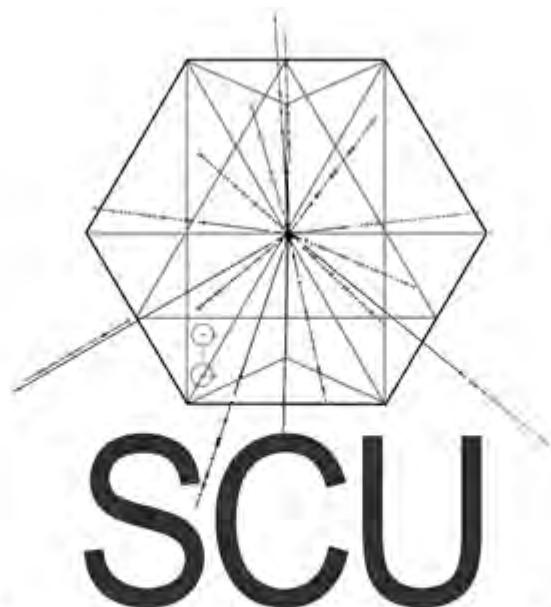


The Delphos CE2 Case – A New Appraisal of the Data



Scientific Coalition For UAP Studies

Scientific Inquiry of UFOs, USOs and UAPs

ANALYSIS OF EVIDENCE AND RESULTING CONCLUSIONS

BY THE SCIENTIFIC COALITION FOR UAP STUDIES

November 2021

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ABSTRACT

An unidentified aerospace phenomenon (UAP) witnessed from 75 ft at a farm in Kansas in November 1971 is regarded as one of the most puzzling physical trace cases. It involved an illuminated UAP hovering just above the ground for several minutes before departing to leave a glowing ring of soil. The latter was photographed and even touched by members of a farming family shortly afterwards. A profound chemical change of the resulting ring soil was discovered in that the surface material down to a level 14 inches deep had become highly resistant to absorbing water as most soils would commonly do. Over the years attempts have been made by various laboratories to analyse the soil in order to shed light on the cause of the hydrophobicity and determine why the ring was claimed to be glowing. This author carried out a major organic chemical analysis in late 1977 which led him to discover that the ring soil was impregnated with a highly water-soluble soap-like compound that paradoxically led to the hydrophobicity and which on isolation and characterization revealed chemiluminescent properties. This paper brings together all other relevant data in order to aid confirming the event as being genuinely anomalous.

1 The Sighting Report

In Brief: The event occurred on November 2nd 1971, at a farm close to the city of Delphos in Ottawa County, Kansas, USA. The main witness of the UAP was Ronald Johnson (age 16) with additional observations made by his parents, Durel and Erma Johnson. Following the event the local sheriff came to visit the family the next morning to take a photograph of the site as well as a sample of the surface ring soil. The MUFON investigator Ted Phillips arrived on the scene a month later to conduct interviews and sample the affected area. Another credible witness was subsequently identified who reported seeing an illuminated UAP on the same day and time from a point south of Delphos.

(NB: Appendix A is a copy of the original 1972 case report¹ written by Phillips which first led this author to request soil material to analyse. It is strongly advised that the reader familiarises themselves with its contextual details).

In Detail: At approximately 7.00 pm Ronald was tending his sheep and heard a rumbling noise resembling ‘an old washing machine that vibrates’ before observing the UAP approximately 75ft away from him. The object was glowing brightly with blue, red and orange colors about

its surface while hovering just above the ground. He simultaneously observed a bright glow between the UAP and the soil. He later drew a sketch of the UAP (Fig.1). After some minutes the UAP began to move off passing over a nearby shed while emitting a jet-like noise. It also became much brighter to look at, and Ronald momentarily lost his vision. After recovering his sight he ran to the farmhouse to tell his parents about what he had seen. They didn't believe him at first and he became agitated. They then followed him out to observe the UAP in the southern sky as a bright luminescent object receding into the distance and bearing "the color of an arc-welder." It was estimated to be at least half the size of the full moon, which could also be seen in the south-eastern sky at the same time. Although this was the last time that the family members saw the object another witness Lester Ernsbarger, a reserve police officer in Minneapolis (ten miles south of Delphos), called in to his base to report a bright light in the northern sky which he had observed at 7.30 pm from his position, thus providing possible independent corroboration for the presence of the illuminated object (Fig.2).

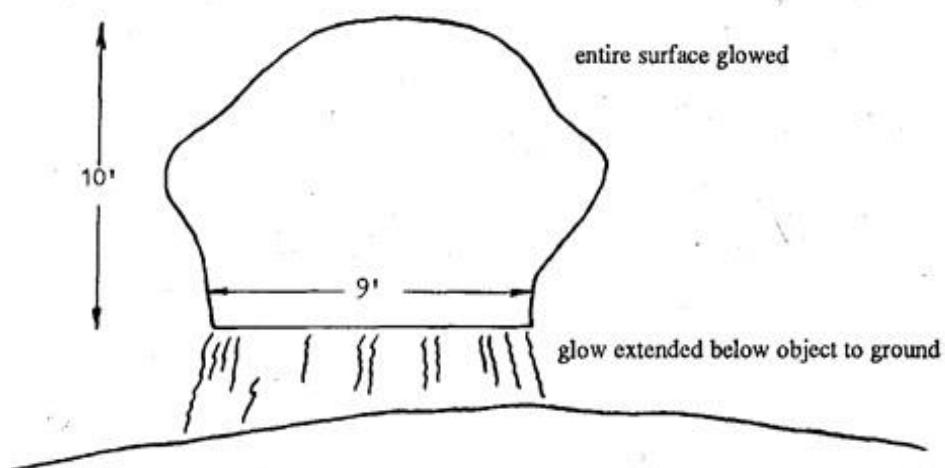


Fig. 1: Sketch of UFO

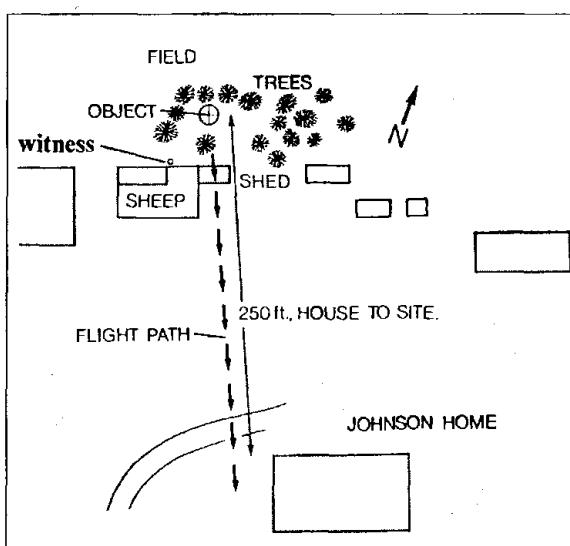


Fig. 2: Site plan showing UFO and farm area

After watching the UAP recede into the distance the Johnson family then walked to the area where the object had originally been seen. As they approached they saw a ring of soil over which the UAP had hovered glowing in the dark. Portions of the nearby trees reportedly also glowed. The glowing ring so impressed Erma Johnson that she ran back to the house to fetch a Polaroid 104 camera with which she took a photograph of the effect (Fig.3). No flash attachment was used to take the photograph, as the light from the ring was described as bright enough to read a newspaper by. She had only one exposure remaining in the camera and could see the illuminated ring through the view finder well enough to get the camera positioned. The family claimed that the glow from the ring lasted long enough to be visible the following night.



Fig. 3: Polaroid photograph of glowing ring (taken without a flash attachment)

The witnesses proceeded to touch the ring, which they described as having a cool, slick, crust-like texture, as if the soil was “crystallized” as well as being pitted with tiny craters or holes on the surface. They noticed an unfamiliar odour on their fingers and immediately experienced a numbing effect similar to that of a local anaesthetic which took some time to wear off. The Johnson family decided to inform someone about what they had seen and since the local sheriff’s office wasn’t nearby they drove to the local newspaper office (Delphos Republican) which was less than a mile away. The owner there was still working to get the next edition out (it was 8.00 pm) and advised the family that a reporter would come out to see them the following day.

A reporter named Thaddia Smith arrived on the farm the next day at around noon to speak to the family and take a photo of the site, before returning to her office to write an article. She also called the local weather bureau, the Ottawa County Sheriff's Office, and KSAL, the local radio station to report the event. The local sheriff Ralph Enlow stated that his office had received a call from Thaddia Smith at approximately 1.30 pm and he then left with his Undersheriff and another officer to arrive at the Johnson farm at 2.00 pm.

Sheriff Ralph Enlow's noted comments² from November 3rd were the following: "We observed a ring shaped somewhat like a doughnut with a hole in the middle. The ring was completely dry with the hole in the middle and outside of the ring mud.We were given a picture taken the previous evening by Mrs. Johnson which showed that the ring glowed in the dark. The soil sample taken was almost white in color and very dry...the soil was not radioactive" (See also Appendix B for the Undersheriff's statement and reference to witness Ernsberger). The officers also took a photograph of the ring (Fig.4).

The lead MUFON investigator Ted Phillips arrived on the scene a month later (December 4th) to find the ring outlined by un-melted snow and took a photograph (Fig.5). He also interviewed the witnesses and took samples of both surface and sub-surface material of the dry ring soil beneath the snow together with control material from outside of the ring.

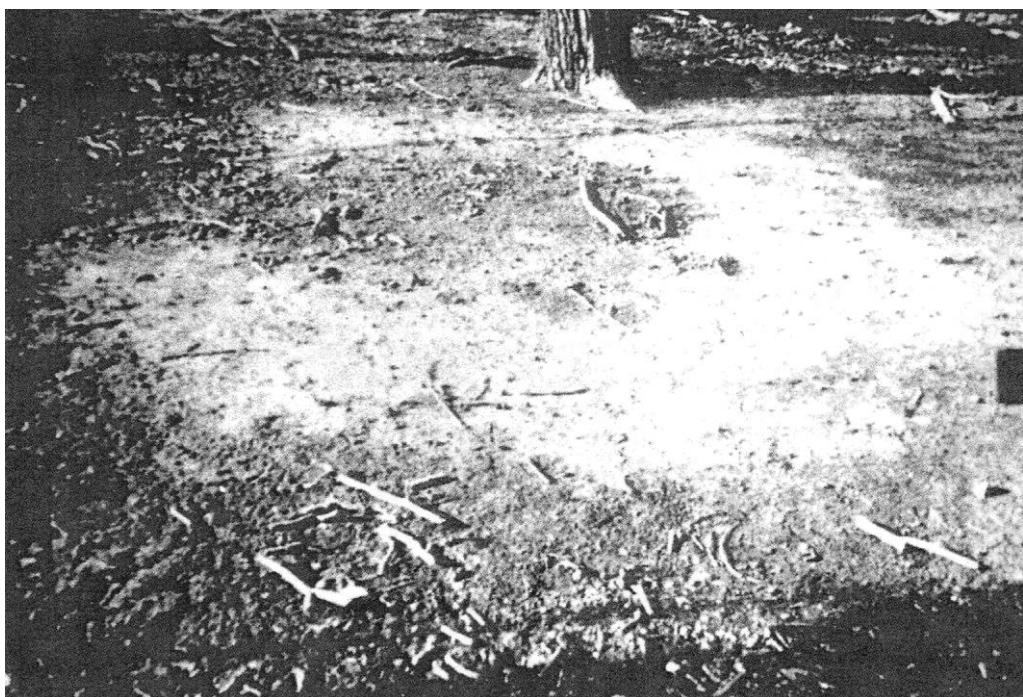


Fig. 4: Photograph of ring taken 19 hours after the alleged event.



Fig. 5 Photograph of ring covered with snow - taken December 4th

These materials were extensively analysed early on by various laboratories in the U.S. and the results summarized by Dr Michael Swords in the Journal of UFO Studies (1991)² (see copy: Appendix C). However, most of the studies were focussed on determining elemental compositions, and while the pronounced hydrophobicity of the ring soil was noted (Appendix C, p.119) no one had performed a specific chemical analysis to discover what was causing it, despite finding out that the agent could only be washed off with water. This author had become aware of the case early on from reading one of the original reports¹ by Phillips (Appendix A). It was only in 1977 that I requested material from Phillips (through the Center for UFO Studies (CUFOS) in Chicago, USA) to analyse while doing postdoctoral research at the chemistry laboratory of Nottingham University (UK). The material was dispatched by airmail held within opaque, sealed photographic film containers which had previously been stored at 0-5°C.

2 Data

2.1 Initial Inspection of Ring Soil

(NB: The following analysis targeted an unknown red compound present only in the ring soil with a view to isolating and then purifying it in order to determine its identifying characteristics. For an overview of the analytical sequence the reader is referred to the schematic description presented in Appendix D)

On receipt, the ring soil was immediately checked for its reported hydrophobicity by adding water to a sample at ambient temperature. The material was found to behave almost like glass, with the water simply beading up on its surface. A spatula was used to forcibly break up the aqueous mixture, which eliminated the hydrophobicity to leave behind a reddish suspension. The mixture was centrifuged to give a clear red solution which contrasted with the colorless solution obtained from control soil samples similarly treated. It was noted that all the ring soil samples were similarly water-resistant. Visible spectra were taken for surface and sub-surface

ring material which both showed a greater absorption towards the 286-333nm region of the spectrum (Fig 5). Each curve was recorded after extracting 70mg of the relevant soil sample with 0.5ml water. The greater absorption of the ring soil extracts towards the visible region of the spectrum illustrates the degree of impregnation of the ring soil with the compound, in comparison to that of control soil.

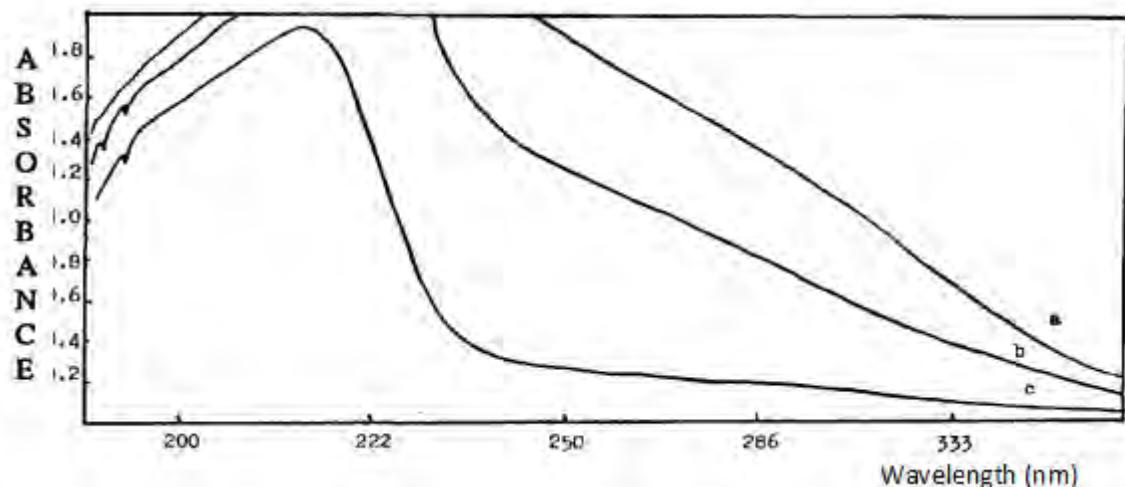
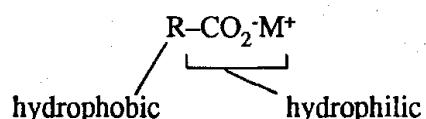


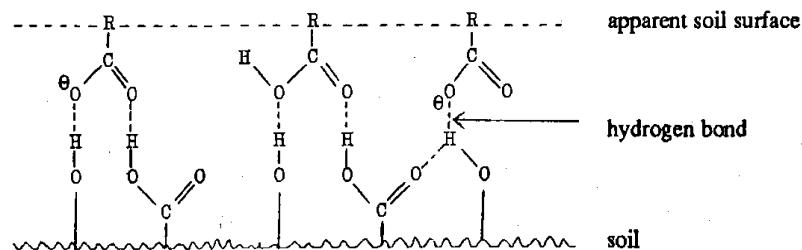
Fig.5: a) Sub-surface ring (*2) extract; b) Surface ring (*1) extract; c) Control soil extract

It was duly noted that shaking the red solution led to some frothing, similar to what one would recognize a soap solution would do. It was also mildly alkaline to litmus paper, and these two observations suggested that the dissolved compound might be an alkali metal salt of an organic carboxylic acid.

Such a compound would consist of a hydrophobic organic residue -R linked to a hydrophilic carboxylate anion $\text{-CO}_2^- \text{M}^+$ (where M represents an unknown metal ion):



This substance and its direct decomposition products appeared to be the only ones ‘foreign’ to the soil and were therefore solely responsible for the observed hydrophobicity. Extracting the ring soil with organic solvents such as ethanol or dichloromethane gave rise to a negligible amount of soluble material. A similar negative result was obtained when the control soil was extracted with water. The apparent paradox of a highly water-soluble substance being responsible for the hydrophobic nature of the ring soil can be explained in terms of a surfactant phenomenon³. The hydrophilic sites normally present in the soil matter are bound up through non-permanent ‘hydrogen bonding’ with those of the substance enabling the organic residue R to behave as the new ‘surface’ of the soil. The action of forcibly wetting the soil disrupts the hydrogen-bond linkages, allowing dissolution of the substance while exposing the soil hydrophilic sites to re-absorb water:



The red extract was also tested by placing it under a UV lamp (366nm) which resulted in a bright bluish-white fluorescence being observed. This was significant, because a UV - induced fluorescence would be anticipated from the claimed glowing of the ring soil. (Note: the emission spectrum of a chemiluminescent oxidation will normally match the fluorescence spectrum of the oxidation product – see Appendix E for a general overview of the chemiluminescence process).

Because the preliminary analysis suggested the unknown compound to be an alkali metal salt of a carboxylic acid, the red solution was treated with aqueous silver nitrate solution which confirmed this by precipitating out the corresponding silver salt of the unknown carboxylic acid⁴. This was centrifuged off and washed with ethanol to remove water, then diethyl ether to remove ethanol, before finally drying under nitrogen gas to give a dark red powder, the amounts of which were found to vary in the ring soil (Table 1):

Table 1. Silver Salt Precipitation

Soil sample	Quantity of silver salt precipitated (averaged): mg per gram of soil
*2	34.8
*3	12.8
*10	10.6
*7	10.1
Control soil	Negligible precipitation observed

2.2 Silver salt analysis

An infra-red absorption spectrum (as KBr disk) of the dried silver salt showed strong hydroxyl (O-H) and carboxyl (CO_2^-) stretching bands at $3,400$ and 1600 cm^{-1} respectively, with the broad band at 1040 cm^{-1} being attributable to C-O stretching (i.e. of C-OH) (Fig. 6).

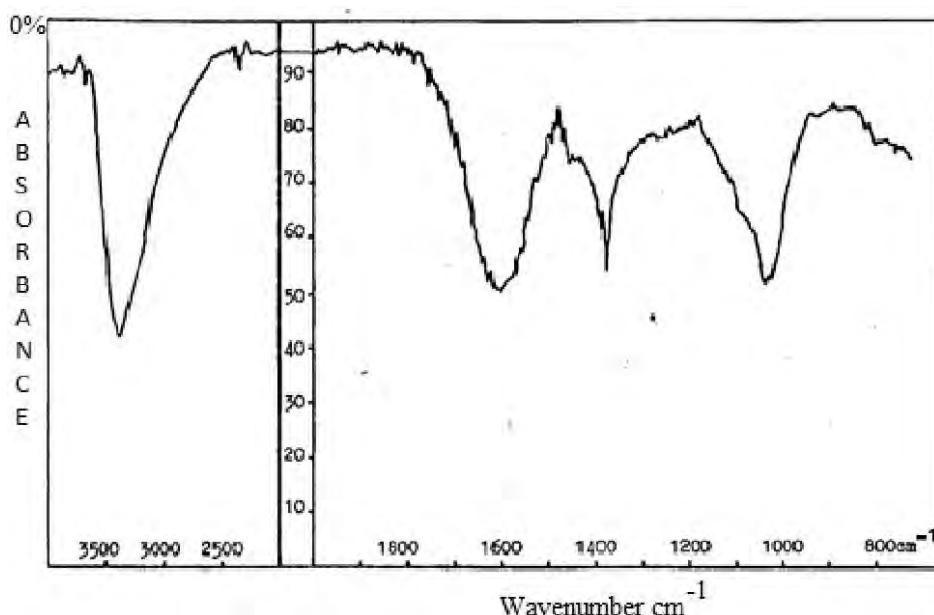


Fig. 6: Infra-red spectrum of silver salt (as KBr disk)

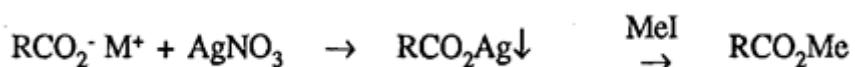
Elemental analysis of the salt (mass based, via O₂-combustion using the in-house laboratory service) gave 27.55% carbon, 2.40% hydrogen and 3.83% nitrogen. Another performed for ash content gave 27.60% carbon, 2.28% hydrogen, 3.53% nitrogen, and 36.95% ash. Analysis for sulphur and chlorine were both negative. If the ash from the combustion was assumed to be principally composed of silver oxide (Ag₂O) and the molecular weight to be in the region 400-600 AMU then a very crude approximation of the empirical formula of the silver salt could be derived as:



The formula as written has a molecular weight of 618 and is composed of 27.18% carbon, 2.27% hydrogen, 4.53% nitrogen, 31.07% oxygen and 34.95% silver (corresponding to 37.54% silver oxide or ash content). The formula's usefulness comes from being able to gauge the relative proportions of each element present in the soil compound. A striking feature is the apparent high oxygen content, the percentage value of which is determined by difference from the other element percentages. The possibility arises that the high value may indicate the presence of other elements that were not checked for by the analysis.

