

Circles in the corn

Now is the season for crops to be flattened into strange patterns in fields across southern Britain. Far from being the work of devils or aliens, the circles seem to arise from a combination of atmospheric physics and the local landscape

Terence Meaden

IF YOU had stood on the slopes of the Iron Age hillfort at Bratton, Wiltshire, near the famous Westbury White Horse, at the end of July 1987, you would have seen a pair of circles in a field of wheat below, 4.5 and 8.5 metres across. On closer inspection, you would have found that the wheat within the circles was flattened like a carpet, with the straws aligned in anticlockwise spirals flowing out from the centre to the abrupt edge. And if you had kept an eye on that field for the next few weeks, you would have seen further strange patterns.

A week later a line of three bigger circles appeared at the other side of the field, only 250 metres away. The wheat was swirled clockwise in two, and anticlockwise in the other. A few days afterwards, two more arrived, the larger wholly obliterating the smaller circle of the original pair. Between 20 and 22 August, a set of five circles arranged in the pattern of the spots on a die, joined this array shortly before the harvest started.

In a matter of three weeks these three acres of southern England had suffered four independent visitations from some destructive aerial agent. Furthermore, there was another group of three mystery circles two fields away, directly below the White Horse. A double-ringed circle had appeared half a kilometre to the east, and yet another big circle, 15 metres across with an elliptical ring alongside, lay a kilometre westward. All these circles appeared beneath the north-facing chalk scarp of Salisbury Plain. What can be so peculiar about this corner of rural England that it attracts such frequent and bizarre happenings?

The appearance of circles is not, in fact, limited to the edge of Salisbury Plain. They crop up across southern Britain, and have been reported from as far north as Grampian in Scotland. The oldest anecdote that I know of goes back to the Middle Ages, when "mowing devils" were held responsible. A farmer asked a workman what he would charge to mow his field. The mower's price was too high, and the farmer told him that the Devil himself should mow his oats before he should have anything to do with it. Next morning, it looked as if the Devil had taken the farmer at his word, for his crops were flattened in the familiar circle.

All sorts of origins have been suggested, from hoaxers to fungi and even extraterrestrials. There is no possibility that all these complicated patterns are hoaxes, nor that the circles



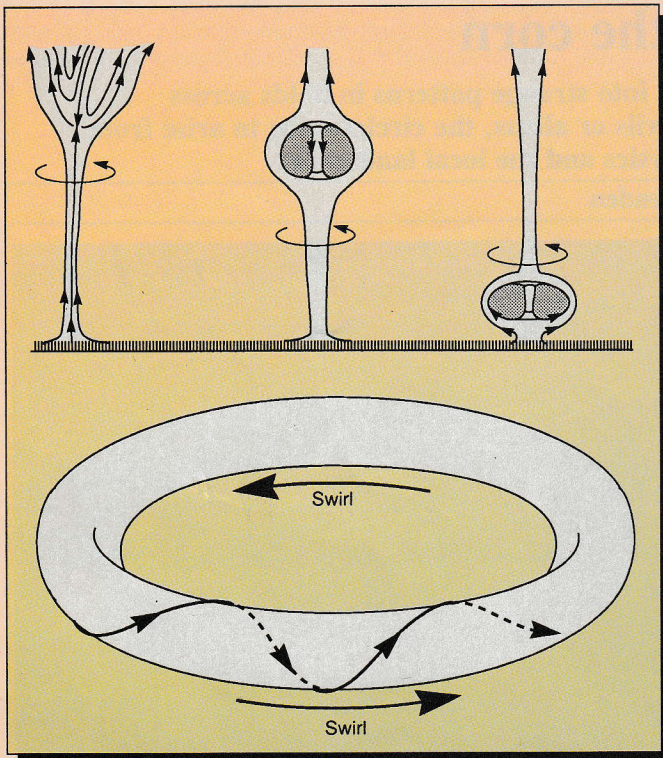
Circles crop up regularly in the Devil's Punchbowl, near Cheesefoot Head in Hampshire

Bob Skinner/Foretan Picture Library

are in any way unnatural. For example, they are not the result of vortices created by aircraft. Everyone who examines flattened circles on site is impressed by the swirling spiral pattern of the corn, the many interwoven layers, the twisted straws and the double centres so often seen—evidence enough to demonstrate how impractical it would be to make them.

