6(26)	4.4(2)	0.5(2)	68.1	97	35.7(7)	9	3
„ Frankfurt	22.6	11.0	30.5(21)	3.6(6)	1.4(6)	59.6	81	28.4(22)	12	8
„ Munchen	19.6	9.3	27.4(27)	3.8(7)	-0.4(7)	104.2	77	29.9(1)	19	4
ITALY: Casalecchio	25.5	15.0	31.0(26)	10.0(6)	9.0(6)	32.7	76	11.0(5)	7	6
MALTA: Luqa	27.4	18.5	32.2(10)	15.8(7)	11.2(15)	Trace	0	Trace (v)	0	0
NETH'NDS: Ten Post	20.1	10.0	27.0(26)	1.8(3)	-1.6(6)	110.9	178	36.4(5)	11	5
SWEDEN: Valla	21.1	8.8	29.3(20)	2.8(1)		40.3		15.5(8)	10	4
SWITZ'LAND: Basel	23.0	8.8	30.8(21)	4.4(6)		45.7	49	18.7(27)	11	7
EIRE: Straide	17.5	8.8	27.8(19)	2.3(2)	-3.7(2)	72.2	98	24.8(9)	17	0
SHET'AND: Whalsay	13.1	7.9	20.0(19)	4.0(2)	-4.1(5)	55.0	147	13.8(20)	15	1
„ Fair Isle	12.0	8.1	18.0(19)	3.1(4)	-0.4(5)	33.7	91	11.4(20)	8	1
SCOT'AND: Braemar	16.0	6.0	27.4(19)	-0.5(8)		45.2		11.5(5)	13	0
„ Inverdruie	17.5	6.0	30.4(19)	-0.8(30)		52.5	86	11.8(12)	14	0

