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H-GLAZE REPORT

INTRODUCTION:

We are issuing this preliminary bulletin as an alert to the community of crop circle investigators in 1994. We wish to report an extraordinary discovery from the 1993 season so that everyone can be on the watch for similar events in 1994. In particular we hope that after reading this report, field investigators will make magnets a standard part of their field equipment.

Since it took months of work to identify the material gathered by Peter Sorensen we are only now able to rush this preliminary report into print. A fuller, more technically-detailed report will be issued at a later date. We hope that all investigators will use this information as a guide.

THE DISCOVERY: by Peter Sorensen

It was the last day of August, 1993. Busty Taylor and I had been to the site of the spectacular Cherhill pictogram to get some seed samples for Dr. W.C. Levengood, even though the field had been harvested, and we had driven less than a quarter of a mile back toward Beckhampton when Busty's sharp eyes spotted two crop formations visible a few hundred feet apart inside another recently cut field. Since he had to get back to Andover for an appointment, Busty couldn't stop to check out the circles, besides they had already been cut and didn't present a very promising picture.

Two days later I obtained a ride back to the site with a neighbor. When we arrived, we found the farmer loading bales in the field and we walked over to ask for permission to investigate it. He was quite amicable and informative. He said the circles had formed about a week earlier on a drizzly night when the field across the road was being worked until the wee hours. He said that he had discovered a dark grey dust covering parts of the circles, although most of it had been washed away by heavy rain a day or two later.

Approaching the first formation I was glad to see its raindrop shape had largely survived the onslaught of the combine. It had been pressed quite flat to the ground and a good 85% of the formation's stalks were untouched by the harvester's blades. Most of the stalks that had been caught by the harvester were still distinguishable by the sharply angled cut through the stubble. Like the well-known Cherhill pictogram nearby, both of

these much smaller formations also had multiple smaller swirls within them. In fact the lay was exceptionally complicated, with the flow taking tortuous turns and frequently reversing directions.

As I approached I could see that some of the swirls were obviously darker than the surrounding area. As the farmer had said, the dust was nearly black, with particles of what looked like fine soot. My companion remarked that it looked as though some farm equipment had stopped with its exhaust blowing. But it didn't seem likely that the equipment had paused right over each of the swirls and nowhere else. If this was a prank, I thought it didn't make much sense because the dust looked almost accidental and not particularly interesting. In fact I would quickly have forgotten about the dust in favor of studying the lay of the formation stalks, except for what happened next.

Exploring the ground itself for signs of the dust I noticed that it was in fact sprinkled on the rocks and what I at first took to be pieces of broken brick. After videotaping for several minutes without disturbing anything, I decided to pick up one of the pieces of brick for a closer look. The tape shows me exclaiming in surprise, "This isn't brick, it's chalk!" The chalk appeared to be coated with something resembling a reddish-brown, dull, ceramic glaze. There were hundreds of such coated rocks in all, but NONE outside the smaller swirls that lay inside the main formation. Some of the pebbles were heavily-coated while others had only a few, small spots. The second formation about 100 meters away (a circle with an arc outside it) also had two smaller swirls inside it which possessed some dust and coated chalk, but not much. I bagged samples of the dusty wheat and dozens of bits of the "glazed" chalk plus controls, and sent them to Dr. Levengood.

A month later, word came back via Linda Howe that Dr. Levengood had found the "glaze" to be attractive to magnets. He wanted me to return to the site with a strong magnet and drag the soil for more. On this trip Busty and I found bits of wheat with some of the spots on them and even a six inch clod of dirt fused together by the mysterious substance.

INVESTIGATION: by Dr. W.C. Levengood and John A. Burke

The first distinguishing characteristic evident in the sample forwarded by Peter Sorenson was magnetic susceptibility. Some of the smaller pieces of rock and wheat could be turned over and picked up by a magnet. Spectroscopic analysis revealed the material in the coating or "glaze" to be composed of iron and oxygen only. It is extremely unusual to find only those two elements and no others present. Spectrographs of the soil showed the normal components of calcium and silicon common to such soils. If the iron content had come from the soil it would have still had at least traces of calcium and silicon in it. We could find no terrestrial system that could account for this and began to consider meteors as a possible source. But even meteors with iron have the iron bound up with other elements, particularly nickel.