I made the first scientific investigations into the circles in August 1980 near the Westbury White Horse, and I have worked on the problem every year since, surveying hundreds of circles and compiling statistics on more than a thousand. This total includes accounts of about a hundred circles from between 1918 and 1979. Of the 303 circles documented during 1989, five also had a single ring, one a double ring and one a triple ring. 1989 yielded 16 sets of circles in the intriguing quintuplet pattern. The outer spots of these complex arrays are sometimes joined by a ring. Single circles range from 0.3 metres to over 60 metres across. When they form regular arrays, the patterns can spread over as much as 90 metres. How can such remarkable patterns be a product of forces in the atmosphere?

The answer comes from the interaction between air flowing in the few hundred metres above the ground and the topography. The flow of air can become turbulent downwind of mountains and hillsides, and form small-scale vortices. When these eddies break down, they can move close to the ground, and sweep out the circles in the crops. If the spinning air builds up an electric charge, this neatly explains the



Twisters and waterspouts: a spinning column of air bulges, then the doughnut-shaped eddy, itself rotating, moves downward to sweep out a circle in crops as it expands and swirls along the ground

humming noises and lights that eyewitnesses have recorded when they have seen the circles form.

It seems that the eddies form best when air settles into stable layers in the few hundred metres above the ground. Another important factor is an undulating landscape which often, but



Ears to the ground: crops are flattened into intricate patterns

not always, features a prominent escarpment or isolated hill, low enough to lie within this boundary layer. A temperature inversion, when a layer of cool air settles in a pool near the ground at night, trapped beneath a layer of warmer air, is a good way to achieve this stable stratification. The hills of southern Britain, commonly between 30 and 150 metres high, may be the best size for the effect. In fact, we have found that circles can appear as far as 6 kilometres downwind of such topographical obstacles.

What seems to happen is that an eddy vortex or trailing vortex develops, in the form of a column of air spinning inward and upward about a vertical axis. These vortices are often inherently unstable because they can form when a short-lived weather front passes by. I think that the high frequency of weak fronts such as cool sea-breeze fronts over southern Britain, in conjunction with the landscape of gently rolling hills, goes part way towards explaining the high density of circles in fields of corn, wheat and rape there.

Have you spotted a circle?

CERES, the Circles Effect Research Group, survey circles and gather reports from all parts of the world. In addition, we seek information about happenings involving relatively small rotating masses of air (other than tornadoes) that descend from the skies, especially if they affect buildings, gardens, automobiles, animals and people, by night or day. We include electromagnetic phenomena too, for we have gathered some direct evidence and a vast amount of circumstantial evidence which link the type of vortex that forms circles and rings to optical and electrical manifestations similar to ball-lightning.

With the aim of assembling into a single archive every bit of information relevant to the subject, we have set up an international data bank. This brings together reports and photographs on circles effect and circular blasts and on related phenomena involving unusual noises (humming, whining, crackling, etc), electrical effects (interference to radio-communications, television, vehicle performance), and luminosity (especially low, hovering, spinning, pulsating and descending lights).

Additional help from enthusiasts who



Field work: the size, pattern and location of circles help to pin them down

can serve as spotters and local investigators anywhere in Britain or the rest of the world is welcome. Besides reporting on circles, we need to monitor potential sites night and day with the hopes of filming circles as they form, and pinning down the electromagnetic spinning sys-

tems which create them.

Readers who can provide data are invited to get in touch with CERES as are those who feel they could help in the future by acting as spotters and investigators of crop circles anywhere in England or the rest of the world. □

Physical meteorologists John Snow of Purdue University, in the US and Tokio Kikuchi of Kochi University, Japan, have analysed what happens when this sort of circulation, known as an eddy vortex, becomes unstable and breaks down. Their conclusions have been reinforced by George Bathurst, a retired engineer, who looked at the problem from an aerodynamic point of view. Snow and Kikuchi found that when such a vortex becomes unstable, a ring-shaped, horizontal bulge develops in the column. This ring-vortex moves downward until it hits the ground, and collapses in on itself. Other researchers have seen this mode of vortex behaviour in laboratory experiments with smoke rings. Witnesses have observed rings in waterspouts and tornadoes, when vapour marks out the shape of the clouds. In drier air, there may be no vapour to give visible clues, but the air spins in the same way.

When such a ring-vortex settles in a field of corn, it sweeps out a ring of damage as it expands, swirling the crop into the characteristic spiral pattern. Keith Moffat at the University of Cambridge has worked on the theory of swirling ring-vortices, in which the pattern of airflow constantly moves around the ring. I think that this swirling motion holds the key to the spiral arrangement of crops within the circles. A stable ring-vortex would deflect the corn in straight lines around the circle, but the swirling would give the curves that are so characteristic.