2.3 Conversion of silver salt into methyl ester

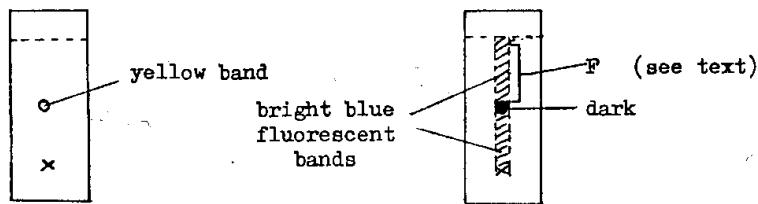
In order to render the unknown compound more amenable to identification the dried silver salt was subjected to a methylation reaction under nitrogen using methyl iodide in anhydrous acetone at ambient temperature overnight to afford the corresponding methyl ester⁵:



After stirring overnight, a yellow solution resulted which was filtered off and evaporated to give a red gum. A sample was submitted for mass spectral analysis which was inconclusive owing to its impure nature and possible low volatility and a molecular ion with a characteristic loss of 31 mass units (corresponding to loss of a $\text{CH}_3\text{O}^\circ$ radical from the ester group) was not apparent in the spectrum. This may also have been due to thermal instability of the ester at the high probe temperature (190°C) used to volatilize the compound. The ion with the highest molecular weight occurred at m/e 395 and this was followed by one of similar but weak intensity at m/e 377. The difference of 18 AMU corresponds to loss of water and would be expected for a compound containing hydroxyl groups. The next ion of any significance occurred at m/e 337 and this also lost water to give a fragment ion at m/e 319. Peaks also occurred at m/e 59 and 57, the former being attributable to the species CO_2Me^+ that would result if a methyl ester had indeed been formed during treatment with methyl iodide.

The crude product was also analysed by thin layer chromatography (TLC), a technique that enables the physical separation of the components of a mixture in the form of ‘bands’ or regions of discrete compounds. Analysis in this way revealed one major yellow band of retention factor (R_f) of ca.0.5 (stationary phase: silica gel HF 254; mobile phase = methanol/acetone/benzene in proportion 20:5:25) situated among a continuum of bright blue fluorescent bands when the chromatogram was viewed under ultraviolet (366nm) light. This yellow band was very unstable and readily oxidized within minutes to give an almost colorless product. When viewed under 366nm light the product from this oxidation had identical fluorescence to the others, thus merging with them (Fig. 7). Covering the chromatogram with a glass slide to reduce exposure to oxygen slowed down this process considerably.

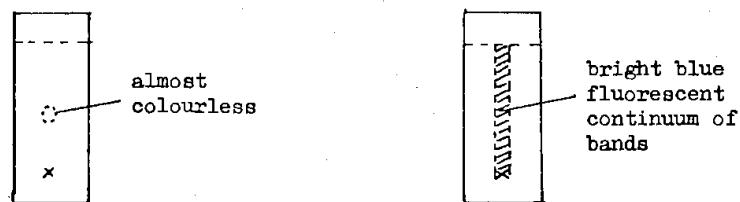
a) Appearance before oxidation:



(i) under visible light

(ii) under 366nm light

b) Appearance after oxidation (after a few minutes):



(i) under visible light

(ii) under 366nm light

Fig. 7: Isolation of the active component of ring soil compound by TLC

The decolorisation of the yellow color of the band was also registered by spectroscopic analysis showing a gradual decrease in peaks at 290 and 358nm and a rise in the 222nm peak (Fig.8).

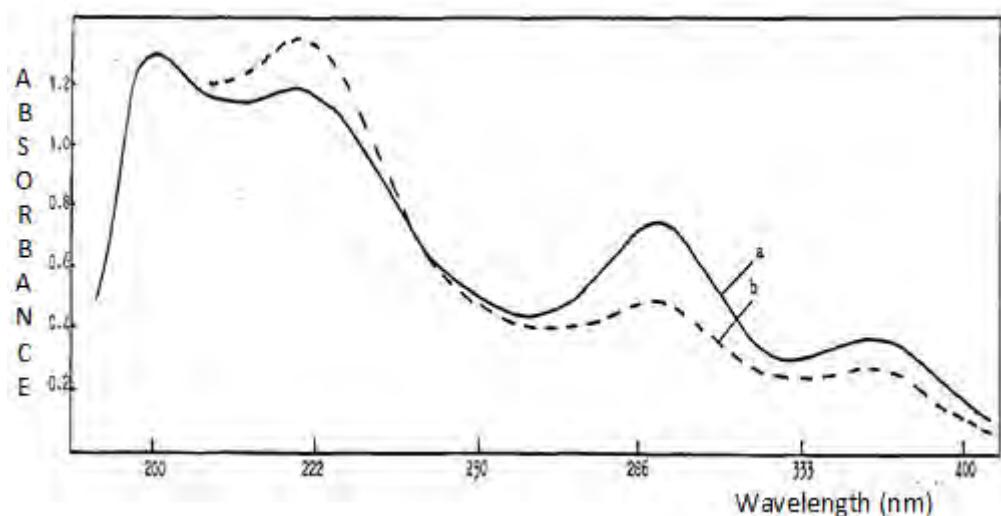


Fig.8: a) Initial b) After 45 min in cell

It was evident that these observations were consistent with that of a potential chemiluminescent reaction (CL), and I therefore went to speak to my post-doctoral supervisor (Dr. Barrie Bycroft, now a retired professor). After describing what I had discovered he referred me to the university's CL expert, Dr. Frank Palmer (now deceased). Palmer became interested and both he and Bycroft allowed me to pursue studying the soil materials, with the former recording the actual fluorescence spectra of samples that I provided to him. Appendix F shows a more recent (2013) discussion I had with Bycroft regarding the soil analysis. My principle research program at Nottingham also led to a chemistry paper being published⁶.

There was the possibility of ring soil extracts being able to generate light but I was unable to confirm this. Palmer was of the opinion that the crude soil extracts were likely too impure for one to be registered, as impurities were known to quench such emissions. (NB: confirmation of CL later came from another laboratory, known to be the Battelle Memorial Institute in Ohio – see further discussion below on p.21).

Although actual CL was not observed, a ring soil extract fluorescence was found to be 5x brighter than that of the control with a similar maximum (Fig.9). Samples (1.0g) each of the surface ring soil and control surface soil were stirred vigorously for 45 min. with deoxygenated water (8.0ml) before being centrifuged and then analysed. The control soil fluorescence had a maximum at 448nm (Fig.10) while that of the ring soil was at 432nm (Fig 9).

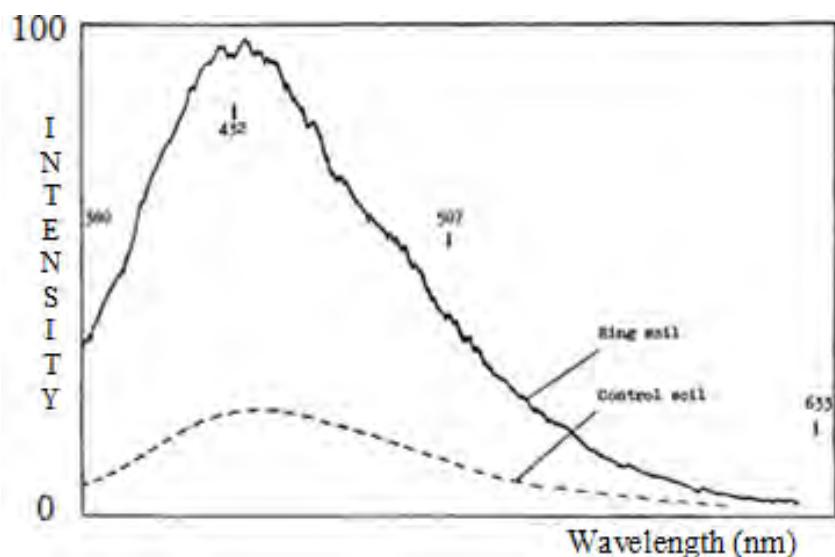


Fig. 9: Fluorescence spectrum of ring soil vs. control soil

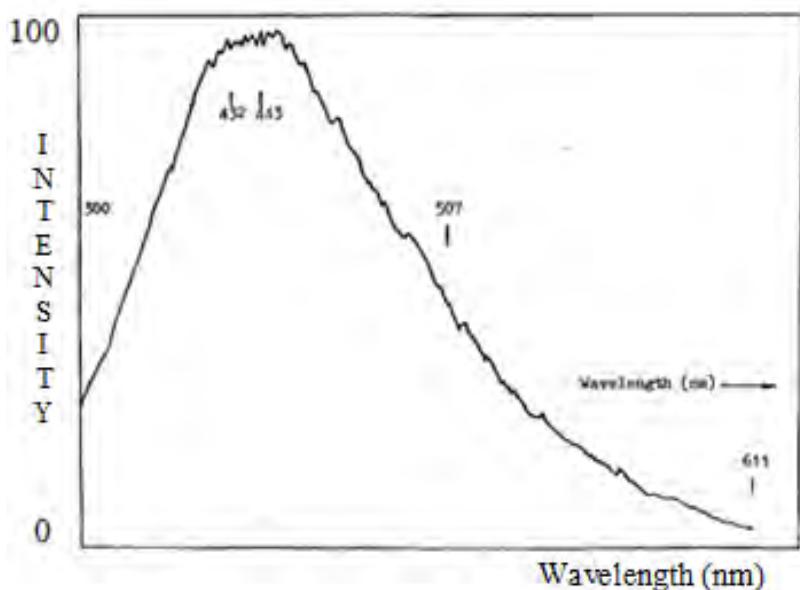


Fig. 10. Fluorescence spectrum of control soil sample

A fluorescence spectrum of region F derived from the yellow band isolation by TLC (see Fig.3) gave a very similar spectrum (Fig.11), providing firm evidence that the fluorescence spectra of the ring soil extracts were directly related to the unknown compound since the TLC bands had all been generated from the isolated silver salt.

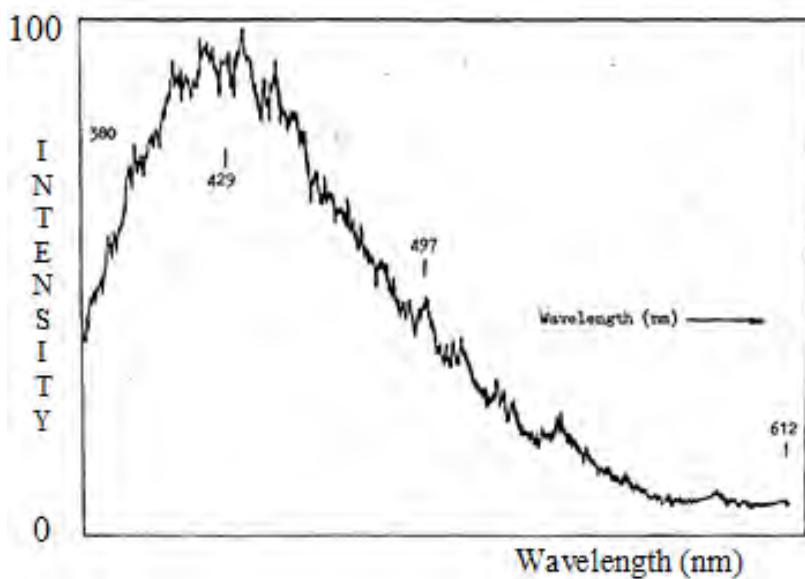
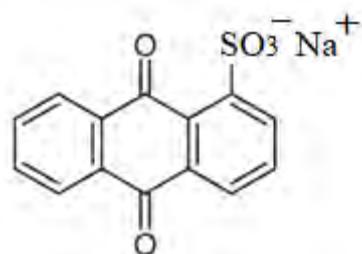


Fig. 11: Fluorescence spectrum of region F (from TLC)

2.4 Reproduction of soil hydrophobicity

To explore this aspect further three known organic acids were converted into their sodium salts in water by neutralisation with dilute sodium hydroxide solution and the resulting solutions mixed with some of the control soil. After allowing the mixtures to dry water was placed on the surface of each sample to test for any acquired hydrophobicity.

It was found that prepared solutions of sodium benzoate or sodium naphthalolate did not produce any appreciable surface effect, whereas that of a solution of sodium anthraquinone-1-sulphonate (1) did impart to the soil a marked degree of hydrophobic character. This indicated that the increased molecular size of (1) combined with the presence of the ionic group and additional polar carbonyl groups able to participate in hydrogen-bonding and thus bind with the soil in 'template' fashion was causing the hydrophobicity.



(1)

The test also revealed how such a change in soil absorption characteristics could be brought about by the addition of an aqueous solution of a suitable compound from an external source.

3 Discussion

3.1 Postulated hypothesis of UAP Spray Model

The foregoing results show that the ring soil is impregnated down to a depth of 14" with a water soluble and air-sensitive compound that has all the attributes for emission of light through oxidation. Since the ground effect is ring shaped a model can be hypothesized to satisfactorily explain the ring features and witness commentaries.

This proposes that the UAP contained within its periphery an aqueous solution of the compound that was likely responsible for the UAP surface light emission observed by Ronald. This may have involved absorption of aerial oxygen through the outer surface of the UAP to produce the emission (Fig.12). If the solution had been deposited in the form of a spray, this could then explain the elongation of the ring towards the wind direction (290° and 8mph) that prevailed on the night of the event (Fig.13) as well as the pitted and moist nature of the soil. The actual emission color would be bluish white (432nm peak) in accordance with the fluorescence of the aqueous soil extracts. The UAP would need to be constructed from a transparent material permeable to oxygen, and if oxygen absorption wasn't uniform across the UAP surface as it hovered above the ground the actual red color of the solution would likely be observed instead of blue, explaining the mixture of red and blue colors that Ronald described. After departing a uniform bluish white color would be anticipated from the entire UAP surface, which was corroborated by its illumination being described as that of an arc-welder.

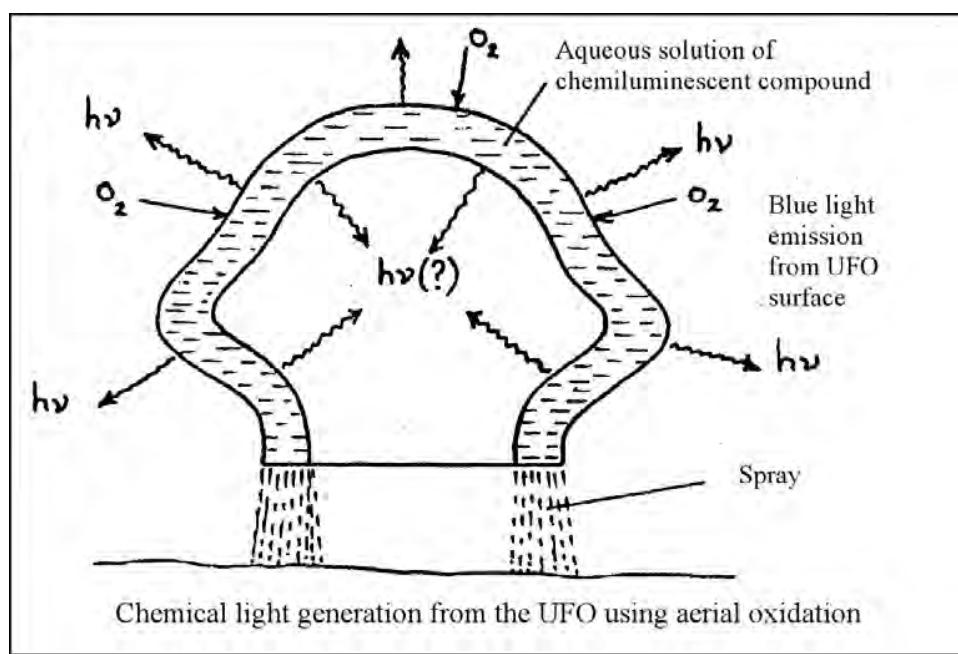


Fig.12: Hypothetical model for Delphos UAP

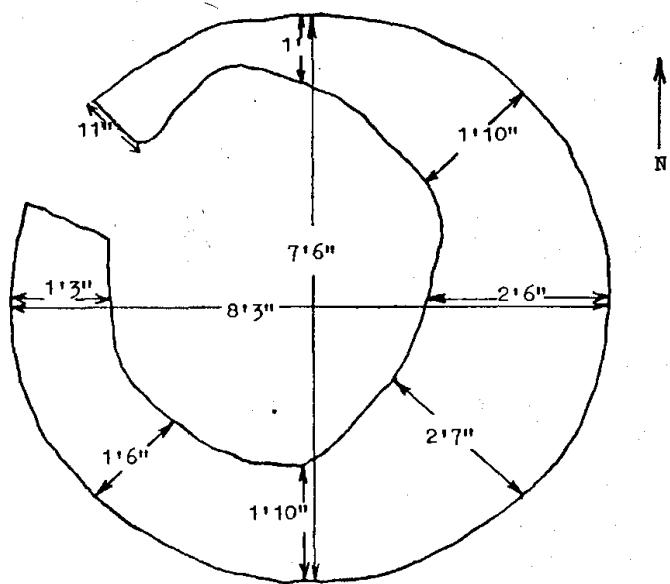


Fig. 13: Dimensions and elongation of affected ring soil

3.2 Witness corroboration of the spray model

In view of the proposed ‘spray’ scenario, some of the comments made by the witnesses from their approach to the ring site now make a great deal more sense (from their verbatim testimony)⁷.

Durel: “Shoot, it just glowed, when we came around the corner of the shed, that ground just glowed...and them trees did too”.

Ron: “I showed ‘em where it landed and we went out there and it glowed like a fluorescent light...my sister-in-law (came) out there and the circle was still the same way, trees glowing”.

Durel: “Yeah, I touched the ground too, I never will forget the blisters on the ground, I couldn’t describe it, little blisters on it... you know....little holes....like hail had hit the ground”.

Erma: (on touching the soil)...”Oh, it had a funny feeling.... After I felt the ground and it went to making my hand numb I pulled my hand away and rubbed it on my leg...it didn’t feel warm...it felt like it was kind of moist-like. (Q: was soil smooth?) No, it was kinda bumpy, it was like little blisters like, no holes, like bumps, blisters....just kinda moist and bumpy”.

3.3 The white color of the ring surface

After the deposition of the aqueous solution by the UAP the witnesses observed the ring surface to be glowing brightly along with portions of nearby trees. This glowing would represent the oxidation of the deposited compound by the air to leave an end product which we can now see from spectroscopic evidence is accompanied by a decolorisation (see Fig.8). I had the opportunity to observe how quickly this occurred in its ‘natural’ state by taking the visible light spectrum of a sub-surface ring soil extract, and then running it again immediately afterwards. The time lapse in between the two runs (2 minutes) was enough to show a reduction of the

hump in the 290nm region from (a) to (b) and a concomitant rise in the 220 nm region (Fig.14). Treatment of this solution with aqueous hydrogen peroxide decolorized it almost completely (c). Evaporation of the final solution yielded a whitish solid, which I suggest would represent an appropriate modelling of what actually happened at the soil surface after the UAP departed.

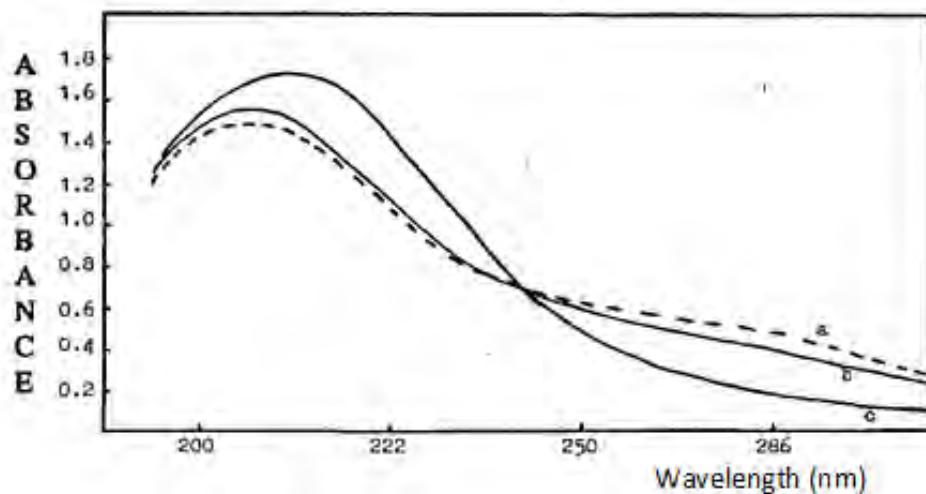
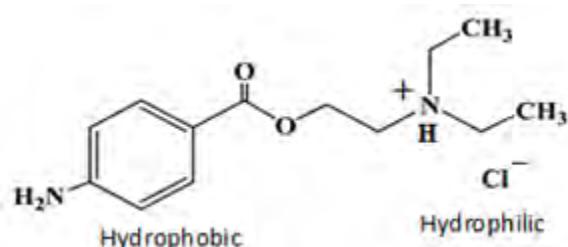


Fig. 14: a) Initial sub-surface (*3) extract
b) After 2 minutes in cell
c) After treatment with hydrogen peroxide

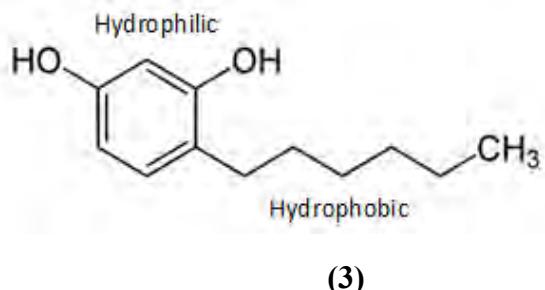
3.4 The numbing effect of the ring surface material

Both the adults experienced an immediate numbing on their finger tips on touching the ring soil surface. This effect became permanent for Erma Johnson. The clue as to why this occurred lies in the dual hydrophobic/hydrophilic nature of the unknown compound as well as the fact that the soil felt moist as described by Erma. There are many examples of topical anaesthetics (TA) in use today, but they usually comprise of a compound having a lipophilic group at one end of a molecule attached to a tertiary amine at the other end⁸. One example is the compound Procaine (2). The tertiary amine on the right hand side can easily bind to a proton to form a water soluble ionic species (i.e. the hydrochloride salt as shown), which overall would then result in a compound having a hydrophobic group attached to a hydrophilic one, which is the basis for causing the anaesthetic effect. Water would need to be present to administer the effect, and TAs are therefore usually applied as water based ointments. The discovery that the ring soil compound contains nitrogen might therefore suggest that this is also present as a tertiary amine, but this would need to be proven by identifying the compound.