Meanwhile, microscope study of the material revealed a fascinating structure. The glaze

was composed of thousands of partially-fused tiny spheres, each a fraction of a millimeter across. Some spheres were black and some red indicating some of them were composed of magnetite (Fe_3O_4) which is black and responds to a magnet, and some were hematite (Fe_2O_3) which is red and not magnetic. Fused together in a mass, as a whole they looked brown and were attracted to a magnet.

An extensive search of the literature revealed that this material is exactly identical to meteoric dust. When any iron-bearing meteor enters Earth's atmosphere, the surface heats up to a molten state. In the process, nickel and other elements are separated out so that the surface of any such meteorite is covered with pure magnetite. This is the black surface so familiar from museum specimens of meteorites. During entry through the atmosphere, this surface is heated to a near-liquid state. Droplets are then blown off or ablated into the surrounding air whereupon they are immediately cooled into solid, tiny spheres a fraction of a millimeter across. During this process and during subsequent exposure to the elements some of these black, magnetite spherules are oxidized (they rust) and turn into reddish, hematite spherules. Because they are tiny and nearly hollow, these particles, collectively known as meteoric dust, drift slowly down through the atmosphere, taking days or even weeks to reach the surface. At this point we realized that while we did not have an exact date for the crop formation, it had occurred within two weeks of the 1994 Perseid meteor shower. Normally the strongest shower of the year, in 1994 the Perseids were particularly intense, producing three times as many fireballs as in normal years. In other words, the mystery material has the exact appearance of meteoric dust and appeared at a time when more meteoric dust was around than at almost any other time in decades.

While finding meteoric dust in a crop circle is exciting, it is not the most important part of this discovery. Rather, the real value of this finding lies in the way the material impacted the ground. Normally crop circles occur in normal air and there is nothing left around afterwards to indicate what happened in that air. Here we had a second medium - magnetic dust particles in the air. These were not laid down randomly. Bear in mind they were found only in the smaller, sub-swirls within the larger formation and nowhere else. Also note that they were fused together. This is not normal.

While the meteor's surface is molten at the time the drops blow off, those drops cool and harden with seconds and drift to the ground over days where they land as very separate microscopic balls. Something had reheated this dust to near the melting point and thus the spheres were able to partially fuse. Further evidence of this can be seen in a variety of markings left on the glaze. Distinguishing "mud-crack" patterns were photographed indicating rapid cooling. Flakes peeled off wheat stalks had an upper surface of bubbly appearance, due to the edge-to-edge spherules. But the undersurface of these flakes have the actual pattern of the wheatstalk surface impressed in the now-rigid iron. And finally, bigger bubbles or domes were raised in the outer surface, some with the bubble blown apart by some internal pressure. This is to be expected by the interaction of the hot iron with the chalk. Chalk's chemical twin limestone is commonly used as a flux in the smelting of iron and gives off gas when in contact with hot iron. This gas had raised, and in some cases even burst, bubbles in the glaze.

The wheat itself was also full of important evidence. One might expect the wheat to have been badly burned by contact with molten iron (it was not) but this need not be the case. Even the small amount of moisture in mature wheat would have produced steam. And remember the event occurred on a rainy night when the stalks would have been coated with water. A well-known phenomenon called "the Leidenfrost effect" explains how this layer of steam can actually insulate living tissue from damage by an otherwise scalding heat source. Magicians take advantage of this effect to dip their fingers first into water and then into molten lead without burning the skin.

The wheat was subjected to the standardized crop-formation tests in Dr. Levengood's laboratory. There were dramatic differences between formation samples and controls from outside the formation both in terms of growth differences in the seeds and conductivity changes in the bract tissue (the so-called "alpha test"). This is exactly consistent with results in previous crop formations. (Samples flattened by man and examined in 1993 had no such changes.) In other words, this was not a hoaxed formation.