Experiments using smoke-rings, by H. Yamada and his colleagues show what happens when a ring-vortex moves close to a wall. I have interpreted this work to visualise what happens when the descending ring-vortex meets a field of crops. First, the ring spreads out sideways, sweeping the corn into a spiral. The flow of air along the ground then divides into two, setting up a vortex rotating in the opposite direction as the original one dies out. The second, counter-rotating, vortex terminates the swirling abruptly, and accounts for the sharp edge of the crop circles. The combination of two oppositely-directed airflows accounts for the complicated directions of swirling seen in some of the circles. This prevents the primary ring from flattening more corn and helps to generate the sharp edge.

Some circles have pyramids of corn standing upright at the centre of the spiral. In others a former standing centre has been removed when the vortex has drifted, or because of oscillation caused by a cross-wind. In contrast, there are examples in which the centre has been struck exceptionally hard, with no evidence of a vanished ring. Everything is swept clear in a radial direction.

At the other extreme, a small percentage of vortices must descend gently, in order to explain "brushed circles", in which the crop has been skimmed rather than punched flat. So, overall, more than one vortex mechanism may be involved. In the complex circle sets, like the quintuplets, the links between circles, whatever their origin, must be powerful because they operate over distances of tens of metres. The longest pattern so far is 90 metres across.

Furthermore, and probably too often for it to be entirely due to chance, the centre is sometimes on a patch of bare earth that was there before the circle formed. This suggests that the vortex may have aimed for the soil, following minor variations in the local electric field, perhaps in the same way as lightning heads for pointed objects because of the greater density of charge around them.



Old story: mowing devils were once the best explanation

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Eyewitnesses have reported that the circles form to the accompaniment of a humming noise, like the electric hum from high-tension wires. Land-devil whirlwinds make a similar noise that researchers attribute to electrostatic fields resulting from friction within the moving air. The vortices that make corn circles are probably electrically-charged too, by some means dependent on their intense spin. The density of airborne particles such as pollen, dust and salt, serving as charge carriers, may play a role in the build-up of electric charge, as water droplets do. Unlike fair-weather whirlwinds, which form from rising currents of air in daylight only, the vortices that form circles happen at night too; the electric fields could also account for lights seen near circles in Kent and Wiltshire last summer.

Around midnight on 28 June 1989, a man saw a big orange ball of light moving downward into a Wiltshire wheat field just in front of a sloping hill. The witness watched the bottom "go flat" as it reached the ground, the light disappeared a few seconds later. Next morning there was a 15-metre-wide ringed circle at that spot. In Kent, late on 10 August, Wilfred Gomez and a friend spotted a "vortex of light" in a wheat field south of Margate. It dissipated before they got to the site, but immediate investigation by moonlight revealed a circle 18 metres in diameter.

These reports of circles with lights have antecedents from countries other than Britain, among them France, Japan, Australia and the US. Taken together they support the idea that balls of light of exceptional dimensions create the circles. One instance, in Japan's Tamagata Prefecture in 1986, was accompanied by television interference that indicated radio-frequency emissions.

In the space of 10 years the study of circles has grown from a small-scale inquiry into a project with serious scientific potential and a considerable popular following. Field investigations start in May when the crops are mature enough to suffer permanent damage when struck by the spinning air, and work continues until harvest time. Besides marking other types of crop and vegetation, these vortices leave circular traces in earth, sand, snow and frost-covered grass, occasionally scouring or blasting hollows.

The circles have great popular appeal. Many amateur circle-spotters collect extensive and useful data. But the subject has also been invaded by cranks and publicity-seekers, whose wild guesses about extraterrestrial origins divert attention from the science of how the circles form.

We expect that other countries suffer similar vortex-phenomena where topography, air stability and frontal types are similar, but a comparable rate of circle frequencies demands that the land be crop-covered too. In Southern England these conditions combine superbly every summer, and render Wiltshire the most prolific area in the world for the natural production of these exquisite circles. □

Terence Meaden, formerly associate professor of physics at Dalhousie University, Halifax, Canada, has been a "vortex watcher" for 30 years. In 1974 he founded TORRO, the tornado and storm research organisation, in 1975 the *Journal of Meteorology*, and in 1988 CERES, the circles effect research group. Contact him at 54 Frome Road, Bradford-on-Avon, Wiltshire BA15 1LD.

Further reading: *Circles from the Sky*, Terence Meaden, to be published in July by Artetech. *The circles effect and its mysteries*, Terence Meaden, Artetech. See also "Vortex breakdown in atmospheric columnar vortices", H. J. Lugt, *Bulletin of the American Meteorological Society*, volume 70, pages 1526 to 1537, 1989.