(2)

However, there are compounds having TA-like properties which do **not** contain nitrogen. One example is 4-hexyl resorcinol (3) which exhibits anaesthetic properties by virtue of this same dual hydrophobic/hydrophilic nature and is employed in throat lozenges for that purpose as well as for its antiseptic nature. Consequently, it may suggest that the extreme dual hydrophobic/hydrophilic nature of the soil compound that is causing the soil hydrophobicity is also the actual cause of the TA-effect noted by the witnesses.



3.5 Significance of other laboratory data

As already mentioned, the Delphos ring and control soils were investigated by other laboratories not long after the event had occurred and before I had got hold of the material. But these others didn't focus on the hydrophobicity of the ring soil, but rather concentrated on performing mainly elemental tests on both soil types (Appendix C). In more general terms, there was no indication that the ring soil had been heated (witnesses described the surface as being cool to touch), or subjected to ionizing radiation (KU finding, p.123).

The one analyst who did focus on the hydrophobicity was Phyllis Budinger, who runs a private laboratory and published her full paper on Delphos on-line⁹. A copy of this report is attached as Appendix G.

a) Phyllis Budinger Analysis:

Budinger confirmed the absence of heating on the ring soil (Appendix G, p.12) as well as the hydrophobicity of the coating material (p.13) and also photographed the red color of the aqueous extracts obtained from them (p.14). She used the silver nitrate method that I had referred to her to isolate the compound as its silver salt (p.20), but didn't go one step further to perform the methyl iodide reaction. A battery of other tests were performed on the 'As Received' soil materials despite the fact that the principle difference between the two types was the 2-3% by weight of the unknown contaminant in the ring soil which could only be extracted out using water. When the aqueous extracts of the ring versus control soils were analysed Budinger obtained after evaporation similar pro-rata amounts of the unknown compound (12.8 – 18.3 mg/g) that I had obtained from ring soils but as amber flat particulates (p.14). An elemental analysis of this material gave the following results (p.17):

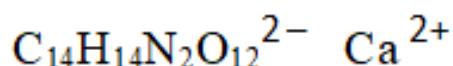
C 43% H 5% N 5% O 42% (total = 95%)

Budinger concluded from NMR evidence that the ring compound was a soil humate substance which she named Fulvic acid mainly because of its water solubility. Although this name strongly implies a natural substance, she fully accepted that the UAP was responsible for the deposition while not offering an opinion as to why the UAP should be carrying such material.

Budinger's samples were much older (28 years) than the ones that I had studied (6 years) and could therefore possibly have degraded to a greater extent. A literature search reveals that organic compounds left in soil will usually degrade into humate-type material because of natural microbial actions¹⁰.

In my opinion, Budinger's Fulvic acid identification is flawed, because this compound - being an acid - will not react with silver nitrate, since the precipitation method using silver nitrate relies upon cationic exchange. Although Budinger used silver nitrate to precipitate the silver salt as well as repeat the procedure on commercial sodium humate, it was then concluded that the precipitations were the result of "chelation of Ag with the humic substance" which is highly questionable. Chelation reactions normally occur with divalent metals to afford cyclic adducts in which the metal ion is enclosed within a cage-like matrix to afford compounds that can be of biological importance¹¹.

However, monovalent silver ions do not normally take part in such reactions. The ring soil compound I initially identified was an alkali metal salt of a carboxylic acid which was deposited as such into the soil. The aqueous extract of this on treatment with silver nitrate simply exchanges the metal ion with the silver one, which is a well-known organic carboxylate reaction⁴. The elemental analysis of the corresponding insoluble silver salt (with MW: 618, see p.8) indicates that there are two silver atoms present suggesting the organic moiety has a di-carboxylate group. This would fit well for the original alkali metal species to be calcium, as this is also divalent. Hence a reasonable deduction for the original compound deposited into the soil would be the following calcium salt:



If simply isolated from the ring extract through evaporation (and not by precipitation using silver nitrate) this material would have a molecular weight of 442 and have the following elemental composition:

	C 38%	H 3%	N 6%	O 43%	Ca 9%	(total = 99%)
cf: Budinger result:	C 43%	H 5%	N 5%	O 42%		(total = 95%)

As can be seen these figures are not too dissimilar to Budinger's result from isolated material. An obvious consequence of this is that if the compound was deposited as the calcium salt it would mean that the calcium content of the aqueous extract of the ring soil should be higher than that of the control.

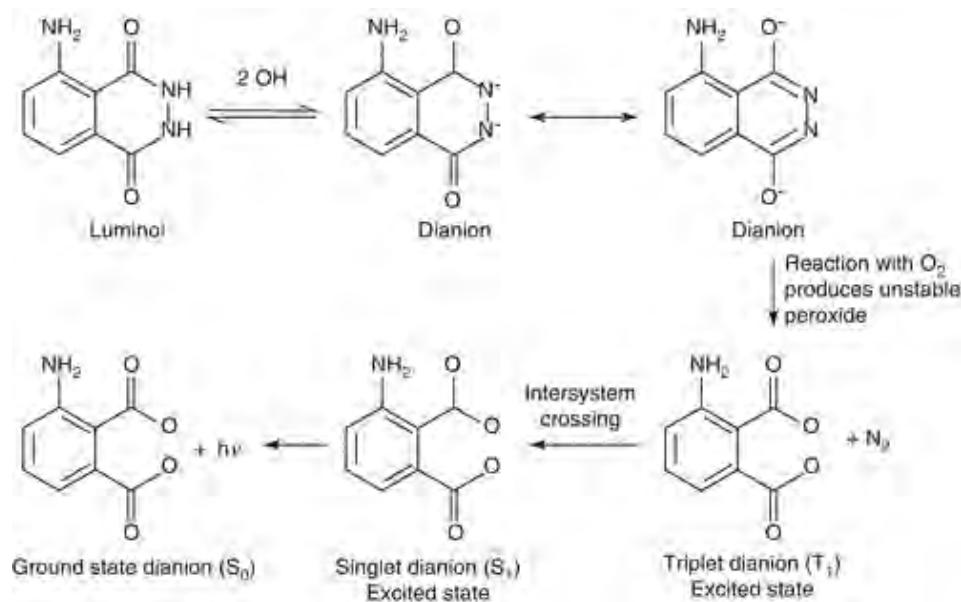
b) Calcium measurement from other laboratories

There are numerous results tabulated for the calcium content of the Delphos soils as determined by the initial laboratory studies (Appendix C), but many are quite high in value and appear to refer to the calcium mineral content of the soils rather than those derived from aqueous extracts. However, the Agri-Science Lab analysis provided low figures more applicable to aqueous extracts and showed 2400 ppm Ca in ring soil, as against 912 ppm for control, (Appendix C, p.125). The four samples of silver salt that I had isolated from the ring soil varied from 10 mg/g to 35 mg/g of soil (see Table 1). These figures would correspond to 7 – 25 mg/g of the calcium salt which would in turn represent 0.6 – 2.2 mg of calcium, the latter figure being equivalent to 2200 ppm in good agreement with the Agri-Science figure. In addition, the Oak Ridge National Lab carried out a scanning electron microscope X-ray analyses (SEM-XRA) on ten samples each from control and ring soils, and found average Ca content to be 0.95% and 2.44% respectively (Appendix C, p.126).

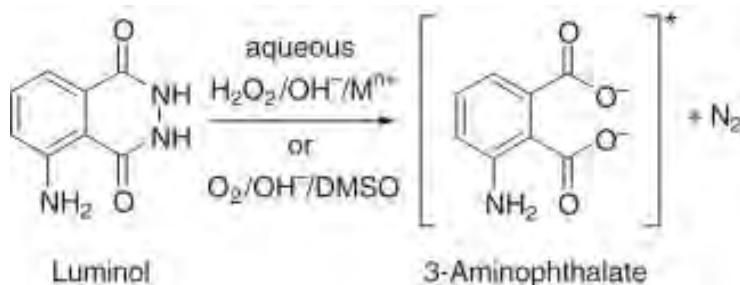
The above Agri-Science Lab also looked at the presence of other metal ions by extracting the two types of soil with 0.1 molar hydrochloric acid (this method was likely also to have been used for the calcium analysis). They discovered sharp increases (ppm) in the ring soil relative to control by atomic absorption (Appendix C, p.125):

	<u>Control</u>	<u>Ring</u>
Fe	6.80	28.00
Mn	5.20	56.00
Cu	1.00	2.48
Zn	0.18	20.00

The relevance of these other metals may become apparent from the following description of a well-known CL process. The organic compound Luminol will react with molecular oxygen in alkaline dimethyl-sulfoxide (DMSO) to give an unstable, energy rich peroxide which decomposes to give amino-phthalic acid with simultaneous emission of blue light (480nm). The emission spectrum matches the fluorescence spectrum of amino-phthalic acid in the same solvent system.

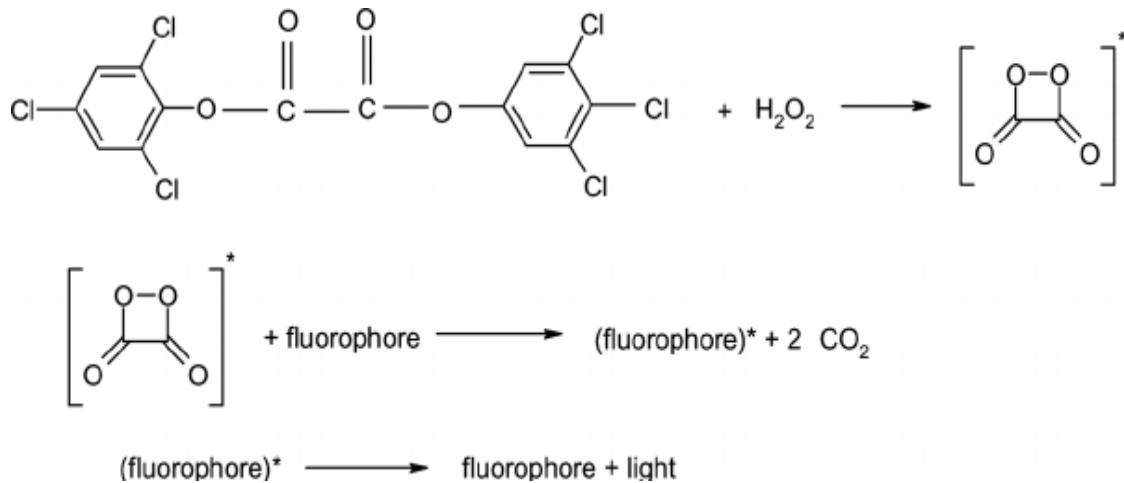


However, Luminol can also react similarly in aqueous systems using hydrogen peroxide as the oxidant. In this case the addition of metal ions can greatly enhance the resulting CL reaction¹²:



In a 1983 study on Luminol CL in water (but in the absence of hydrogen peroxide) it was demonstrated that a 50,000 fold increase in light intensity occurred in the presence of such ions¹³.

Another compound identified by Budinger in the ring soil was oxalic acid. And again, it was pointed out that this compound could sometimes be found naturally in soil. In this instance, however, the situation is much more ambiguous, because oxalic acid is also a key compound used for the preparation of oxalyl diesters that can give rise to highly efficient CL reactions. The commercially available Cyalume Light Stick (e.g. for camping use) is an example of the use of this reaction which relies upon the oxidation of the initial oxalyl diester with hydrogen peroxide to create an excited 1,2-dioxetanedione intermediate which then transfers its energy to a fluorescent additive to produce light:



In the case of the ring soil compound, the formula derived for the silver salt contains twelve oxygen atoms, which could imply that four are used to incorporate a di-ester of oxalic acid in the structure. That would still leave eight oxygens to tie up potentially as two carboxylate groups and four hydroxyls. By leaving this compound in the soil for a very long time (i.e. 28 years for Budinger's material) it may have led to decomposition with generation of free oxalic acid which she subsequently identified.

Budinger's Fulvic acid identification doesn't refer to it being a water soluble calcium salt, and this is significant because such alkali metal salts could not be naturally formed in any forest soil. And there's also no obvious natural explanation for the increased presence of the other metals found in the ring soil.

Suggested Action 1: Check Fulvic Acid assignment

To resolve Budinger's identification it would be necessary to acquire some commercially available Fulvic acid and dissolve some in water before attempting the silver salt precipitation. If this failed then it would confirm that Budinger's identification was incorrect. A suitable material to use might be the following: **TRUE Fulvic acid 90% CONCENTRATED, HUMINOVA Brand** available from Ebay at \$12 per 40g.

3.6 Additional correspondence on the soil analysis

There is another aspect of this story which is not generally known. As my own analysis of the ring soil proceeded I sent Phillips and Allen Hynek progress reports of my findings. A total of three were sent on dates 9th December 1977, 28th April 1978 and lastly 27th February 1979. In the second one I wrote the following assessment: “*The impression I have is that the compound*

in the soil might have been responsible for the surface glow of the UFO. Perhaps some UFOs contain concentrated solutions of chemiluminescent compounds around their periphery which give rise to the vivid glows reported". All these early reports as well as copies of the original spectral data are available to view at the CUFOS website¹⁴.

Ted Phillips replied to my second report (dated May 11, 1978 – see Appendix H) in which he answers questions put to him from my first report. He points out that Mrs Johnson described the ring soil as being moist and having a cratered feel, while both adults experienced an immediate numbing effect from touching the soil, such that the prick of a needle couldn't be felt (the test was conducted by a local doctor).

In his second letter (dated Oct.19, 1979 – Appendix I) he refers to two U.S. laboratories that were *following up from the results of my own analyses*. He states that he was awaiting new results from a laboratory at St. Louis, Missouri but hadn't received any to forward to me as yet. However, he had unexpectedly been approached by another laboratory which he described as being the “finest soil laboratory in the U.S.” He had received an unexpected telephone call from personnel at that laboratory (later confirmed by Phillips to be the Battelle Memorial Institute, Ohio) requesting soil material to analyse which he duly sent to them *together with copies of my reports*. He was assured that they would certainly follow up on my own work. Ted also points out in this letter that ring soil samples taken the day after the event showed *no indication of any fungal growth, while the four week old samples did*. This is important information which will be referred to in the discussion of fairy rings below.

Following this second communication to me, Phillips then wrote a memo to Mimi Hynek dated December 26, 1979 to say that he'd had the first ‘very preliminary’ report from Battelle which stated: “The results initially didn't look very encouraging. On closer examination I did find two curves which did look significant, and which suggest that further study might be fruitful. Most of the light emission appears to be chemiluminescence rather than thermoluminescence. I will try to discover a better way to examine them later.”

In a third letter (dated May 13, 1981 – Appendix J) Ted informs me that he hasn't heard anything further from the two laboratories regarding the Delphos soil material. He had written to them on numerous occasions and had been assured that work was on-going. He muses on the possibility that nothing will eventually transpire from them because they are government aligned laboratories.

In his last letter (dated Nov. 12, 1985 – Appendix K) Ted confirms that nothing more was ever heard from the two laboratories on their follow-up work based on my original results.

In 2004 I was in email contact with Ted Phillips and Phyllis Budinger during which the availability of further ring soil material was discussed. He was able to provide useful information on this, as well as on the original white colored ring sample taken by the sheriff (Appendix L).

What the above implies is that a much deeper analysis was carried out on the Delphos ring soil by two high powered soil laboratories in the U.S., the results of which have yet to be divulged.

Suggested Action 2: Attempt FOIA release of data from these labs.

4. Concluding Observations

4.1 Summary of unusual effects:

This case is remarkable because it is a multiple witness close encounter with a UAP that has reportedly left a grossly affected ring of soil which, on analysis, undeniably has an extraordinary chemical make-up.

The ‘strangeness’ factors of the ring can be listed:

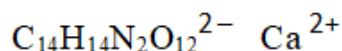
FACTUAL:

S1: Ring soil extreme hydrophobicity (similar to a glass surface on adding water).

S2: Hydrophobicity extends to 14" below the soil surface

S3: The ring is elongated towards the south-east which was also the wind direction on the night of the event.

S4: Ring contains a highly water-soluble soap-like compound having the putative formula:



S5: Ring compound can be forcibly extracted out with water and converted via its silver salt into a methyl ester which was purified by thin layer chromatography to afford an active component (AC) having chemiluminescent properties. Visible light and fluorescence spectra were obtained of this AC.

S6: Ring soil was also found by to contain oxalic acid (Budinger finding), as well as higher amounts (Agri-Science Lab finding) of potassium (4x), copper (2.5x) and manganese ions (11x) over control soil, all of which are known to have relevance to chemiluminescence chemistry.

ANECDOTAL:

S7: The ring soil was glowing brightly when the witnesses approached it, such that one of them hurried back to the farm to fetch a camera and take a photo.

S8: The ring glow appears related to the UAP surface glow and that seen between the UAP and the ground, since all three were observed at the same time by Ronald.

S9: The ring soil felt ‘moist’ and ‘cratered’ to the touch before inducing a numbing effect on the skins of both parents.

S10: Ronald described the ring light emission as being like a ‘fluorescent glow’.

4.2 Conjectural Origins of Ring Soil Compound:

Three possibilities can be envisioned:

a) HOAX:

Bearing in mind the strangeness factors S1-S6, it is clearly very difficult to imagine how these could have been caused by an agency perpetrating a hoax. From where could such an unusual chemical be obtained and in such quantity in order to create the ring effect? (NB: Any notion that an elaborate hoax may have been perpetrated using commercially available Cyalume ‘Light Sticks’ is highly unlikely because the latter employ toughened plastic to prevent breakage and liquid spillage, while thousands would likely have been required to cope with the ring size and depth of impregnation. The light stick chemistry is also very different to that of the soil compound, since it relies upon the presence of a co-reactant (hydrogen peroxide) as the necessary oxidant).

I would argue that, even with the knowledge we have of the ring compound so far, it would be difficult to replicate the extreme hydrophobicity on common earth soil to the same degree. A moderate amount of hydrophobicity was actually induced into control soil by the addition of aqueous sodium anthraquinone-1-sulphonate (1), but this effect was not in any way comparable to that of the genuine ring soil. This indicates that there is something rather special about the ring compound’s chemical structure to account for the observed extreme effect. For these reasons I would strongly argue that a hoax interpretation for Delphos can almost certainly be ruled out.

b) NATURAL ORIGIN:

An obvious initial suggestion for the ring would be that it could be a fungal ‘fairy ring’. But this is not viable for many reasons. The ring did not grow outwards with time as would be expected for such rings. There were certainly tiny amounts of fungal matter in the soil that I analysed, but this likely arose over time because of the enriched organic content of the ring soil, rather than vice versa. And this view is borne out by the statement that Ted Phillips made in his second letter that the freshly obtained ring soil samples were devoid of fungal material. Also, fungal fairy rings are normally associated with a visible mushroom growth which was totally absent in the ring soil.

One of the persons who inspected the ring soil was a renowned expert on fungal diseases, Dr. Hubert Lechevalier of Rutgers University. He also concluded that the ring, although containing some fungal elements as most soils would do, was not the product of such an agency. The fact that there were increased amounts of metal ions in the ring soil would also be inconsistent with the fungal ring suggestion as it would be with any other supposed ‘natural origin’ theory.