Normally, after even a record Perseid meteor shower there is not enough meteoric dust to coat the ground in sufficient density to be visible to the unaided eye. If there was we would all have noticed it long ago. Something concentrated dust from a wider area into these smaller swirls. Our calculations suggest that if you cut a swath clear through the atmosphere from top to bottom that was 15 meters wide (the same diameter of the crop formations) it would have contained roughly the actual amount of dust found in the aftermath of the 1993 Perseid shower. So why should these 1.5 meter wide swirls have attracted the dust? As it turns out, the same mechanism that explains this can explain the reheating.

As regular readers of our reports know, we have previously referred to an ion plasma vortex as a possible mechanism for crop formations. Two important aspects of such vortices match the evidence discussed here.
1) Ions (which are simply electrically-charged atoms or molecules of air) travelling through the atmosphere are captured by the Earth's magnetic field lines which they then rotate around. A moving ion therefore moves toward the Earth's surface in a helical path, spiralling around a geomagnetic field line. The electrically-charged ion moving in this fashion in turn produces two effects of its own. It increases the strength of the geomagnetic field line around which it is spiralling. The faster it spirals the more it increases the strength of the field line. A cloud of such ions swirling around can be referred to as a vortex composed of plasma (which is simply a cloud of ions).

Picture how a figure skater performing a spin, speeds up as she pulls in her outstretched arms. By reducing her effective width she speeds up her spin due to the basic physical principle called Conservation of Angular Momentum. This is true for a plasma vortex. As it shrinks its width, the ions spiral faster around the field line, increasing its strength. Thus the smaller, 1.5m sub-vortices would have greater magnetic strength than the large 15m vortex. If there was a suspended cloud of magnetite dust it would be expected that the dust would be concentrated in the region of strongest magnetic strength. That is exactly what we see. The dust was found only in the small sub-swirls, which would have been

created by these sub-vortices.

2) The second effect produced by ions spiralling around a geomagnetic field line is the emission of microwaves. This is the same principle employed in home microwave ovens. There, electrons are spun around a central magnet in the ceiling of the oven and microwaves are emitted. This occurs also in plasma vortices. As we know from our home microwaves,putting metal in the oven is asking for trouble because microwaves interact powerfully with metal. In our ion plasma vortex, the spiralling plasma would have produced microwaves which would have heated the iron dust particles.

Proof that this dust did arrive on the same "wind" which flattened the crop into swirls can be seen on at least one sample stalk. This stalk had been pressed to the ground. But bits of molten iron had hit the stalk and dug a groove into it running from the bottom part of the stalk towards the top. At the end of each groove the drop of iron still sits. This is consistent only with the iron moving parallel to the stalk while the stalk was prone.

CONCLUSION:

This incident provides rare, direct evidence for a theoretical model of crop formation - the plasma vortex - that had previously been indicated only in an indirect way. If there is any other explanation for the evidence in hand we are eager to hear it from anyone and invite immediate communication at the address listed above.(If this formation can be described as man-made, then we and the scientific community of the world will be most eager to hear how the hoaxers managed to scavenge the atmosphere for meteoric dust, re-heat it and lay it down just right with no contaminants. We assure you, you could support yourself nicely with such technological skills.) The fact that the plant samples showed the same tissue and growth changes typically found by this laboratory in many other crop formation samples strongly suggests that this was a typical formation except for the fortuitous presence of the meteoric dust. Thus we can expect that the mechanisms involved in this formation were typical of other formations and that the principles at work here are probably at work in other formations as well. Thus the serendipitous involvement of magnetic iron dust in this formation has produced what we consider to be an important breakthrough in the conceptual understanding of the crop circle phenomenon.

IMPORTANCE FOR 1994 FIELD INVESTIGATIONS:

We hope that all circle investigators will be on the lookout for such dust and adhesive coatings on the ground and the plants. Magnets can be employed to maximize the chances of recovering similar evidence. The most likely times will be in the aftermath of the meteor showers at the end of July and mid-August. As in 1994, the Perseids are expected to again be unusually strong, making the second half of August the richest time of the 1994 crop circle season for atmospheric meteor dust. Perhaps we will never again get such an occurrence, but then again we may.

In general we hope that these findings underline the importance of keen observation of anything and everything associated with crop circles. When dealing with such a little-

studied phenomenon it is impossible to predict what factors may turn out to be of the utmost importance.

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