	Mean Max	Mean Min	Grass Max	Grass Min	Rain	%	Wettest	RD	Th
„ Rannoch	16.5	5.2	27.0(18)	−1.0(7)	−1.1(7)	72.9	31.2(12)	14	1
WALES: Pembroke	19.3	9.9	28.3(20)	4.1(2)	1.3(2)	40.8	58	5.4(28)	14	0
„ Velindre	19.8	7.8	28.6(20)	−0.1(2)	−3.4(2)	35.1	62	9.7(28)	12	0
„ Carmarthen	18.4	9.7	29.1(20)	2.7(2)	−1.9(2)	63.6	82	18.2(26)	13	0
„ Gower	18.8	10.6	26.9(20)	4.0(2)	0.8(2)	61.2	86	17.0(30)	12	1
GUERNSEY: Airport	18.5	11.4	26.3(12)	6.1(1)		29.3		11.8(26)	8	0
ENGLAND:										
Denbury, *Devon*	20.8	9.1	28.8(20)	3.5(4)	−0.9(4)	29.2	55	12.2(1)	10	1
Gurney Slade, *Somerset*	20.2	8.0	29.3(20)	0.5(5)	0.4(5)	57.4	91	17.1(28)	12	1
Yatton, *Avon*	21.1	9.8	29.5(20)	1.9(2)	0.3(2)	34.8	57	16.3(26)	10	1
Corsham, *Wiltshire*	20.9	9.5	29.1(20)	3.2(2)		45.7		12.0(1)	11	1
Mortimer, *Berkshire*	21.2	9.5	29.0(20)	3.4(4)	1.1(3)	37.9	73	13.2(1)	10	1
Reading Univ., *Berks*	21.1	9.8	29.2(20)	3.8(5)	−2.4(3)	27.1	48	7.3(26)	10	0
Sandhurst, *Berkshire*	21.4	8.9	29.4(20)	1.1(4)	−1.7(4)	40.0	97	13.4(1)	9	3
Romsey, *Hampshire*	21.7	8.9	29.7(20)	2.6(3)	−1.5(3)	37.5	57	14.7(6)	9	2
Horsham, *Sussex*	21.4	10.4	29.5(20)	2.9(5)	1.0(5)	49.0	96	16.3(6)	10	4
Brighton, *Sussex*	21.2	11.0	28.0(19)	3.2(5)	2.2(5)	34.8	59	10.6(6)	9	4
Hastings, *Sussex*	21.3	11.0	27.2(20)	5.3(5)	2.4(5)	58.0	113	16.1(6)	–	3
Dover, *Kent*	19.9	10.0	26.9(14)	2.3(3)		43.5	102	8.2(26)	13	3
East Malling, *Kent*	20.8	9.8	27.4(20)	2.3(5)	−2.7(5)	40.2	87	18.1(6)	12	2
Epsom Downs, *Surrey*	21.3	8.8	29.4(20)	−0.5(5)	−3.5(4)	34.5	64	13.1(6)	9	2
Reigate, *Surrey*	22.0	9.8	30.2(20)	2.4(5)		42.8	78	14.2(6)	10	4
Guildford, *Surrey*	21.2	10.4	29.2(20)	3.9(4)	2.1(4)	61.4	124	25.4(6)	11	3
Sidcup, *London*	21.9	10.6	29.9(20)	2.8(5)		34.2	70	6.8(26)	11	3
Hayes, *London*	21.8	10.4	29.8(20)	3.3(5)	1.2(4)	36.2	64	9.5(6)	10	3
Hampstead, *London*	20.6	10.5	28.6(20)	4.2(5)	−2.2(5)	57.0	103	19.3(1)	9	4
Royston, *Hertfordshire*	21.0	9.9	28.0(19)	2.5(2)	−0.8(2)	45.6	87	22.0(6)	10	1
Loughton, *Essex*	21.9	9.81	28.9(20)	3.4(5)	−0.4(5)	42.7	70	11.1(2)	9	4
Buxton, *Norfolk*	19.4	8.6	26.8(25)	2.3(5)	0.7(5)	80.2	150	25.2(30)	12	3
Ely, *Cambridgeshire*	21.0	7.9	28.5(19)	0.1(2)	−1.0(5)	36.6	72	10.2(28)	12	1
Luton, *Bedfordshire*	20.9	9.0	28.5(20)	0.3(5)	−3.5(5)	33.0	59	7.3(28)	9	0
Buckingham, *Buck'shire*	20.7	8.3	28.8(20)	1.6(2)	−2.6(2)	33.6	79	10.0(28)	11	2
Oxford University	20.8	10.5	29.5(20)	2.8(2)	−2.2(2)	45.9	85	11.0(5)	10	–
Stourbridge, *W.Midla'ds*	20.3	9.4	28.4(20)	1.2(2)	−3.3(2)	36.4	54	9.8(6)	8	1
Birmingham Univ'sity	20.0	9.3	28.9(20)	1.0(2)	−5.0(2)	35.1	61	8.5(5)	7	1
Wolverhampton	20.3	9.8	29.0(20)	2.1(2)	−2.7(2)	49.9	12.4(30)	8	2
Louth, *Lincolnshire*	20.3	9.1	29.9(20)	2.1(2)		47.2	15.9(30)	10	1
Nottingham *Nott'shire*	21.3	9.9	30.4(20)	1.6(2)		48.0	15.8(30)	10	0
Derby, *Derbyshire*	20.5	10.3	29.0(20)	2.8(2)	1.9(4)	47.0	85	13.0(30)	8	2
Middleton, *Derbyshire*	17.5	8.8	26.0(20)	2.7(4)		105.9	120	38.2(30)	13	2
Keele University, *Staffs*	18.5	9.0	26.6(20)	2.9(2)	−2.3(2)	64.4	96	21.2(30)	8	0
Liverpool, *Merseyside*	19.6	10.5	28.8(18)	3.6(2)		99.3	180	37.6(30)	11	3
Lathom, *Merseyside*	18.2	9.3	27.6(19)	3.2(1)		124.8		51.0(26)	14	–
High Bradfield, *S.Yorks*	16.6	8.2	27.2(20)	1.1(4)		66.0		18.9(30)	10	–
Cottingham, *Humb'side*	21.0	9.3	30.2(20)	2.9(2)	0.0(2)	47.9	94	21.0(30)	10	2
Carlton-in-Cleveland	19.3	8.4	29.6(20)	1.5(2)	−1.4(2)	44.8		16.0(30)	12	1
Durham University	19.0	8.0	29.2(20)	2.0(4)	−0.7(4)	52.1	104	17.8(26)	11	–
CANADA: Halifax	19.1	10.9	26.6(22)	6.8(15)		156.3	186	38.6(8)		
U.S.: Bergenfield, *NJ*	26.6	16.7	32.8(27)	10.0(12)	8.9(12)	156.7		31.8(10)	16	9
JAMAICA: Kingston	32.9	25.2	34.4(11)	22.7(26)		27.1		15.4(25)	4	3
AUSTR'LIA: Leopold	13.4	7.0	17.8(17)	0.3(26)		82.6	152	17.3(28)	15	0

CUMBRIA RAINFALL:

Carlisle, 49.0mm (79%); Seathwaite, 110.0mm (60%); The Nook, Thirlmere, 88.1mm (68%); Coniston, 111.7mm (86%).

Book Announcement

THE CIRCLES EFFECT AND ITS MYSTERIES

The present text is available as an independent paperback book entitled *The circles effect and its mysteries.* Price £9.95, obtainable through your bookseller or from the publisher.

It is printed on high-quality paper with normal pagination (i.e. commencing 'page 1'), and runs to 112 pages with covers in colour.

Foreign purchasers are asked to send cheques for £12.00 sterling or US $30.00, the price allowing for packing and the cost of surface postage.

Although no copies of this special magazine edition remain available for purchase separately, a few have been set aside for future new subscribers to the *Journal of Meteorology* who request all ten issues for 1989. Subscription rates are available on request from the publishers.

Conference Announcement

INTERNATIONAL CONFERENCE ON THE CIRCLES EFFECT

A one-day international conference on this exciting new research discipline is planned for Saturday 23rd June 1990, at Oxford Polytechnic, when it is hoped to draw together all scientific workers in this rapidly-expanding field. Immediate publication of the conference proceedings is intended. Those wishing to offer papers or to attend the conference are invited to request details from Dr Derek Elsom, TORRO Research Centre, Oxford Polytechnic, Headington, Oxford, 0X3 0BP, England.

CONTENTS PAGE

FRONT COVER:
Automatic weather station of Ventureprise Co-operative Ltd.

EDITORIAL OFFICE:
Journal of Meteorology, 54 Frome Road, Bradford-on-Avon, Wiltshire, BA15 1LD, U.K. (telephone 02216 2482; fax 02216 5601).