If the silver nitrate test precipitation test can be carried out on commercial Fulvic Acid in order to rule the latter out as being the cause, I would argue that a natural origin for the ring can be overwhelmingly ruled out.

c) AUTHENTIC UAP ENCOUNTER HYPOTHESIS:

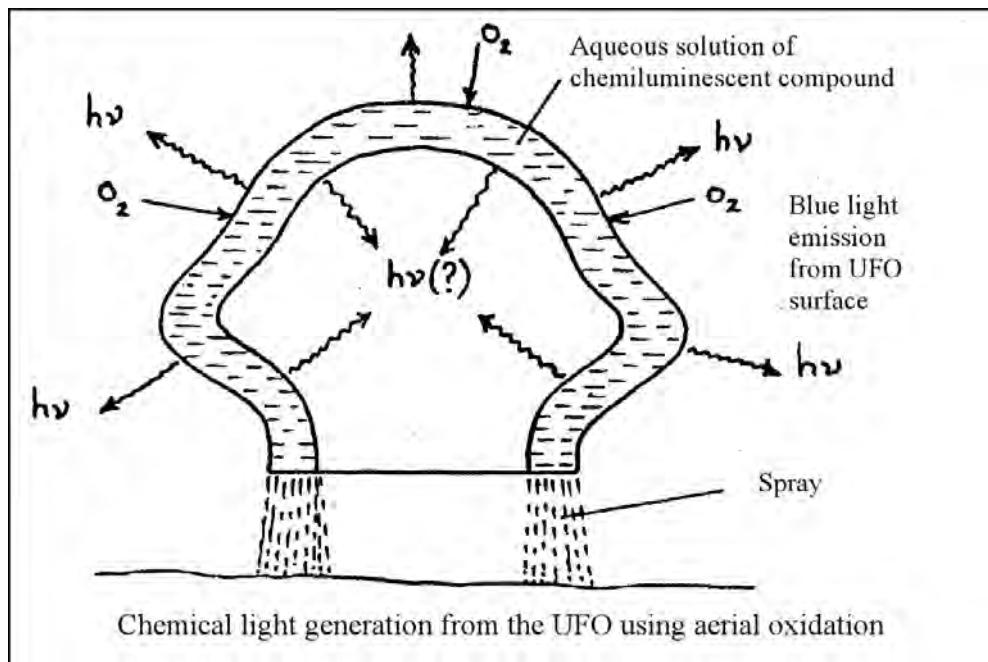
The discovery of the active component (AC) of the ring soil compound being a potential chemiluminescent substance was significant, and led to the possibility of explaining most of the peculiar attributes of the ring soil. The UAP itself was reportedly glowing brightly with blue, red and orange glows according to Ronald, and this glow was also being projected down towards the ground (see Figure 1), after which the latter was also found to glow. This suggests a connection, and I would propose the model shown in Fig.12 for explaining all three glows.

The UAP hypothetically would contain an envelope of chemiluminescent (CL) material within a double transparent wall that would potentially allow illumination of the UAP both internally and externally. An oxidant is required for the emission to occur, and this could conveniently be in the form of aerial oxygen which would need to be absorbed through an outer permeable surface. If the absorption was not uniformly distributed about the UAP's surface only parts of it would emit the bluish white light, while non emitting regions would retain the natural orange/red color of the solution depending upon Ron's viewing aspect.

To continue, some of this solution was apparently deposited from the UAP while it was situated under a tree (to avoid observation from the air?). The solution being discharged would likely react with aerial oxygen to result in the glow between the UAP and the ground. After the UAP departed the ground surface was still glowing because the surface layer was continuing to react with oxygen. As it did so, the original red color would be discharged to leave a whitish solid which is likely shown on the photo taken by the sheriff the next morning. It is very notable that Ronald described the glowing ring as being like a 'fluorescent glow' which is exactly how the light emission would be described from a CL reaction.

The hypothetical deposition of the solution over some minutes would also explain why the ring hydrophobicity extends to 14" below the surface. The ring elongation towards the wind direction would suggest that the solution was ejected in spray form. This could then explain why the ring soil felt 'moist' and 'cratered' to the touch soon after the event. The subsequent numbing effects experienced were very likely due to the potent dual hydrophobic/hydrophilic property of the compound which is a known requirement for topical anaesthetics.

Finally, once the UAP was airborne its surface reaction with oxygen to give the bluish-white emission (432nm) was now more uniformly distributed, which is why the UAP was described as being the color of an arc-welder. For comparison Appendix M exhibits a UAP case report that occurred in France in April, 1957 which has notable similarities to the Delphos case, including the fan-like luminosity observed beneath the object as well the description of the UAP being 'double-bodied'.



5. Conclusion

Although the aforementioned hypothetical scenario invoking a UAP spraying an aqueous solution into the ground may read like sci-fi fantasy, it nevertheless represents a model that fully explains the puzzling features of the sighting report. The notion that a UAP may utilize an envelope of a chemical solution to emit light and thus render itself illuminated may not be far-fetched. One of the most enigmatic characteristics of UAP are their vivid glows such as the often mentioned ‘glowing red ball’ by witnesses or indeed green/orange/blue versions of the same. Occasionally the terms ‘eerie’ and ‘fluorescent’ would be used in the same context. A chemical method for creating these different colors would be relatively easy to do and once employed may not be unduly affected by any kind of powerful EMF emission being used for the propulsion of the object.

In a NARCAP study published in 2001 entitled *UAP – Eighty Years of Pilot Sightings*, a catalogue of 1,305 cases of military, airliner and private pilots’ observations was presented for the period 1916 – 2000¹⁵. Of these cases only 31 used the term ‘metallic’ to describe the UAP, whereas 71 were ‘luminous’, 22 were ‘glowing’, 116 were ‘orange’, 122 were ‘green’ and 69 were ‘blue’, with the less obvious term ‘fluorescent’ being used for just 3 cases. Another factor to consider is that in those instances in which UAP abduction of humans has been claimed, a common theme used to describe the inside of the craft by witnesses is that it is uniformly illuminated with light that appears to be originating from the walls themselves. Clearly, an envelope of chemiluminescent material covering the UAP would potentially be able to provide illumination for both the inside and outside of the craft simultaneously.

PostScript: In 2020 a scientific team from Kansas State University visited the Delphos farm and with the guidance of the now adult Ronald Johnson dug up some of the affected material and were able to reproduce the ring soil hydrophobicity on camera¹⁶. Ronald had some years after the event entombed the ring surface by covering it with extra soil, thereby potentially protecting it from oxidation. More of the original material may therefore yet be available for any newer analysis undertaken.

Acknowledgements

I would like to thank Drs Timothy Oliver, Gregory Vasquez, Michael West and S. Little for their valued contributions in reviewing this report.

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Appendix A: Original 1972 Case Report by Ted Phillips

Landing Report from Delphos

Ted Phillips

An illuminated object was observed very close to the ground at a farm near Delphos, Kansas, on November 2, 1971, at 19.00 C.S.T.

Delphos is located 11 miles north-east of Minneapolis, in Ottawa County, Kansas. The site of the observation was on the Durel Johnson farm, half a mile north and half a mile east of Delphos. The farm is located on a section of the state which consists of scattered tree lines and fields. There are no hills in the area.

The witnesses were Durel Johnson, aged 52, Erma Johnson, 49, and Ronald Johnson, 16.

Possible confirming witnesses were Elton Smith, School Principal, Delphos, and Lester Ernsberger of Minneapolis.

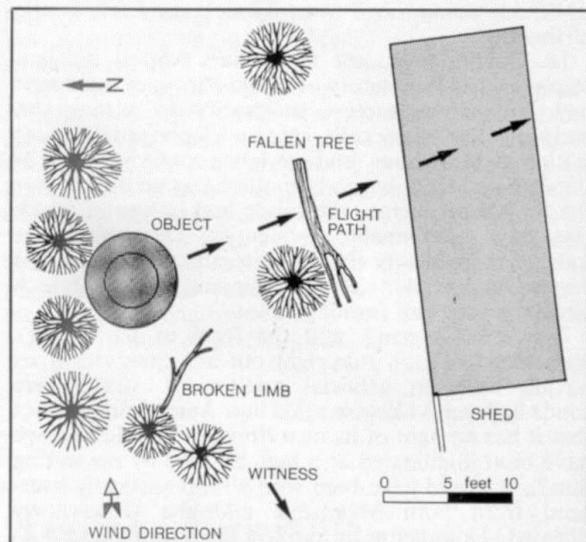
An investigation was conducted at the site on November 3, 1971, by Sheriff Ralph Enlow, Under-sheriff Harlan Enlow, and Kansas Highway Patrol Trooper Kenneth Yager. Further investigations at the site were made on December 4, 1971, and January 11, 1972, by the author.

The observation

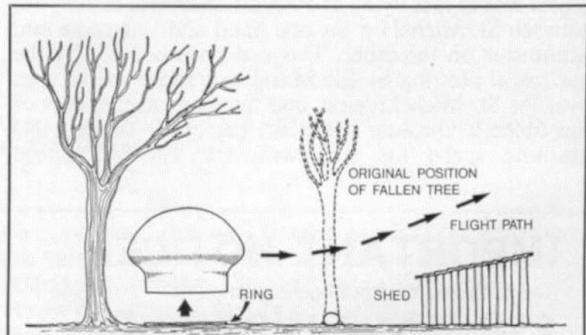
At approximately 7.00 p.m. C.S.T. on November 2, 1971, Ronald Johnson was tending the sheep, accompanied by his dog. Mrs. Johnson called from the back door of the Johnson house asking Ronald to come to supper; he replied that he would be through in a short time. After Mr. and Mrs. Johnson had finished their meal, Mrs. Johnson called the boy again, but this time he didn't reply. Mrs. Johnson stated that she didn't see anything of an unusual nature, such as a glow, and did not hear any sound.

Ronald stated that as he worked in the sheep pen and just after his mother called to him the first time—he heard a rumbling sound and the object was suddenly illuminated. Ronald and the dog did not notice the object prior to the sound. The object was illuminated from top to bottom by multi-coloured light. The illumination did not come from individual lights but rather it was a mass of varied colours over the entire surface. An actual metallic surface could not be seen, but the boy could make out a definite shape. The object appeared to be slightly domed at the top and base, with a slight bulge at the centre. There was a bright glow between the base and the ground. The object was hovering about 2ft. above the ground, and at no time did the witness see it touch the ground.

The witness was about 75ft. from the object and had a fairly clear view of it. Upon seeing the object he stood quite still, and noted that the dog was very quiet. Ronald stated that the colours were blue, red and orange and that the colours did not change at any time. The object had an estimated diameter of 9ft.



Plan showing the object and surrounding area



The object and surrounding area

and appeared to be about 10ft. high. He could not see any surface details because of the glow, which was quite bright, and the trees in the area were illuminated, as was the ground. The boy said that it hurt his eyes when he looked directly at the object, and for several days following the incident his eyes were sore, and he suffered from headaches.

The sheep were obviously disturbed by the presence of the object, or by the sound, as they were bellowing. Mr. Johnson stated that the sheep would jump from the pen each evening for a week after the incident.

¹ Bulletin of the Aerial Phenomena Research Organization, 3910 East Kleindale Road, Tucson, Arizona 85712, U.S.A.

² Skylook, Box 129, Stover, Missouri, U.S.A.

The boy was sure that he would have seen the object before the rumbling sound began had it been illuminated. Ronald likened the sound to that of an old washing machine which vibrates. After several minutes the object brightened at the base. The glow at the base enlarged somewhat and the object began to ascend with considerable speed at an angle, passing over a nearby shed by about 4ft. As it cleared the shed the sound changed to a high-pitched sound, like that of a jet aircraft.

As the sound changed the boy was suddenly unable to see—he claimed to have lost his vision completely. I asked him if he could see spots in his vision, as one would do following a photographic flash: he said he could not. (We may assume—and this would be an assumption only—that it was at this time that Mrs. Johnson called the boy the second time. As the object had ascended and was to the south of the house at a point not visible from the back door, Mrs. Johnson

ceeded to the landing site. They did not see the object again.

As Mr. and Mrs. Johnson and Ronald walked around the shed adjacent to the site, they saw, in the darkness, a glowing circle. The soil surface was glowing a bright grey-white. Portions of nearby trees reportedly glowed also. Mr. and Mrs. Johnson touched the ring surface, but it was not warm. The texture of the soil surface felt strange, like a slick crust, as if the soil was crystallised. Mrs. Johnson noted an immediate numbing at her finger tips. She rubbed her hand against her leg in an attempt to remove the dirt and that portion of her leg also became numb. She likened the numbness to that of a local anaesthetic. Mr. Johnson noted the numbness in his fingers also. For about two weeks this condition prevented Mrs. Johnson from taking pulse readings on patients at the rest home where she works. She stated that she simply could not feel anything with her finger tips. Mr. Johnson said that the numbness left his fingers in a much shorter time. They did not consult a doctor. Mrs. Johnson ran to the house and picked up their polaroid camera, returned to the site, and photographed it.

Upon returning to the house, Mr. Johnson called Mr. Willard Critchfield, Editor of the *Delphos Republican*: according to Mr. Critchfield the time was about 8.00 p.m. No action was taken at that time.

The following day—November 3, 1971—Mr. Johnson and Ronald drove into Delphos and talked with Mrs. Thaddia Smith. I quote from Mrs. Smith's report given to Sheriff Enlow on the afternoon of November 3, 1971:

"While visiting with Mr. Johnson and Ronnie during the noon hour, Wednesday, November 3, I learned some of the details of the previous night. This is the way it was told to me.

"Ronnie, aged 16, accompanied by his dog, was taking care of his flock of sheep at approximately 7.00 p.m. when suddenly he saw a blinding, brilliant light, and heard a loud rumbling sound that turned into a sound similar to a jet engine, and then the light ascended into the heavens in a southerly direction from an area in a shelter belt of trees behind a hog house near the sheep pen.

"He was nearly paralysed with fear, but finally managed to run to the house and called his parents out of the house to look at the light which was still visible high in the heavens to the south of their house.

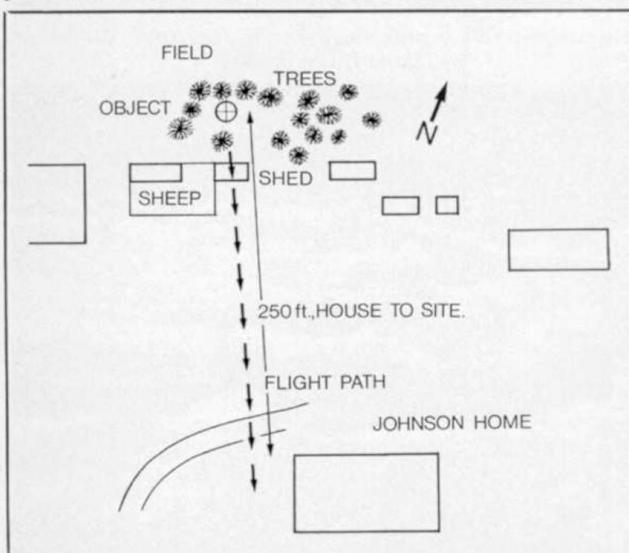
"The boy and his dog were still afraid. The dog wandered around the yard with his head up in the air as though still looking for the object.

"The family went to the area where the object was seen ascending from [sic]. There they found a large circle on the ground that had a fluorescent glow in the dark. Mrs. Johnson took a picture of the area.

"I, after listening to their experience, a little sceptical, having my curiosity aroused and being a newspaper reporter, decided to go to the Johnson farm home to take a picture of the area where the object had been.

"I was accompanied by my husband, Lester Smith, and son-in-law, Kenneth McCullick, who were also curious.

"Upon arriving at the scene I knew instantly that something had left evidence that it had been there.

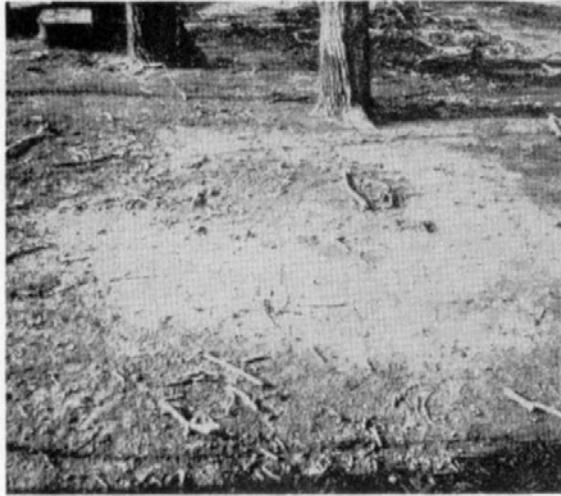


Plan showing situation of object, relative to the Johnson home.

would not have heard or seen anything unusual.) Ronald stated that, while unable to see, he could hear the sound fading into the distance.

After what seemed to be several minutes, the boy began to regain his sight. He saw the object in the sky and ran to the house. He told his parents that a flying saucer or something had landed and was still visible in the sky. Mr. and Mrs. Johnson both stated that the boy was frightened and excited when he entered the house. They didn't believe the boy at first and he became very aggravated.

Mr. Johnson then went outside and saw a bright light in the southern sky. He called out, and all three observed the light at a point 180° due south. They described the light as being very bright and at least half the apparent diameter of the full moon. I asked if it would have been as bright and large as an automobile light 100ft. away and they said it was larger and brighter. As they observed the light, which was the colour of an arc-welder, it was decreasing in size, moving into the distance. They watched the light for a brief time and then pro-



Photograph taken November 3, 1971, 19 hours after alleged landing by Sheriff Enlow. Note undisturbed section of left edge



Ring outlined by unmelted snow—facing NW—taken December 4, 1971

"The circle was still very distinct and plain to see. The soil was dried and crusted. The circle or ring was approximately 8ft. across, the centre of the ring and outside area were still muddy from recent rains. The area of the ring that was dried was about a foot across and was very light in colour.

"The object had crushed a dead tree to the ground either when it landed or took off, and from appearance had broken a limb of a live tree when it landed. The broken limb was most unusual, it would snap and break as though it had been dead for quite some time, yet it was green under the bark, and the upper area still had green leaves clinging to its branches. However the lower area was free of all leaves and some of the bark on the lower areas looked as though it had been blistered and had a whitish cast.

"I took a picture of the area and went back to the newspaper office to write my story. Thinking about the almost unbelievable things I had seen I decided to call the Concordia Weather Bureau to find out if they had seen any unidentifiable objects on radar, and was told their radar had not been turned on and they advised me to notify the Ottawa County Sheriff's Office. I called KSAL in Salina to report the incident. They also advised me to report to the sheriff's office, which I did."

The above report was written by Mrs. Thaddia Smith, reporter with the *Delphos Republican*, and given to Ottawa County Sheriff Enlow.

I now quote from a written report by Under-sheriff Harlen Enlow to me on January 11, 1972:

"Report of Harlen Enlow, Undersheriff

UFO SIGHTING AT DUREL JOHNSON RESIDENCE 1 N. $\frac{1}{2}$ E. OF DELPHOS

"At approx. 1.30 p.m. 11-03-71* this Officer received a call from Thaddia Smith, a reporter for the *Delphos Republican*, advising that a UFO had been reported at 7.00 p.m. 11-02-71 at the Durel Johnson farm 1 mile north and $\frac{1}{2}$ mile east of Delphos. Mrs. Smith advised that she had reported the incident to the Weather Bureau



Fallen tree, 7in. diameter

at Concordia, Kansas, and to KSAL Radio in Salina, Kansas, and that both had advised her to report it to this office.

"At approx. 2.00 p.m. 11-03-71 Sheriff Ralph Enlow, Kansas Highway Patrol Trooper Kenneth Yager, and Undersheriff Harlan Enlow went to the Johnson farm and talked to Mr. and Mrs. Johnson and their son Ronnie who had observed the UFO the previous night.

"We were advised by Ronnie that at approx. 7.00 p.m. 11-02-71 while out in the sheep pen with the sheep he had heard a loud noise and saw a bright light coming from a shelter belt behind the hog house. As he watched, the light rose into the sky and left in a southerly direction. Ronnie ran into the house and got his parents who came out and saw the object in the sky still headed South.

"Mr. Johnson took us out behind the hog house where we observed a ring shaped somewhat like a doughnut



Broken limb over W edge of ring

with a hole in the middle. The ring was completely dry with the hole in the middle and outside of the ring mud. There were limbs broken from a tree and a dead tree broken off, there. There was a slight discoloration on the trees. We were given a picture taken the previous evening by Mrs. Johnson which showed that the ring glowed in the dark. Undersheriff Enlow took a soil sample from the dried ring and photographed it.

"The soil sample taken was almost white in colour and very dry. We used a Civil Defense Radiological Monitor to determine that the soil was not radioactive. The soil sample and photographs are stored in the vault in the Sheriff's Office pending further investigation by the proper authorities.

"On 11-03-71 Mr. Lester Ernsbarger of 416 Argyle St. in Minneapolis advised Deputy Sheriff Leonard Simpson that at approx. 7.30 p.m. 11-02-71 he had observed a bright light descending in the sky in the Delphos area.

Signed: Harlan Enlow, Undersheriff."

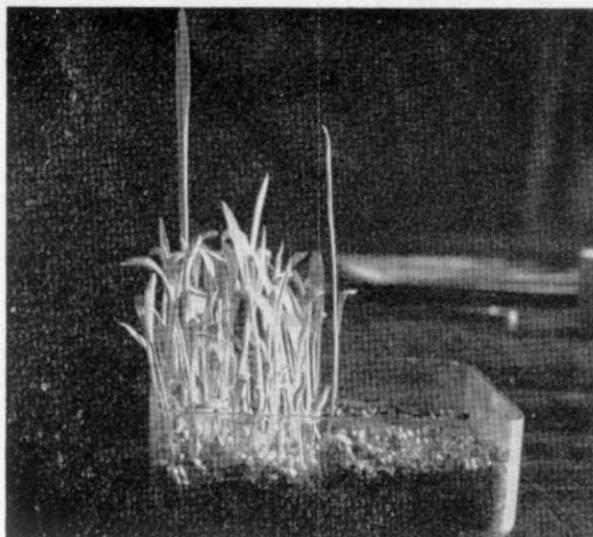
Field investigation: December 4, 1971

On the evening of December 2, 1971, I received a telephone call from Dr. J. Allen Hynek. During that conversation Dr. Hynek gave me the basic details of the Delphos sighting. I immediately placed a call to Sheriff Enlow and advised him that I would be in the area on Saturday morning, December 4, 1971. Sheriff Enlow offered to contact Mr. and Mrs. Johnson, which he did.

When I arrived at the small Kansas town of Minneapolis I found Sheriff Enlow in his office awaiting my arrival. We discussed the details of the case briefly and I was given a soil sample taken by the Sheriff on November 3, 1971, the day following the alleged landing. Sheriff Enlow and I then went to the Johnson farm which is located 11 miles north of Minneapolis.



Ronald Johnson and dog



Growth in normal soil taken 5ft. from ring—no growth in ring soil

When we arrived at the farm the temperature was 37° and the snow was melting. At the farm the condition of the lot was that of a bog. Mr. Johnson and Ronnie met us at the car and I was impressed with their sincere interest in the incident which had taken place there 32 days before. I began by talking with young Ronald. I would describe them simply as typical residents of the mid-west, having a rural background. The boy and his father are very pleasant and calm, not really excited by their unusual experience, but quite curious as to what the UFO may have been and what could have produced a ground marking such as the one found at the alleged landing site.

The witnesses

I discussed the observation with Ronald as long as the limited time would permit, he seemed sincere and not too interested in UFOs or space flight. Ronald stated that he had read a few books on UFOs in the past; that it had been at least a year since he had heard or read anything on the subject; that he had

hoped to see a UFO some day but didn't believe that he would. To my knowledge there have been no UFO sightings in the central Kansas area during the last year. He did not at any time attempt to embellish his story with wild comments or theories, and it seemed he tried very hard to answer each question correctly and to the best of his ability.

Durel Johnson stated that he and Mrs. Johnson had indeed rushed outside to see the brilliant object in the southern sky. Unfortunately, neither Mr. Johnson nor the boy were able to make any really sound estimates of the time periods during the observations. As they are not trained observers there were numerous details which they could not give with any certainty.

The traces on the ground

Following the discussion of the sighting we went to the landing site. To reach the site one must cross the farm lot which by then was extremely muddy. The melting snow had left a great deal of standing water along with the mud. As we approached the site we walked around a small shed and through scattered trees. To my amazement there was the ring, with snow melting from the ground in all the surrounding area, still to be seen after 32 days. It was perfectly outlined by the unmelted snow. Although the surrounding soil was extremely moist, we found that if the snow was removed from any portion of the ring the soil directly beneath the snow was dry and light brown in colour, in contrast with the black, moist soil in the ring centre and around the ring.

We removed snow from one section of the ring and introduced water into the exposed ring area: the soil would not permit the water to pass through the surface. This was most remarkable, as there had been several inches of rain and snow between November 2 and December 4.

Mr. Johnson and I next removed a sample from the ring. The sample contained a high concentration of a white substance, and this white material was evident in all of the ring soil that we exposed. The particles were not to be found in the soil in the centre of the ring, or in the surrounding soil. The ring soil was quite dry to a depth of at least twelve inches. The soil outside the ring was also sampled and was simply black and wet to a depth of at least eight inches. I cannot imagine soil exposed to the elements remaining so dry for such a long period of time.

The site

The site is located some 250ft. to the north of the farmhouse. The ground at the site is devoid of all plant life. A shed is located 23ft. from the centre of the ring, one edge of the shed being at 140° S. at 27ft., the other edge 200° S. at 25ft. The shed is 27ft. long and 4ft. high at the side towards the ring, and 5ft. high on the south side. A wooden fence runs west from the shed to the sheep shed where the witness stood, and the length of the fence is 51ft. The boy stood at a point 10ft. to the south of the fence.

Between the ring and the shed is a dead tree, located 145° S. at a distance of 16ft. from the ring centre. This

tree was dead before the incident, but was standing. The stump is 7in. high and 7in. in diameter and the break indicates that the tree may have been broken as the object made its descent along the assumed entry path. It appears that the tree was pushed towards the ring but fell, possibly due to a weak section on the eastern side of the trunk, at a right angle to the flight path. The fallen tree is 11ft. long and careful examination failed to reveal any marks at any point along its length. This tree could have been pulled over with a tractor and chain, but one would expect to find chain marks. Sheriff Enlow and I discussed this possibility and feel that this was not the case.

Also adjacent to the flight path one finds two 6in. diameter trees: 125° S. at 20ft. and 180° S. at 13ft. The flight path would have been between these two trees, the limbs of which extend towards the flight path, being 11ft. apart at a height of 12·5ft. above the ground. Two trees are located at 325° N. at 5ft. from the ring centre (1ft. from the ring edge) and at 35° N. at 5ft. from ring centre. These trees reportedly glowed and do show a slight discoloration on the ring side. A large broken limb is found still handing at 260° W. at a distance of 11ft. from ring centre. The limb is broken at a point 8·5ft. above ground. The limb was broken downwards, and the diameter at the break is 3in. When extended to its original position the limb would have been quite near the ring's edge.

Close examination of this limb showed several possible impact marks. One mark in particular is of interest—on a section of the limb which would have been very near the circle—and is about 1in. in length: the bark was peeled back exposing a green surface. This area was definitely not a natural fault in the bark. This limb was alive at the time of the alleged landing, and it would have taken a considerable pressure to have broken it.

Entry into the site would not have been possible to the north or east as those areas contain numerous undisturbed trees. A vertical descent or ascent would be out of the question as the tree branches directly above the ring were not damaged. The broken limb did show what appeared to be heat blisters, while branches were green at the centre, but would snap at the slightest pressure. The flight path would appear to have been as Ronald described it: between two trees, over the fallen tree, over the low shed and to the south. An object with the dimensions described by the witness could have made its way into, and out of, the landing site. A landing by any conventional aircraft is completely out of the question.

After taking the appropriate measurements and photographs, we returned to the house and again briefly discussed the observation.

I then drove back to Delphos and talked with a representative of the Concordia Weather Bureau by telephone. He stated that the meteorologist had visited the site and made a check for radiation, and that the results were negative. The meteorologist could offer no explanation for the ring, and felt that it was indeed unusual.

I was given photographs of the site taken by the *Delphos Republican*, November 3, 1971, and a small branch taken on the same day.

Field investigation: January 11, 1972

I decided that a second trip to the alleged landing site was necessary to obtain the needed information, and to get the most accurate measurements of the site possible. I felt that the trip would be worthwhile, if only to observe any changes in the ring.

I talked with Sheriff Enlow about the possibility of a hoax, we discussed this at length and both are of the opinion that a hoax would be most unlikely. I obtained a signed statement from Sheriff Enlow regarding the reliability of the witnesses. I quote his statement:

"TO WHOM IT MAY CONCERN:

"In reference to the UFO sighting at the Durel Johnson residence near Delphos, Kansas, on November 2, 1971. The Johnsons are life-time residents of Ottawa County and the Delphos Community. They are well known and well respected by Officers from this Department. It is the opinion of this Officer that the information given by them would be accurate to the best of their knowledge.

"In reference to the UFO sighting on November 2, 1971, by Mr. Lester Ernsbarger of Minneapolis, Kansas. Mr. Ernsbarger is an Employee of the Minneapolis Street Department and a reserve Police Officer with the Minneapolis Police Department. I feel that his information would be accurate to the best of his knowledge.

"Signed: Ralph Enlow, Sheriff, Ottawa County, Kansas."

After talking with Sheriff Enlow I proceeded to Delphos where I stopped at the office of the *Delphos Republican*. I talked again with the Editor, Willard Critchfield and reporter Thaddia Smith. I obtained a signed statement from Mrs. Smith as she had gone to the site on November 3, 1971, and obtained branch samples and photographs. I quote from her statement:

"After receiving information late in the afternoon of November 3, 1971, that personnel from the Ottawa County Sheriff's Office, Highway Patrol and the Cloud County Weather Bureau had visited the site and taken samples of the soil and trees, I, with my husband returned to the Johnson farm that evening to secure further information they might have for my newspaper article concerning the mysterious UFO.

"The Johnson family, my husband and I, without lights, walked in the darkness to the site.

"As we came into view of the area we could see very distinctly the glowing ring. In the area around and inside the circle there was nothing but darkness giving a person an eerie feeling.

"The Johnson family having lived in the Delphos community their entire life are respected, truthful, conscientious, trustworthy and a well-thought-of typical hard-working Kansas farm family.

"Signed: Thaddia Smith, Reporter, *Delphos Republican*."

I then returned to the Johnson farm to find Mr. Johnson and Ronnie working in the lot. The three of us went through the observation once again the details were basically the same as given before. Mr. Johnson did mention that the dog avoided the ring on the evening following the sighting, and he would return to the area only after a number of people had

visited the site the following day. Mr. Johnson stated that he had lived on the farm for the past 14 years, and that the site has never had any structures on it.

The three of us went to the site and the ground which had been muddy on my previous visit was now dry. The ring was faintly visible as it was a slightly lighter colour than the surrounding soil. We proceeded to "water down" the area with several buckets of water, and as we placed the water on the soil the ring became quite prominent. As the surrounding soil immediately absorbed the water it turned dark black, but the ring soil would not admit the water, and simply turned a lighter colour. The water stood on the ring soil briefly and suddenly ran off the surface into a lower section of ground at the centre, as it did so the surface appeared dry. It was as if the water had been poured on a glass surface.

We must remember that all this was taking place 71 days after the ring appeared. Mr. Johnson and I opened the ring in several areas all were dry and contained the white substance. We were able to expose the soil to a depth of 14in. it was still dry at that point. I opened the soil at the ring edge in order to see the normal soil meeting the ring soil from the surface to a depth of 6in. (I did not go deeper at this point) the ring soil was dry with the white substance, the normal soil joining the ring was black, damp and did not contain the white material.

On the western edge of the ring one finds an area which was not dried; it contains none of the white material. The ring has an irregular diameter of 8ft., the ring width ranges from about 12in. to over 20in. The greatest width is at the eastern side. This is interesting as it would have been down wind from the ring centre it may be possible that the wind acted as a spreading agent.

After spending several hours at the Johnson farm I drove back to Delphos and talked with Mrs. Johnson at a rest home where she works. Mrs. Johnson is a very pleasant, soft-spoken individual, sincere and intelligent. As she related the events of the evening of November 2, 1971, she simply confirmed the information given me by Mr. Johnson and Ronnie. She did state that the object seen in the sky was quite large and bright and that it was moving away from them, growing smaller. She said that as she touched the ring soil minutes after the alleged ascent it felt cool, not at all warm. It felt strange, having a slick, crusty feel. She felt the numbing in her fingers and tried to remove the soil by rubbing her hand against her leg. That portion of the leg became numb also, this condition persisted for more than two weeks.

During my first trip, and during this visit as well, I attempted to meet Lester Ernsbarger who is a possible confirming witness. I have not been able to contact him as of January 16, 1972.

Possible confirming witnesses

Elton Smith, Box 326, Delphos, Kansas, telephone 913-523-4357. Elton Smith is employed at the Delphos Attendance Center as Principal-Educator.

Smith stated the following about the observation which took place at about 6.20 p.m. on November 2, 1971:

"I saw *only* a streak of light coming downward, to the North of me (in the approximate Delphos area) as I was walking to the north from the school building to the football field in Bennington, Kansas. I did not see an object, but just thought it was a falling star."

As Smith observed the streak descending in the general direction of the alleged landing site just 40 minutes prior to the observation of the landed object, we might assume—and it would be pure conjecture—that Smith may have indeed seen the object on its landing path. If the streak was a meteor, it would have been quite bright as the sky was not in total darkness. As no object was seen, however, we certainly cannot consider this to be a confirmation of the Delphos UFO.

* * *

Lester Ernsbarger, 416 Argyle Street, Minneapolis, Kansas 67467. Ernsbarger, a Minneapolis Street Department employee and reserve police officer observed a bright light in the sky towards Delphos at 7.30 p.m. No other details as of this date.

Summary

Based on the interviews with Mr. and Mrs. Johnson and Ronald, Sheriff Enlow and reporter Thaddia Smith, and after seeing the alleged landing site over a period of 71 days, it presents, I believe, considerable evidence which would seem to confirm the unusual event described by the witnesses. I would suggest that this may be a most significant report.

If one eliminates the observation of the object and the evidence found at the site, the ring remains, and this unusual ground mark is indeed a mystery. Although, according to the Concordia, Kansas, Weather Bureau, there had been several inches of rain and snow at the site, the ring soil remains extremely dry and light brown in colour. The contrast between the ring soil and the surrounding soil is incredible.

It is my belief, *based on the information at hand*, that we have here an excellent example of the unusual phenomena which has been reported by so many for so long.

Comparison cases

The following reports from my physical trace file compare favourably with the Delphos, Kansas, case, which is listed as case P.T. > 367

P.T. > 099

Tucupan, Argentina, January 31, 1963. 2 scorched rings were found, each 14in. wide with a diameter of 12ft. and lying some 16in. apart forming as it were a figure "8". Police and scientists made deep cuts and found that not only the grass, but also its roots, had been burnt down to a depth of 4in., "as though dessicated at a temperature in excess of 2,000°, yet without combustion or flames." On the rings a white ash-like powder was found. Later, Juan G. Perea, overseer of the neighbouring "El Trenzel" Ranch, said that he and his wife and children had seen an egg-shaped object pass over the ranch and go down towards the precise area where the marks were found. The object was travelling at a very slow speed.

P.T. > 090

Standoff, Alberta, Canada, May, 1968. A Mrs. Hoeffer watched a bright, circular object land about

300 yards away. The witness ran away. The next day, two oval-shaped burned areas were found. Digging in the larger circle, which was 9ft. in diameter and 7½in. in depth, revealed that it had been *burned down about 3ft.* The centre of the circle was not as badly burned as the outside perimeter. The grass grew in the burned area the next year, but the sheep wouldn't eat it. Also the growth within the oval was much coarser, greener and taller than in the area surrounding. *The second circle was 8ft. in diameter.*

P.T. > 226

Boggabri, Australia, October 19, 1970. Unusual ground markings were found on the property of Mr. W. Erratt. They occurred in the centre of a paddock, the soil was damp and had the cohesive properties of clay. About 80 pints of rain had fallen just prior to the investigation of the site, making the site rather muddy at the time of observation. However, the initial portions of all the holes were hardened on the inside, as though they had been subjected to great heat. This contrasted markedly with the soft, surrounding soil. Compression rings were found in some cross-sections of the holes. An encrustation was found on the inside of the holes over the length which was hardened and was also found on the surface, this area also appeared dry and hard. The central hole was about 4½in. in diameter, had sharp sides and appeared to be cut as if with an auger. It was inclined at about 20° to the vertical and 16in. deep. It was slightly greater than 4½in. inside diameter at the base. A white encrustation was found in all the holes. The markings consisted of a "crater" 8in. deep and 6ft. in diameter. Inside the crater were the holes, disposed apparently symmetrically about a central hole.

P.T. > 357

Waihoke, New Zealand, January, 1965. Ross Liverton reported finding a ring in a sheep-holding pen on his farm. The circle of bare earth was 8ft. in diameter and 12in. wide. The area was a quagmire of mud. But after a shower of rain the circle reappeared as if the ground below was porous. The rest of the ground was covered with grass but the circle did not produce any growth. The ring became fainter until it disappeared after 4 years.

Appendix B:

Report of Undersheriff Harlan Enlow

UFO sighting at the Durel Johnson farm

At approximately 1:30 P.M. 11-03-71 this officer received a call from Thaddia Smith, a reporter for the *Delphos Republican*, advising that a UFO had been reported at 7:00 P.M. 11-02-71 at the Durel Johnson farm 1 mile N and 1/2 mile E of Delphos. Mrs. Smith advised that she had reported the incident to the Weather Bureau at Concordia, and to KSAL Radio in Salina, and that both had advised her to report to this office.

At approx. 2:00 P.M. 11-03-71 Sheriff Ralph Enlow, Kansas Highway Patrol trooper Kenneth Yeager and Undersheriff Harlan Enlow went to the Johnson farm and talked to Mr. & Mrs. Johnson and their son Ronnie who had observed the UFO the previous night.

We were advised by Ronnie that at approx. 7:00 P.M. 11-02-71 while out in the sheep pen he had heard a loud noise and saw a bright light coming from a shelter belt behind the hog house. As he watched, the light rose into the sky and left in a southerly direction. Ronnie ran into the house and got his parents who came out and saw the object in the sky still headed south.

Mr. Johnson took us out behind the hog house where we observed a ring shaped somewhat like a

doughnut with a hole in the middle. The ring was completely dry with the hole (undisturbed area not a hole) and the outside area entirely mud.

There were limbs broken from a tree and a dead tree broken off there. There was a slight discoloration on the trees. We were given a picture taken the previous evening by Mrs. Johnson which showed that the ring glowed in the dark. Undersheriff Enlow took a soil sample from the dried ring and photographed it.

The soil sample taken was almost white in color and very dry. We used a Civil Defense Radiological Monitor to determine that the soil was not radioactive. The soil sample and photographs are stored in the vault in the Sheriff's office pending further investigation by the proper authorities.

On 11-03-71 Mr. Lester Ersnberger of 416 Argyle St. in Minneapolis (Kansas) advised Deputy Sheriff Leonard Simpson that at approx. 7:30 P.M. 11-02-71 he had observed a bright light ascending in the sky in the Delphos area.

(Signed)
Harlan Enlow,
Undersheriff

Appendix C: Michael Swords compilation of Laboratory Data

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Research Note: Delphos, Kansas, Soil Analysis

To the Readers:

The following material represents a cluster of data analyses of one of the most famous "landing trace" cases in UFO history, the alleged close encounter of the second kind at Delphos, Kansas, on November 2, 1971. The analyses were conducted by a variety of outstanding laboratories, mostly in the United States, at the request of Dr. J. Allen Hynek and Mr. Ted Phillips, the primary case investigator. As many readers know, Mr. Phillips is almost legendary as a physical-trace researcher. He served as the focus for the collection of this data, most of which has unfortunately lain unpublished in the files of the Center for UFO Studies. We are privileged to present this accumulation of data as an extended research note, with special thanks to Ted Phillips, J. Allen Hynek, and the laboratories and researchers who cooperated to unravel the facts of this peculiar occurrence. Readers unfamiliar with this interesting case may wish to refer to: Landing Case in Kansas, 1971, *APRO Bulletin*, Vol. 20 (November-December): 1-3; Ted Phillips, 1972, Landing Report from Delphos, *FSR Case Histories*, No. 9 (February): 4-10; More on Kansas Case, 1972, *APRO Bulletin*, Vol. 20 (March-April): 8-9; B. Ann Slate, 1973, Kansas UFO Leaves Hard Evidence, *Fate*, Vol. 26 (April): 88-96; and Erol A. Faruk, 1990, The Delphos Case: Soil Analysis and Appraisal of a CE-2 Report, *Journal of UFO Studies*, new ser., Vol. 1: 41-65.—MDS.

SOIL ANALYSIS RESULTS

COMPILED BY MICHAEL D. SWORDS

College of Natural Sciences, Western Michigan University, Kalamazoo, MI 49008, U.S.A.

THE CASE IN BRIEF

Single witness Ronald Johnson, the 16-year-old son of farming parents living near Delphos, Kansas, stated that he was working outside on November 2, 1971, at approximately 7:00 p.m. CST when he heard a rumbling sound and saw a light. The light and sound came from a multicolored luminous object, hovering about two feet above the ground. The object, about 75 feet away, was domed on top and narrower at the bottom, resembling a large, squat button mushroom. Although luminous throughout, an exceptionally bright light appeared between the base of the object and the ground. The smaller diameter was about 9 feet, and the object's height about 10 feet. After several minutes the object's base brightened, and it rose at a shallow angle over a shed. The rumble changed to a high-pitched whine, which occurred simultaneously with a temporary loss of vision to the witness. The object's sound receded rapidly. Minutes later, his vision returned. He summoned his parents and they witnessed a bright light receding on the southern horizon. Inspecting the original location, all three family members discovered a glowing, bright gray-white circle. The soil internal to the ring felt unusual and produced a numbing effect on the skin. The incident was reported the following day to the sheriff's office.

GROSS CONSTITUENCY AND PROPERTIES OF THE SOIL

(a) Primary Witnesses' Remarks

1. There was a glowing circle (bright gray-white).
2. The ring surface was not warm (despite the glow).
3. The surface texture was like a slick crust, like crystal.
4. The ring material numbed the skin.

(b) Local Sheriff's Remarks, November 3, 1971

"We observed a ring shaped somewhat like a doughnut with a hole in the middle. The ring was completely dry with the hole in the middle and outside of the ring mud. ... We were given a picture taken the previous evening by Mrs. Johnson which showed

that the ring glowed in the dark."

"The soil sample taken was almost white in color and very dry . . . the soil was not radioactive."

(c) News Reporter's Remarks, November 3, 1971

"The circle was still very distinct and plain to see. The soil was dried and crusted. The circle or ring was approximately 8 feet across, the center of the ring and the outside area were still muddy from recent rains. The area of the ring that was dried was about a foot across and was very bright in color."

"I, with my husband, returned to the Johnson farm that evening [November 3] to secure further information . . . As we came into view of the area we could see very distinctly the glowing ring. In the area around and inside the circle there was nothing but darkness . . ."

(d) Primary Ufological Field Investigation, December 4, 1971 (Snow-covered)

"Although the surrounding soil was extremely moist, we found that if the snow was removed from any portion of the ring the soil directly beneath the snow was dry and light brown in color, in contrast with the black, moist soil in the ring center and around the ring. We removed snow from one section of the ring and introduced water into the exposed ring area: the soil would not permit the water to pass through the surface."

"[Sampling the soil] The sample contained a high concentration of a white substance, and this white material was evident in all of the ring soil that we exposed. The particles were not to be found in the soil in the center of the ring, or in the surrounding soil. The ring soil was quite dry to a depth of at least twelve inches. The soil outside the ring was also sampled and was simply black and wet to a depth of at least eight inches."

"The ground at the site is devoid of all plant life."

(e) Second Investigation, January 11, 1972 (Dry)

"The ring was faintly visible as it was a slightly brighter color than the surrounding soil. We proceeded to water down the area with several buckets of water, and as we placed the water on the soil the ring became quite prominent. As the surrounding soil immediately absorbed the water it turned dark black, but the ring soil would not admit the water, and simply turned a lighter color. The water stood on the ring soil briefly and suddenly ran off the surface into a lower section of ground at the center; as it did so the surface appeared to dry. It was as if the water had been poured on a glass surface."

"[Sampling ring areas] . . . all were dry and contained the white substance . . . to a depth of 14 inches [the soil] was still dry."

"The ring soil was dry with the white substance, the normal soil joining the ring was black, damp, and did not contain the white material."

"On the western edge of the ring one finds an area [as if the ring were incomplete or broken] which was not dried. It contains none of the white material. The ring has

an irregular diameter of 8 feet; the ring width ranges from about 12 inches to over 20 inches. The greatest width is at the eastern side [the downwind side from ring-center]."

(f) *Dean Stewart Investigation, November 1972*

"I examined the ground and found that the ring had disappeared but the ground remained resistant to water. I found that the ground on the ring and within the circle was devoid of plant life except for some small mushroom-shaped plants that were growing. I dug a few of the plants on the ring and found a wispy gray-white film running through the dirt."

Stewart noted that simple soil-in-cup observation showed that extreme hydrophobicity remained. However, hydrophobicity in soil nearest to the "plants" was less, and gradually accepted water over a 24-hour period. Ring soil away from "plants" resisted longer. Also, Stewart reported numbness in his fingers for three days after digging the soil. He was also told by Mr. Johnson that he too (not only his wife) had this similar experience.

(g) *Moisture Content Tests, Ted Phillips*

Mr. Phillips, as primary investigator of the Delphos case, returned several times to the site, and made the following tests using an MC-320 Moisture Tester, accuracy = $\pm 0.5\%$. See Table 1.

(h) *Gross Inorganic Content*

1. University of North Dakota finding: "Basically the sample is that of lake or stream sand consisting of quartz and altered feldspar."
2. Northern Illinois University finding: "mica-claysize kaolinite; FeO(OH) iron compound not in control soil; lots of quartz, colloidal size; feldspar (not in control soil); normal, ordinary soil; hydrophobicity related to organic content."

(i) *Plant Growth Capability*

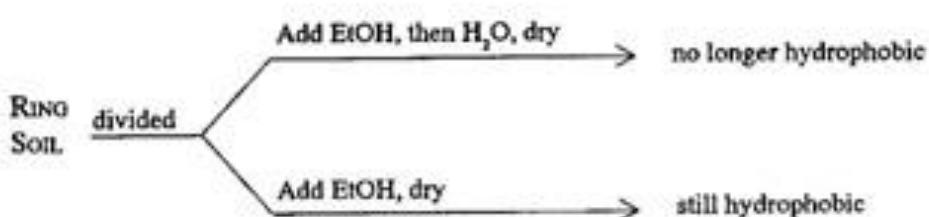
Northwestern University finding: Plant growth in soil within the ring area (the hydrophobic soil) is retarded over growth in external control soil by a factor of 5:1.

Table 1. Moisture Content Tests

Date	Control	Location	Ring	Location
12/04/71	19.6%	surface - $1\frac{1}{2}$ "	-1.0%	surface - $1\frac{1}{2}$ "
01/11/72	16.3%	surface - $1\frac{1}{2}$ "	-1.0%	surface - $1\frac{1}{2}$ "
03/18/72	17.6%	surface - $1\frac{1}{2}$ "	2.1%	surface - $1\frac{1}{2}$ "
04/15/78	18.3%	surface - $1\frac{1}{2}$ "	15.4%	surface - $1\frac{1}{2}$ "
04/15/78	—	—	18.5%	2" - $2\frac{1}{2}$ "
04/15/78	—	—	16.3%	8" - $8\frac{1}{2}$ "

(j) *Hydrophobicity*

1. Northwestern University finding: "Drops of water, ethanol and carbon tetrachloride were placed on the ring soil to see if the hydrophobic nature of the soil would be affected. Treatment with CCl_4 did not change the hydrophobicity of the ring soil. However, the EtOH did change the soil. The EtOH experiment was conducted as shown below.



"Apparently, when the water is added to the ring soil immediately after the EtOH, something is washed away so that surface properties of soil are changed."

2. University of California, Berkeley, finding: "10-gm samples were washed with about 20ml EtOH, 20ml of 50% EtOH in water, and untreated. After drying at about 55°C., the untreated and EtOH treated samples were still hydrophobic, whereas the sample treated with dilute EtOH could be wetted readily. EtOH does wet the sample, though it is difficult to wet samples with water alone."

"Further experiments in which small samples of soil collected on August 8, 1972, were thoroughly mixed with water and ground mildly, and then were extracted with several volumes of water and dried, show that the hydrophobic property can be removed with just water extraction, under these conditions."

3. University of North Dakota finding: "The sample was found to be not only insoluble in water or any mineral acid (such as muriatic) but also unwettable in such liquids—the individual sand grains and even smaller nodules actually floating on water. At the same time, this material was completely wettable in some organic solvents—such as Tri-Chloro-Ethylene—but likewise insoluble. The material sunk in such solvents because of their lesser surface tension than that of water."

"Heated to redness in the flame of a propane torch, the nodules did not disintegrate. This test ruled out the possibility of the bonding substance being some synthetic plastic."

"The sample contained both fine-grained material and its nodules, the latter formed when some bonding substance was sprayed or spilled on the sand. There were also found two columnar formations consisting of the same sand grains cemented together by the bonding substance as the latter was drying and crystallizing. Their shapes suggest the bonding material being monoclinic, crystallographically. There was no radioactivity noted."

PHYSICAL FORCES ON THE SOIL

(a) University of Florida Opinion

"I know of no lightning phenomenon that could have produced the effects described in your letter. I might add that the ball lightning literature contains many reports of 10 to 20 foot-in-diameter balls which give the impression of being as bright as lightning and may last for a minute or more. Generally these are seen at treetop or roof level from hundreds of yards away and occur during thunderstorms."

(b) Oak Ridge National Laboratory Finding

"...the question being pursued in these particular analyses was whether any unusual radioactivity had been induced in the affected sample. The histograms indicate that there is no unusual radioactivity in the affected soil. The variations in the histograms are due to statistical fluctuations, and these are quite large because the number of counts is small, as would be expected from soil with normal radioactivity. Some of the peaks in the spectra of both samples occur at energies at which peaks are seen in the gamma-ray spectra of uranium ore. It is likely that there are traces of fallout particles in the soil resulting from early A-bomb testing in Nevada." See Figures 1 and 2.

(c) Texas A & M University Opinion

"Microwaves in the range 1,000-10,000 megahertz at power densities above 100 watt seconds/cm², can cause plant symptoms similar to burning and can definitely cause dehydration. Depressed soil level has not been observed in any of our studies, but it is conceivable that some depression of soil could occur if sufficient amounts of water were removed to a sufficient depth.

"Wilting and browning of soybeans, occurring very quickly after treatment, can be caused by microwaves in the range mentioned. Rapid drying with the green color retained often occurs with microwave. Multicolored lights, glowing of soil and trees and numbing sensations, could not have been caused by microwaves. All of these phenomena can be induced by energy in other parts of the electromagnetic spectrum—for example, electricity can cause numbing sensations, and light can be received by biological photo receptors, e.g., chlorophyll, and later reradiated at a different wavelength. Microwaves can cause breaking of trees and tree branches if the water contained therein changes to steam rapidly.

"From your descriptions, the 'ring' of soil was not only dried, but changed in structure. Changes in soil structure such as you describe would require the application of large amounts of energy. We have not seen appreciable effects on soil structure at power intensities from 100-400 joules/cm², and a consideration of the inherent energies leads me to believe that increasing power density by one or even two orders of magnitude would not result in effects on soil structure such as you describe.

"In summary, some of the effects you describe could be attributed to exposure to relatively high power densities of microwaves; others could not. All the biological

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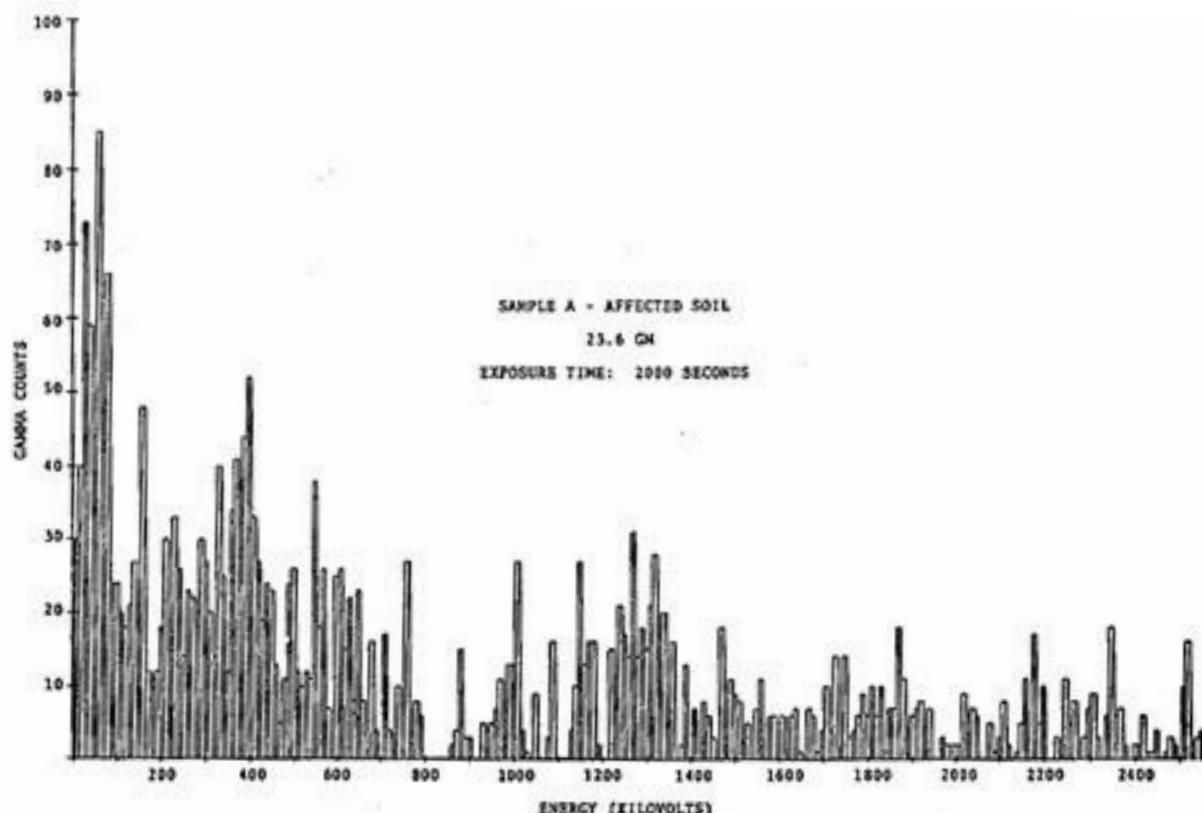


Fig. 1. Gamma-ray counts vs. 10 keV energy bands for affected Delphos soil.

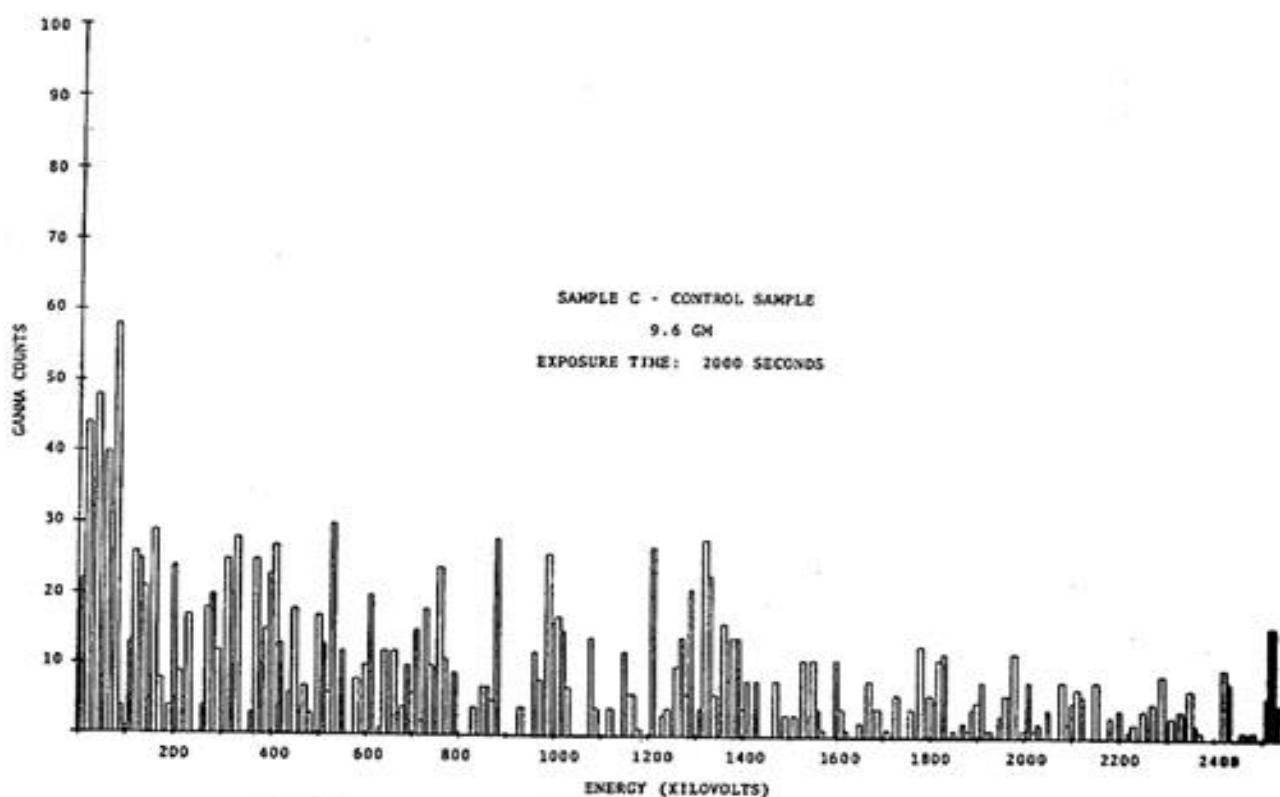


Fig. 2. Gamma-ray counts vs. 10 keV energy bands for normal Delphos soil.

effects described could conceivably be caused by energy in some portion of the electromagnetic spectrum, but no one area could account for all the effects described."

(d) University of Kansas Finding

"I tested all samples for natural thermoluminescence and found that they all showed similar glow-curves although minor differences were detectable. The natural thermoluminescence is of very low intensity with a single peak at approximately 290°C.

"After completing these tests, I irradiated the three samples you sent me with a total dose of 3×10^5 rad gamma radiation in our CO^{60} irradiation, and re-ran the glow curves. All three samples showed intense luminescence with the main peak at 125°C. The intensity of this peak is 100 to 200 times greater than the high temperature peak shown by the natural material. This means that the samples are sensitive to high energy radiation and that a strong peak should be present at about 125°C. if they had been irradiated. Since none of the natural samples show this peak it is highly unlikely that the samples were irradiated by ionizing radiation.

"We also tested the samples by means of our electron-spin-resonance apparatus but

Table 2. Emission Spectrographic Data—Quantitative Analysis

Element	72031	72032	Element	72031	72032
Li	—	—	Cu	trace	trace
Be	—	—	Zn	—	—
B	trace	trace	Ga	—	—
Na	trace	trace	Ge	—	—
Mg	minor	minor	As	—	—
Al	minor	minor	Sr	trace	trace
Si	major	major	Zr	trace	trace
P	major	major	Mo	—	—
K	trace	trace	Ag	—	—
Ca	minor	minor	Cd	—	—
Ti	minor	minor	Sn	—	—
V	trace	trace	Sb	—	—
Cr	trace	trace	Ba	trace	trace
Mn	trace	trace	Pt	—	—
Fe	trace	trace	Au	—	—
Co	—	—	Pb	—	—
Ni	trace	trace			

Table 3. Qualitative Spectrochemical Analysis and Concentrational Estimates of Detected Constituents

<i>Sample taken 20 ft. E of ring</i>		<i>Ring sample taken 1/11/72</i>	
Element	Concentration	Element	Concentration
Si	5.0% - 50.0%	Si	5.0% - 50.0%
Al	3.0% - 30.0%	Al	3.0% - 30.0%
Fe	1.0% - 10.0%	Fe	1.0% - 10.0%
Ti	0.3% - 3.0%	Ti	0.3% - 3.0%
Na, Ca, K	0.2% - 2.0% (each)	Mg, Na, K	0.2% - 2.0% (each)
Mg	0.1% - 1.0%	Zr, Sr	0.03% - 0.3% (each)
Zr, Sr	0.03% - 0.3% (each)	Mn	0.02% - 0.2%
Mn	0.01% - 0.1%	Cu	0.005% - 0.05%
Cu	0.005% - 0.05%	V	0.003% - 0.03%
V	0.003% - 0.03%	Pb, B, Ar	0.001% - 0.01% (each)
Pb, B, Ni	0.0005% - 0.005% (each)	Sn, Ni	0.0005% - 0.005% (each)
Sn, Cr	0.0001% - 0.001% (each)	Cr	0.0003% - 0.003%
Co	trace < 0.0005%	Co	trace < 0.0005%
Ar	trace < 0.0001%	Ash	83.7%
Ash	91.7%		

failed to find significant differences between the ring and control samples. ESR tests after irradiation showed little change."

INORGANIC ELEMENTAL ANALYSIS

(a) University of Kansas Finding

Soil comparison essentially identical elementally (72031 = normal control; 72032 = ring). See Table 2.

(b) Chicago Spectro Service Lab Finding

Calcium possibly higher; ash content lower in ring soil. See Table 3.

(c) Williams/APRO Finding

"... spectrographic analyses indicated that there were about the same amounts of Si, Al, Fe, Mg, Na, and K in the two samples, but that the calcium concentration was apparently more concentrated in the ring sample."

"... a significantly lower ash content in the ring sample..."

"A higher concentration of Mn, Sn, Ag, and Cr in the ring soil, but about the same in Ti, Zr, Sr, Cu, V, Pb, B, Ni, and Co."

DELPHOS RESEARCH NOTE

Table 4. University of Utah and Agri-Science Lab Test Results

Test for	University of Utah		Agri-Science Lab	
	Control, 5' E (but markedly different)	Ring	Normal, 20' away (5733)	Ring B4 (5734)
pH	7.0	5.8	6.4	6.0
EC	1.0 (no units)	5.7	4.0 mMhos/cm ²	15.0 mMhos/cm ²
Lime	0.0	0.0	not reported	
Ca	0.64%	0.61%	912 ppm	2400 ppm
Mg	540 ppm	720 ppm	87 ppm	730 ppm
Na	132 ppm	129 ppm	310 ppm	310 ppm
K	0.13%	0.27%	940 ppm	1680 ppm
NO _x	not tested		144 ppm	102 ppm

(d) University of Utah Finding

Lower pH, higher conductance in ring soil. Ring soil significantly higher in magnesium and potassium content (but not calcium). See Table 4.

(e) Agri-Science Lab Finding

Similar pH, higher conductance in ring soil. Ring soil significantly higher in calcium, magnesium, potassium, iron, manganese, copper, and zinc. See Table 4.

Further findings from Agri-Science were the following ppm of minor cations, extracted by 0.1 N HCl, determined by atomic absorption (Variant Model 1000):

	Control	Ring
Fe	6.80	28.00
Mn	5.20	56.00
Cu	1.00	2.48
Zn	0.18	20.00

(f) Oak Ridge National Lab Finding

Results of Scanning Electron Microscope X-Ray Analysis (SEM-XRA):

"The composition of soil is greatly variable from one small piece to another. Because the SEM-XRA technique involves only a microscopic sample, I requested that analyses be made of ten random samples of Sample A and Sample C. The results are listed in [Tables 5a-5b]. Note that samples A-2 and A-10 of the affected soil contained over 5% calcium, whereas the maximum calcium in the control samples was 1.8%. Also note that sample A-1 of the affected soil contained 3.8% copper, whereas the maximum copper content in the control samples was 1.7%."

**Table 5a. Analysis of Delphos Soil Samples by SEM-XRA
(Sample A—Ring Sample)[§]**

Sample	%Al + Si*	%Ti	%Fe	%Cu	%Ca
A-1	90.03	0.27	4.58	3.80	1.31
A-2	82.73	2.11	9.87	0.24	5.05
A-3	87.95	1.12	7.70	0.87	2.36
A-4	89.26	1.31	5.93	1.33	2.16
A-5	87.93	1.28	6.70	2.51	1.58
A-6	90.64	0.00	7.53	0.64	1.20
A-7	87.60	1.20	9.53	0.00	1.66
A-8	85.75	0.98	10.00	1.36	1.39
A-9	87.71	0.98	8.14	0.55	2.63
A-10	85.14	0.47	8.79	0.53	5.08
Average	87.47	0.97	7.88	1.18	2.44
Variance	5.69	.36	3.15	1.35	2.13
Std. Deviation	2.38	.60	1.77	1.16	1.46
% Std. Deviation	2.72	61.90	22.50	98.30	59.80

**Table 5b. Analysis of Delphos Soil Samples by SEM-XRA
(Sample C—Control Sample)[§]**

Sample	%Al + Si*	%Ti	%Fe	%Cu	%Ca
C-1	93.82	0.23	5.33	0.17	0.47
C-2	89.64	0.22	6.63	1.69	1.82
C-3	92.26	0.33	6.29	0.22	0.91
C-4	88.21	1.30	7.94	1.09	1.46
C-5	91.74	0.09	6.46	0.46	1.25
C-6	91.77	1.16	6.21	0.46	0.41
C-7	90.79	0.00	7.30	0.20	1.71
C-8	91.06	0.93	7.34	0.38	0.29
C-9	91.27	1.32	6.26	0.60	0.55
C-10	90.71	1.26	7.01	0.35	0.67
Average	91.13	0.68	6.68	.56	0.95
Variance	2.26	.31	.55	.23	.32
Std. Deviation	1.50	.55	.74	.48	.57
% Std. Deviation	1.65	81.10	11.10	85.00	59.30

* and elements of lower Z.

§ The sample and control soil differ at p=.001 for %Al+Si, and at p=.011 for %Ca. There is no difference for the other three elements.

ORGANIC ANALYSES

(a) Northwestern University Finding

"Three soil samples were studied via infrared and Raman spectroscopy, electron spectroscopy and chemical solvency tests. The results of these tests are consistent with the hypothesis that the ring soil is coated with a hydrocarbon."

Sample Designation: Three samples of Kansas soil were labeled "one-day ring soil," "30-day ring soil," and "normal soil."

Table 6. Absorption Bands (in Nanometers) from Infrared Spectroscopy, Control and Ring Samples

Normal	EtOH Extract Residue		CCl ₄ Extract Residue		
	One-Day	30-Day Soil	Normal	One-Day	30-Day Soil
2925	2925	2925	2915	2925	2925
—	—	—	2860	2860	2860
—	—	—	1750	—	—
—	1650	1650	—	—	—
1470	—	—	1470	1470	1470
1390	1390	1390	—	1390	1390
—	—	—	—	1370	1370
1040	1040	1040	—	—	—
1030	1030	1030	—	1030(b)	1030(b)
—	—	—	—	790*	790*
780?	—	—	—	—	—
—	—	—	—	730	730
530	530	530	—	530	530

(b) broad

* CCl₄ solvent band

Infrared Spectra of Soil: The infrared spectrum of each soil sample was obtained by dispersing the soil in potassium bromide (KBr) and pressing the mixture into a disk at about 9 tons per square inch. The spectra of the disks showed no gross differences.

Extraction and Infrared and Raman Studies: Each of the three samples was extracted with two separate solvents, ethyl alcohol (EtOH) and carbon tetrachloride (CCl₄). The extract was then evaporated to dryness on an infrared window (KBr) and the infrared spectrum of the residue was obtained with a Beckman Model IR-9 Spectrophotometer. Several absorption bands, listed below according to wave number, were observed.

A total of 19 infrared spectrograms were obtained. Also six Raman spectra of the extract residues were obtained but no additional information was obtained. See Table 6.

ESCA Studies: The elements in each of the three samples were detected by Electron

Spectroscopy for Chemical Analysis (ESCA). ESCA spectra were taken at -100°C and at +100°C. The only differences observed involved silicon. At the lower temperature, the normal soil showed the presence of silicon whereas the ring soil showed no silicon. However, when the ring soil sample temperature was raised to +100°C, the silicon lines appeared. This behavior indicates that the ring soil was coated with a material that was removed from its surface at +100°C under the conditions in the ESCA spectrometer."

(b) NASA Finding

"Control soil dark in color, clean of foreign material—very little wood pulp no white material. Ring soil lighter in color, large amount of foreign material, especially decaying wood pulp. Large amount of white material."

"... spectra of chloroform extracts were similar, but that there was evidence of a waxy material, 3-5 times as much in the ring soil as in the control soil. Benzene extract of the CHCl₃ extract yielded a yellow material having the same IR spectra. Spectra seemed to be that of a hydrocarbon ester."

(c) Battelle Finding

"Chemiluminescence techniques . . . one-gram samples in test tubes, which were then placed in an oven at 200°C while light emission was measured. . . . The intensity of the emission is very weak from all samples and certainly would not be visible to the naked eye. . . . I did find two curves which did look significant, and which suggest that further study might be fruitful. . . . Most of the light emission appears to be chemiluminescence rather than thermoluminescence, since a sample heated to 200°C, cooled, and reheated gave a similar curve of emission vs. time but with a lower intensity." [This study was conducted in 1979.]

(d) University of Nottingham Finding

[Extracted from Erol A. Faruk, 1989, The Delphos Case: Soil Analysis and Appraisal of a CE-2 Report, *Journal of UFO Studies*, new ser., Vol. 1: 41-65.]

1. Hydrophobicity of soil was destroyed by agitating aqueous solution of ring soil. A mildly alkaline solution which foamed readily on shaking was produced. Relevant organic material could be an alkali metal salt of an organic acid.

2. The relevant hydrophobicity-conferring alkali metal salt was precipitated as a silver salt, purified, and methylated. Thin-layer chromatography revealed one major yellow band, which oxidized readily. The instability made further analyses difficult.

3. UV and visible-light absorption spectral readings were made. Maxima occurred at 220, 290, and 358 nm.

4. Further study of the oxidation product of the yellow band revealed a white product possibly related to the white material commonly seen in the ring soil.

5. Chemical analysis of the silver salt (IR absorption, mass spectroscopy, elemental analysis) was difficult, but may point to an empirical formula of C₁₄H₁₄N₂O₁₂Ag₂ with possible substructures, such as 2 carboxyls and an unknown number of hydroxyls.

6. The nitrogen content could be related to the claims of local anesthesia (due to tertiary amine groups).

7. Because the yellow compound oxidizes rapidly to give a blue-fluorescing product, this could potentially explain the "glowing" soil reported. Soil extracts show amounts of material which fluoresce blue-white when viewed in 360nm light. Ring soil fluoresces more brightly than control soil.

THE "FILAMENTS"

(a) University of California, Berkeley, Finding

"[Microscopic examination at various magnifications up to 400 \times :] One small clod about 5mm long was covered to about a 20% extent with the white substance. The fibers look more like small needle crystals, but with a glistening appearance like snow crystals. They form a 3-D matrix with no definite orientation. In a small cave-like void, about 1mm deep along one side of the clod, the whitish crystals graded into what looked more like spider webbing in which small grains of soil were caught. The crystals themselves are not needles, which would imply a smoothness, but look much like dried beads along a string, though without the roundness of beads. The structure is much like the 'needles' of the cedar tree, though without regularity that a leaf structure would imply. The material is intimately mixed with the soil grains, and seems to fill up cracks in the clod, making it more solid than it might otherwise be. The branching needlelike elements are on the order of 2-5 microns wide, and perhaps 10 times as long as wide."

(b) Oak Ridge National Laboratory Finding

"[Ring soil] was observed to contain abundant specimens of fibrous material, somewhat resembling dirty white wool from a sheep, except the fibers were finer. A specimen of this material was extracted with forceps and placed on a separate glass slide. A droplet of water at room temperature was placed on the slide next to it, and the fibrous sample was pushed into the water. The fibers would not become wet with the water. The droplet of water was wiped off the glass slide with tissue, and a droplet of methanol was placed on the slide. The fibers were rapidly dissolved by the methanol, completely disappearing in several seconds.

"An area of a slide the size of a dime was covered with the soil from [the ring]. A droplet of water was dropped on the soil. For many seconds the droplet remained spherical—a beautiful object in the binocular microscope—before it wet the glass partially and 'tumbled' over into a different position. Lumps of dirt were pushed into the droplet, but they would not become wet at first. After prodding them with a needle in the presence of the water, portions of their surface would become wet, but they would not become wet to the extent that the lumps could be easily broken. Methanol was then mixed with the water and the lumps readily became wet, and they could be broken much more easily with the needle.

"A similar size sample of [control soil] was prepared. This soil soaked up the water

like a blotter, and lumps which were quite hard before the water was added became soft and muddy. No fibers, such as seen in [ring soil], were found after a thorough looking and poking around the entire sample."

(c) Rutgers University Finding

". . . observed under a stereoscopic microscope with a magnification of about 30x one could see fibers of various diameters. The wider ones were tubular. I found a clump of soil where a whole part of the structure could be seen. There was one big fiber that branched into thinner and thinner fibers. The terminal ones, formed cottony spherical masses of fibers about 1m in diameter (the size of actinomycetic hyphae).

"These fibers were not soluble in water and not soluble in ethanol although some of the material associated with the fibers was solubilized by the alcohol . . .

". . . the capillitium of some myxomycetes resembles somewhat the network of fibers observed. I am sure these fibers are not hyphae of actinomycetes (*Nocardia*).

"I streaked some of the cottony masses on plates of agar media good for the isolation of actinomycetes. A few actinomycetes grew as did some fungi and bacteria. Nothing very unusual there."

Also, (a) ring surface soil repels water, but not control soil or ring soil from greater than 4 inches of depth; (b) however, the white filaments were numerous in both ring surface soil and ring soil from greater than 4 inches of depth, although absent from control soil; and (c) the ring soil white filaments were isolated and hydrolyzed (these would not noticeably dissolve in methanol). Testing of the acid-hydrolyzate showed:

". . . paper chromatography ninhydrin-positive spots corresponding to either lysine, aspartic acid, or ornithine; glutamic acid; glycine; serine; 2 unknowns, one of which is yellow but which is not proline; glucosamine; valine; and isoleucine. There were no spots corresponding to alanine, muramic acid, or diaminopimelic acid.

"We can conclude that the fibers do not have the chemical composition of hyphae of actinomycetes but are composed of an organic polymer."

(d) University of Nottingham Finding

"The white fibrous material appears to be a fungal microorganism which is indigenous to the soil but which has grown at an unusual rate in the enriched organic medium. It is insoluble in all the solvents tried (including water and methanol) and does not melt below 250°C. There seems to be more of the material in the soil taken from beneath the surface and this may reflect the lower extent of decomposition of the substance at this level.

"A comparison of the material under a microscope against *Streptomyces chartreusis* (an Actinomycetes species) shows them to be similar in their fibrous nature. The latter was cultured by a colleague in corn steep liquor at pH 7 with added nutrients and the dried hyphae are easily wetted when suspended in water. The material in the ring soil is very difficult to wet, however, and this could be due to the fibers being thinly coated with the organic substance."

(e) Department of Agriculture Finding

"Yes, I believe the soil samples which you collected near Delphos, Kansas, are from a 'fairy ring.' The white material in the soil is fungal mycelium of a basidiomycete or mushroom. Microscopic examination of the soil plainly shows the filaments of the fungal mycelia and the presence of clamp connections typical of a basidiomycete.

"The data from soil analyses done by the University of California Agricultural Extension Laboratory are typical of the changes in soil caused by mushroom growth. Without some of the fruiting bodies or mushrooms, it is not possible to determine the species.

"Fungal mycelia are frequently observed on the soil surface as well as within the soil which explains the white coating on the soil in the picture. Also, such mushrooms excrete chemical substances as part of their metabolism which could account for part of the whitish material.

"A number of fungal and bacterial species have bioluminescence, sometimes called phosphorescence, that is, they emit light of one color or another which can be seen in the dark. The growth activity of the fungus is affected by weather conditions and the season of the year. Hence, it might glow at one time and not at another, even though the fungus is still alive.

"As to the apparent waterproofing of the soil and its seeming inability to grow plants, these too are characteristic effects of a fairy ring fungus of some species. After a period of time (one to several years, depending on the species, weather, and climate), the other microorganisms living in the soil degrade the substances produced by the fairy ring fungus, letting the soil again obtain the more-or-less normal characteristics which held before that area of soil was invaded.

"The fairy ring fungi start at a point or small center of infection and each year advance outward in a circular fashion analogous to an expanding torus or doughnut. Hence, the general shape observed in your specimen. The gap in the ring is indicative of soil or other conditions unfavorable for fungal growth."

COMMENTARY

This completes the essential laboratory information and observations on the Delphos ring soil (as far as is known by the editor) available to researchers from the files at the Center for UFO Studies.

As an individual who was not involved with the human factors of the case (the verbal reports, the veracity of the central witness, etc.), I will limit my views to the physical evidence, as is appropriate anyway for the scientific method.

Physically, the quality of the Delphos case revolves around the nature of the material in the trace and what could have caused the differences between the ring and surrounding soil. There appear to be three physical anomalies:

1. the hydrophobicity of the ring;
2. the temporary luminescence of the ring; and
3. the ability of the ring soil to numb the skin.

The major question is whether these three phenomena are readily explainable by the obvious mundane alternative: the properties of a fungal ring.

The hydrophobicity question remains a mystery. Dr. Hubert A. Lechevalier, at that time at Rutgers University, provided the key data on this point. As noted on his report, Lechevalier observed that the hydrophobicity was not simply related to the "white filaments" of possible biological origin. Filaments spread throughout the soil at depth, yet the hydrophobicity was limited to the surface.

There seems to be no question that the surface soil was hydrophobic, luminescent, and anesthetic, but to what this can be attributed is still unknown. Several researchers noted odd substances associated with the soil:

1. a "waxy" or polymeric organic compound near or on the surface;
2. an apparently chemiluminescent organic compound partially isolated by Dr. Erol Faruk of Nottingham and measured by Battelle;
3. an organic polymer vaguely mimicking fungal filaments, but not constituted of proper fungal filaments, possibly having some soluble elements, and described by Lechevalier as "the interesting material."

What the relationships of these materials may have been to one another is unknown. The chemistry was never pursued far enough to describe any of these structures sufficiently. Consequently this becomes another in a long series of missed opportunities to discover something new in nature, because of the lack of social willingness or support by the scientific community to push this research to a conclusion.

What we are left with are questions. The case is not solved. The chemical peculiarities *may* have been explainable by mundane biology, by mundane biology plus exotic energy environments, or by exotic chemistry and physics. No honest scientist can claim to know. If one credits the primary witness as presenting a subjectively honest account, one can still not offhandedly assume any specific causal agency. We must remember that the report in this case primarily hangs on the words of one young witness who was affected physiologically by whatever occurred.

Was Delphos a UFO landing case? I believe that no one can give any sort of strong answer to this. The physical data do not indicate anything that would require us to admit the presence of advanced technology. Perhaps had we been able to completely characterize the unusual chemical molecules associated with this trace, we could have hypothesized the relationship between them (and their probable progenitors), and estimated the type of energy environment necessary to have accomplished the changes. This determination might have pointed to the possibility of a technology commensurate with the witness's observation and with other energy effects noted in CE-2 cases elsewhere.

I find myself living in a *deja-vu* experience with former Project Blue Book director Ed Ruppelt, who—no matter how hard he tried—could never get a case beyond the conclusion "unknown."

ADDENDUM

One of the primary scientific investigators of the Delphos soil, Dr. Hubert Lechevalier, formerly at Rutgers University, recently wrote to me from his retirement home in Vermont. I greatly appreciate his expertise, his cooperation, and his open-mindedness in our natural pursuit of the truth in these unusual matters.

"Dear Dr. Swords:

"Since I have not read everything that was written on the Delphos case, please excuse me if what I write has already been discussed. If there was a hoax at Delphos it could have been of two different types: one created by the Johnson family, or one created by someone playing a joke on the Johnson family.

"If the Johnsons created the hoax, then there was no illuminated object, no luminescence, and no numbness. We are only left with determining what they did to the soil to make it look unusual.

"If a neighbor pulled a joke on the Johnsons, he must have been a clever fellow to create the illuminated washing machine that took off and left the luminescence and the numbing substance behind.

"Where does the fungal ring fit in all this? The Johnsons observed a fairy ring, removed all the carpophores, and called the sheriff to tell him about a glowing object, etc.?

"It is possible that there was a fungal ring at Delphos, but the only thing that I can say is that the cottony masses that I saw were not fungal hyphae. As I stated, morphologically these filamentous masses were closer to the capillitium of certain myxomycetes than anything else I know. In other terms, if of microbial origin, they would have been the *product* of an organism, not the living organism itself.

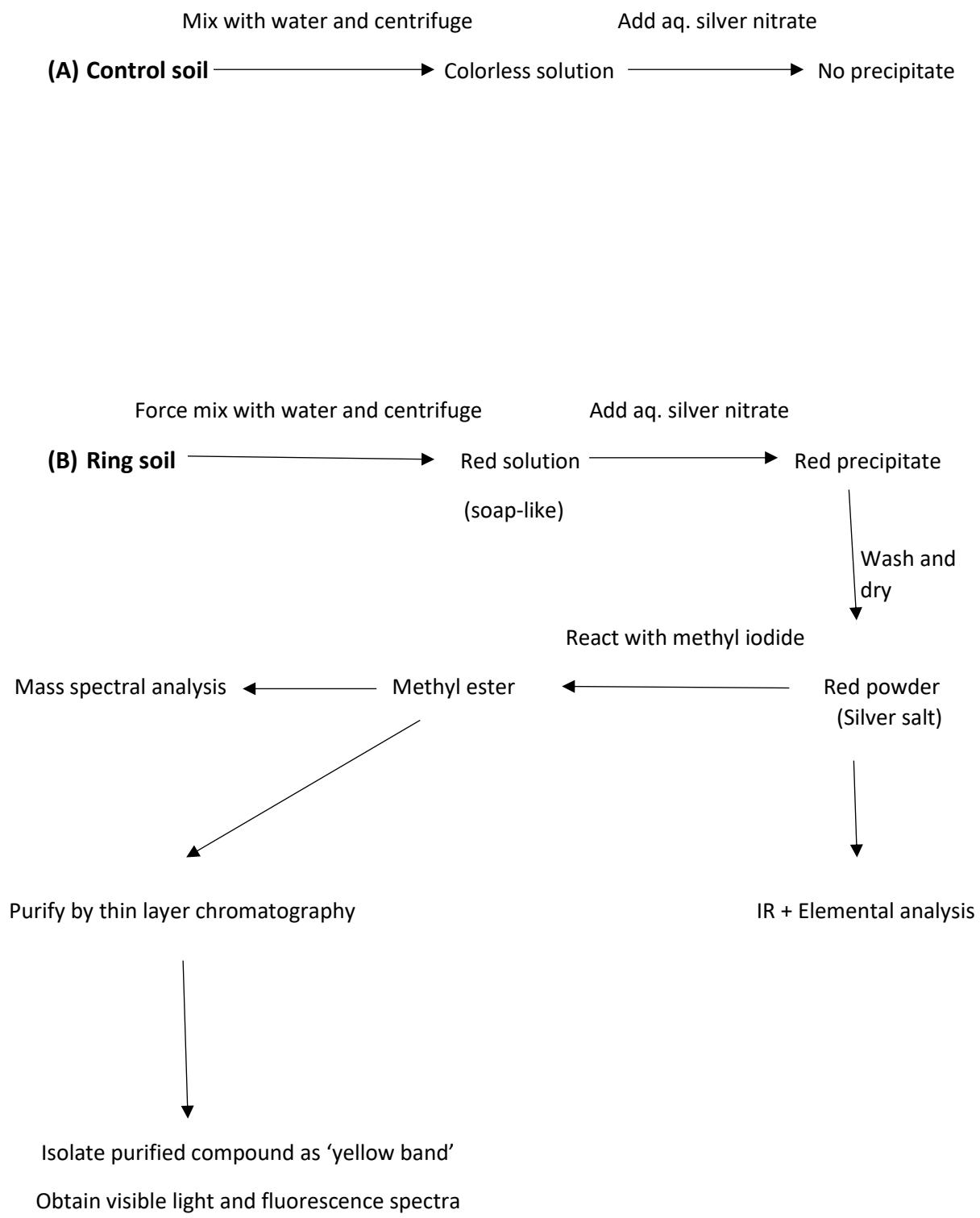
"As you know, some fungi are luminescent and some hyphae of fungi and actinomycetes are hard to wet due to lipid content. As far as having a numbing effect, I doubt it. Numbing could be caused by certain chemicals or by a difference in electrical potential between the skin and the numbing substance. However, presumably the numbing substance was in contact with the soil and should have been at ground potential.

"To consider the possible nature of the numbing substance, it might be best to consult a toxicologist, especially one with experience with narcotics and anesthetics. However, it looks as if Dr. Erol A. Faruk went into that with some care.

"Dr. Faruk approached the chemistry of the Delphos case differently. I tried to get an idea of the chemical nature of the cottony substance, and he tried to get an idea of the chemistry of the soil extracts. It is too bad that we could not have coordinated all of these approaches in 1971 when all that was fresh."

HUBERT LECHEVALIER
Morrisville, Vt.

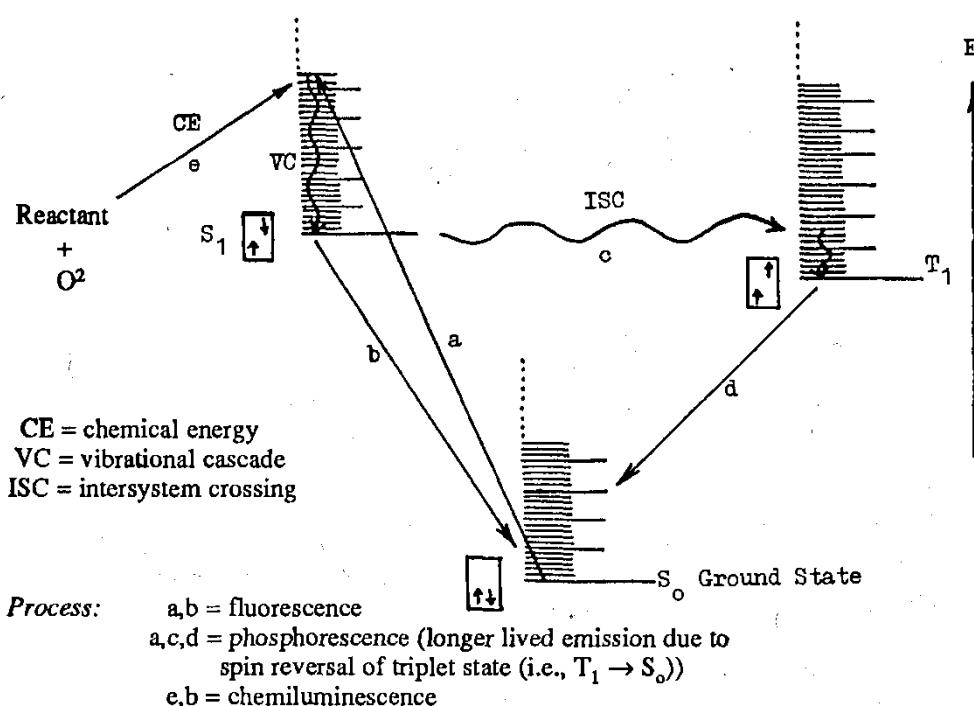
Appendix D: Analysis schematic for Ring vs Control Soil



Appendix E: An overview of the chemiluminescence process

(Taken from: K.D. GUNDERMANN: Recent Advances in Research on the Chemiluminescence of Organic Compounds in **Topics in Current Chemistry 46: Photochemistry**. Berlin: Springer-Verlag. Pp.61-139 (1974).)

Fluorescence is a process in which light of a short wavelength (high energy) is absorbed to promote an electron from the highest bonding orbital to the lowest anti-bonding orbital to produce the first excited singlet state:



Fluorescence and chemiluminescence

After 10^{-9} to 10^{-6} seconds the process is reversed and a photon of longer wavelength (in the visible region) is generated. When an organic compound oxidizes to give a product that is fluorescent, emission of light may occur because the energy liberated during oxidation may give rise to a proportion of the product molecules already in their first excited singlet state. Emission would occur when these reverted to their ground state. In such chemiluminescent oxidations the energy supplied should be at least 41 kcal mol⁻¹ for emission of red light (700nm) and 65 kcal mol⁻¹ for blue light (440nm). Providing that the product molecule is the emitting species (and not some transient chemical intermediate) the fluorescence spectrum of the product should match the chemiluminescence spectrum.

One quantum of light can in principle be emitted by one molecule of reactant and in a perfectly efficient process 1 mole of reactant would generate 1 mole of quanta or 1 einstein. From this it can be calculated that 1kg of perfectly efficient chemiluminescent material might provide 1.47×10^5 lumen hours of light, equivalent to the output of a 40W bulb operating for 13 days.

The quantum yield of a chemiluminescent oxidation is governed by various factors, however, which invariably lead to an overall low efficiency. From the description given above it can be seen that the quantum yield (ϕ_{CL}) for the process will depend on:

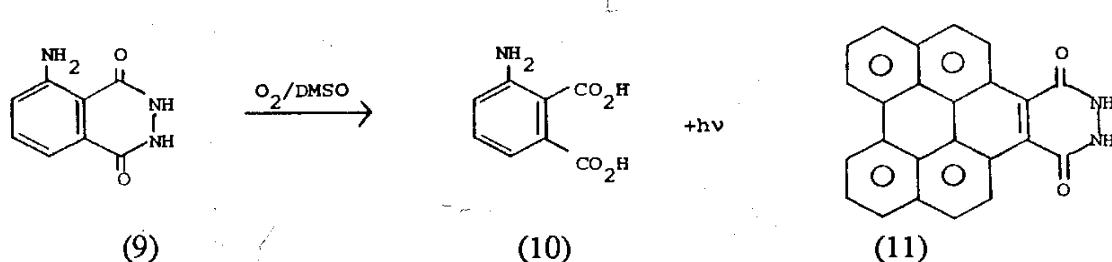
- i) the fraction of reactant molecules taking the correct chemical pathway in the oxidation ($=\phi_R$)
- ii) the fraction of product molecules being generated in the first excited singlet state ($=\phi_{ES}$)
- iii) the fluorescence efficiency of the product molecule (if this is the emitting species) ($=\phi_{FL}$)

from which:

$$\phi_{CL} = \phi_R \times \phi_{ES} \times \phi_{FL}$$

From this relationship it can be seen that all three of these processes must occur significantly for light emission to occur. The product molecule may be highly fluorescent (as is the case for the soil compound) but if the fraction being generated in the excited state during oxidation is small a low chemiluminescent yield will result.

One of the most studied chemiluminescent oxidations is that of the hydrazide, Luminol (9). In alkaline dimethylsulphoxide, Luminol reacts with molecular oxygen to produce amino phthalic acid (10) with simultaneous emission of blue light (480nm). The emission spectrum corresponds to the fluorescence spectrum of amino phthalic acid. The chemical yield ((ϕ_R)) of the process can be as high as 85%. The fluorescence efficiency (ϕ_F) of amino phthalic acid has been found to be 30%, and its efficiency of formation in the excited state during oxidation of Luminol is estimated to be ca. 5%, from which a quantum yield for the process of ca. 1.5% can be calculated. Despite this low figure the emission can be strikingly bright.



One of the most efficient hydrazides yet synthesized is the benzoperylene compound (11) which has a chemiluminescence quantum yield of 7.3%. One can compare this purely chemical process with the enzymically controlled oxidation occurring in the American firefly which is estimated to have a quantum yield of 88%! The emission wavelength for a chemiluminescent oxidation depends on the energy difference between the first excited singlet state and ground state for the product molecule. In general, the more extensive the chromophore (indicating greater complexity in structure) the smaller is the energy difference giving rise to emission at longer wavelengths. Thus those synthetic chemiluminescent compounds that are structurally relatively simple (e.g. Luminol) emit in the blue region of the spectrum.

Appendix F: Email correspondence between myself and retired Prof. Barrie Bycroft

This is an email exchange that I had in 2013 informing him of a Canadian TV company's interest in producing a program about Delphos, and asking whether he would mind if I explained to them the background to my analytical work at Nottingham. (The TV program was eventually shelved).

Barrie Bycroft <Barrie.Bycroft@nottingham.ac.uk>
Fri 2/1/2013 3:14 AM

Dear Erol

Many apologies for the delay in replying to your email. Although I have kept a university email address I have been retired over seven years now and sometimes do not access it for a few days. Also I live most of the time in winter either in Rome or southern Spain which I think probably answers your question as to whether I am enjoying retirement. Anyway excuses apart, it was a pleasure to hear from you after all these years.

I remember well your interest in UFO landings and your report. As you said Frank Palmer sadly has been dead for many years but I do recall us both advising caution as well as not drawing conclusions which were not evidence based. As regards mentioning the circumstances, I obviously cannot speak directly for Frank, but I doubt that He would have minded you relating them as you recall and neither do I.

I would be interested to know what you have been doing over the past three decades as well as the outcome with the documentary.

Kind Regards

Barrie

From: Erol Faruk [erol_faruk@hotmail.com]
Sent: 24 January 2013 10:20
To: barrie.bycroft@nottingham.ac.uk
Subject: Greetings

Hi Barrie,

I hope you are keeping well and happy in your retirement. I trust that you still remember me after all those many years ago when I was at Nottingham Uni doing clavulanic acid biosynth research under your supervision.

I wondered whether you also still remember that I had an interest in a UFO 'landing' case in America that left a ring of soil profoundly affected in its absorption characteristics. I did some preliminary investigation on that material and sent you a draft copy of my report which you and Frank Palmer read and thought was OK for publishing. It eventually was published in the Journal of UFO Studies in the US and caused quite a bit of a stir.

I have now been approached by a Canadian TV media company which wants to make a documentary on that particular case for eventual viewing on the Discovery Channel. I will be going over there in February for interviewing, etc.

It's probable that the circumstances of my doing the investigation on the soil will come up, and I had the intention of telling it as it was - i.e. that you - as my supervisor - directed me to Frank Palmer who helped me to obtain fluorescence spectra on ring soil extracts, etc.

Can I mention both your names if asked during the media interview? I know that Frank is no longer with us. I certainly wouldn't want to say anything that you might be unhappy about.

I look forward to your reply. All the best, Erol.

Appendix G: Phyllis Budinger's Delphos Soil Analysis Report



TECHNICAL SERVICE RESPONSE NO.: UT001

Subject: Analysis of Soil Samples Related to the Delphos, Kansas November 2, 1971 CE2 Event

Date: August 9, 1999

Requested By: Ted Phillips
Director
C. P. T. R.¹

Reported By: P. A. Budinger
Analytical Scientist

Background/Objective:

The famous Delphos, Kansas CE2 encounter occurred at approximately 7:00 in the evening on November 2, 1971. 16 year-old Ron Johnson was tending sheep when he saw a mushroom-shaped object approximately nine feet in diameter with multicolored lights covering its surface. The object, about 25 yards away, was hovering about two feet off the ground. The UFO sounded like "an old washing machine which vibrates." When it took off it temporarily blinded Ronald with a bright light from its base. Ron went to get his family, and when they returned the entire family saw the object in the sky.

At the site where the UFO had hovered witnesses saw "a glowing ring on the ground" and luminescence on nearby trees. Ron's parents experienced numbing effects on touching the ring. One investigator said that the soil "felt strange, like a slick crust, as if the soil was crystallized." On examination the soil was found to be impermeable to water and "dry to a depth of at least one foot". A foul odor has also been reported by some investigators².

The objective of this analysis was to build on the initial analysis done by Erol Faruk on the Delphos ring soils in the 1970s³. At the very least it is hoped this investigation will be a base case for reference to future analyses. Erol Faruk developed his analytical approach based on his experience as an Organic Chemist. He analyzed these materials using 1970's technology which has

¹ The Center for Physical Trace Research

² Personal Communication, Ted Phillips.

³ Erol A. Faruk. *Journal of UFO Studies*, n.s. 1, 1989, 41-65.

advanced dramatically in 20 years. Computerization, new techniques, and instrumentation have advanced the field of analytical sciences to previously unachievable heights. Yet, Faruk's work was outstanding and provided preliminary observations and conjectures regarding unknown residues extracted from the ring soils. My approach to the analysis, as an Analytical Chemist, is different; and there is nothing to contradict his initial observations.

Both ring and control soil samples from this event were located on Thanksgiving Day 1998, and received for analyses on December 7th. Thanks to the wisdom of John Timmerman, the samples were preserved in his attic for many years after closure of the CUFOS Chicago office. Documentation/sample labeling existed attesting to their authenticity, and they were encased in their original tightly closed film containers with no sign of tampering.

Conclusions:

In reading these conclusions it should be emphasized that the soils analyzed were sampled two months after the event. Also the time that transpired before this analysis is 27 years. It is unknown if any changes may have occurred to the samples over this period of time. The following conclusions are based on the results of the current analysis.

1) There has been a definite release of material. This analyst concurs with Erol Faruk in that it was most probably deposited as an aqueous solution. The material, excluding any volatiles such as the water, coats the soil's surface, still imparting the hydrophobic 'effect' noted 27 year's ago. This non-volatile material amounts to approximately 2-3 wt.% of the ring soil. Following is its composition and a rough estimate of the amounts.

RELEASE COMPOSITION (Non-Volatiles)

	<u>Wt. %</u>
•Humic Substance -Probably low molecular weight Fulvic Acid	85 ±10
•Calcium Oxalate	5 ±2
•Calcium Carbonate	~1
•Phosphate	<0.1
•Sulfate	<0.1
•Sulfide and/or Mercaptan	<0.01

2) The humic substance specifically appears to be fulvic acid. It has properties resembling a mull type humus which occurs under conditions of high biological

activities such as under grass vegetation and soils under cultivation. This material coats the soil surface, initially imparting a hydrophobic effect. On water addition to the ring soil, followed by agitation, it solubilizes and the soil readily loses its 'apparent' hydrophobic effect. There is speculation that this predominating component is actually the result of decomposition from the original release material. This cannot be confirmed. However, this analyst leans toward the hypothesis that the fulvic acid is originally part of the release. This is based on observations regarding some physical properties when the soils were sampled in 1971, e.g. the apparent hydrophobic 'effect' and lighter color of the ring soils. The present day samples still retain these properties.

- 3) Both calcium oxalate and oxalic acid are known skin and eye irritants and could account for the physical effects suffered by the witnesses. It is suspected that the calcium oxalate found in the ring soil was deposited as free oxalic acid and combined with calcium in the ground.
- 4) Humic substances in the presence of oxalate derivatives and a suitable catalyst, e.g. hydrogen peroxide, may possibly cause the chemiluminescence (glowing) effect.
- 5) The presence of sulfide/mercaptan could explain any obnoxious odor which purportedly emanated from the ring soils.
- 6) The ring soil was not exposed to a physical effect such as high temperature.
- 7) The analysis neither proves nor rules out a UFO source of the release. The above natural products have many useful properties. Specifically, humates are known for their chelation/bonding to metals and organics. "Earthside" we use them in fertilizer and for removal of toxic metals and organic pollutants. It is natural to assume intelligent extraterrestrial life forms would also use them. One speculation is they are perhaps waste products of a biological process.
- 8.) A speculation is offered by a colleague (Dr. J. Robert Mooney). It is based on the presence of the high concentration (5%) of oxalic acid. (The following may sound bizarre, yet isn't the whole UFO phenomena bizarre? It is worth contemplating.) Oxalic acid is a natural product in the soil. However, such a high concentration would not be expected from the usual plant source. Exhaust from a low temperature ionization or combustion engine (whose fuel source was elemental carbon) could leave a high concentration of the acid along with other lower molecular weight acids. Of course the major components from such an engine would be expected to be carbon dioxide and carbon monoxide. These would be lost as gases. The acids would concentrate in the soil beneath the exhaust. Use of elemental carbon, as a fuel, seems very reasonable as it is safely transportable and contains a high energy density. It is recommended that

future ring sites be carefully assayed for oxalic acid and other low molecular weight acetic components⁴.

9.) Finally, others have countered that the release represents the products of "well seasoned barnyard soil". If this were the case there should be much higher concentrations of elements such as nitrogen, phosphorus, and potassium present. Also there should be evidence of significant amounts of other components such as urea, uric acid, and ammonium components, which are typical of animal waste and its decomposition products. These are not detected. Only the fulvic acid predominates.

Procedure:

Samples: Six Delphos soil samples were received in a 4 x 4 x 2" box containing a 1971 Missouri road map fragment as packing. They were in tightly sealed, and apparently undisturbed, gray Kodak film canisters with black tops. The sample identifications follow:

- Ring Sample A-2, Surface to ½ inch, taken 1/11/72 (15.1 g)
- Ring Sample C-3, Surface to ½ inch (15.9 g)
- Ring Sample D-3 Surface to ½ inch (14.0 g)
- Control Sample Center Surface to ½ inch (23.1 g)
- Control Sample A-9, Surface to ½ inch (21.4 g)
- Control Sample C-8, Surface to ½ inch (23.7 g)

The "as received" ring soils and control soils were analyzed using a battery of tests which includes most of the analytical "alphabet". These include the following: EDX (Energy Dispersive X-ray) elemental analysis; %C, %H, %N; XPS (X-ray Photoelectron Spectroscopy); XRD (X-ray Diffraction); FT-IR (Fourier Transform - Infrared) analysis; SEM/EDX (Scanning Electron Microscopy/Energy Dispersive X-ray); headspace GC/MS (Gas Chromatography/Mass Spectrometry).

Aqueous⁵ extractions of the soils were done quantitatively. The following tests were done on the extracts: FT-IR; ¹H NMR (Proton Nuclear Magnetic Resonance)⁶; %C, %H, %N; IC (Ion Chromatography); UV (Ultraviolet Spectroscopy); SEM/EDX. GC/MS analysis was attempted on the extracts, but

⁴ There is not enough of the currently analyzed Delphos ring soil available for this analysis. The following procedure is suggested. Perform an acid extraction followed by ion chromatography. Quantitatively, this would yield very accurate amounts of the acids. Acids should then be examined by Isotope Mass Spectrometry to determine the C-14 level. Natural product sources of these acids will give the expected values of 15.3 disintegrations/min/gm. Any higher level of C-14 indicates the source was non-terrestrial. Lower levels indicate the source is not of recent biological origin or is not terrestrial.

⁵ Nanopure water.

⁶ Unfortunately there was not enough extract for additional ¹³C NMR analysis.

the material hung up on the GC column, attesting to the presence of very highly polar material. GC/MS was additionally done on the headspace above the extract. IR spectroscopic examination was done on a silver nitrate precipitates of the D-3 extract and an aqueous solution of the sodium salt of humic acid (Sigma-Aldrich Catalog No.: H1675-2).

Organic solvent extractions were done using progressively polar solvents (pentane, chloroform, 1:1 acetone:methanol) on the D-3 ring soil and the A-9 control soil. The fractions were examined by FT-IR.

Results:

The results of the individual tests performed on the samples follow. These results are summarized in the conclusions section on page two of this report.

Analyses of the Soils "As Received"

Ring soil samples have been reported to be much lighter in color than the control soils⁷. Subtle color differences are noted for the samples analyzed in this report. Following is a photograph of two ring soils and one control soil in front of their original containers.



Photograph of the two ring soils (C-3, left; A-2, center) and the control soil (C-8, right).

Elemental Data: The elemental data were acquired on the "as received" soils using EDX, %C, %H, %N, XPS, and SEM/EDX. Differences between the ring and control soils are clearly discerned which show a definite release of materials had occurred. The elements attributed to the release are sulfur, calcium, carbon,

⁷ Personal Communication, Ted Phillips.

T. S. R. No.: UT001

P. A. Budinger

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and nitrogen. Additionally indicated is organic material adsorbed on the surface of the soil. A very small amount of mercaptan and/or sulfide is detected. The detailed data follow.

EDX analysis suggests slightly higher levels of sulfur and calcium. The values are displayed in the following table.

**EDX Elemental Data “As Received” Soils
(Normalized Wt. %)**

Sample	Al	Si	S	K	Ca	Ti	Cr	Mn	Fe	Cu	Zn
C-3 Ring	19.4	59.4	1.3	8.1	4.0	1.4	0.07	0.20	6.0	0.14	0.04
A-2 Ring	19.2	60.5	0.97	8.0	4.0	1.5	0.12	0.17	5.5	0.14	0.04
D-3 Ring	18.9	57.8	1.0	7.5	4.9	1.5	0.06	0.16	8.2	0.05	0.05
C-8 Control	18.8	60.6	0.94	8.0	3.8	1.5	0.08	0.16	5.9	0.15	0.04
Control Center	19.5	60.7	0.64	7.6	3.6	2.0	0.06	0.14	5.6	0.12	0.03
A-9 Control	19.4	61.4	0.64	7.8	3.6	1.1	0.09	0.17	5.6	0.12	0.02

The percent carbon, hydrogen and nitrogen analyses suggest a small increase in carbon and nitrogen in the ring soil samples. Carbon/nitrogen atom ratios are also different. They are lower for the ring samples. It is noted that all of the ratios are consistent with those found in surface soils⁸. Following are the values:

⁸ Jerzy Weber, Agricultural University of Wroclaw, Poland Web Site:
www.ar.wroc.pl/%7Eweber/azot2.htm

**Carbon, Hydrogen, Nitrogen Content
(Wt. %)**

Sample	C	H	N	C/N Ratio
C-3 Ring	2.59	0.54	0.29	10.4
A-2 Ring	2.46	0.52	0.29	9.9
D-3 Ring	4.01	0.76	0.51	9.2
C-8 Control	2.52	0.54	0.25	11.8
Control Center	2.93	0.58	0.29	11.8
A-9 Control	2.04	0.50	0.21	11.3

At first glance the above does not appear to be earth shaking. However, it is very interesting when viewed in context of the following XPS surface data.

XPS is an excellent technique for looking at the surfaces of materials. It shows a very significant increase in both carbon and nitrogen on the surfaces of all the ring soils which indicates that some of the release is organic. There is an expected decrease in soil elements, i.e. much of the oxygen, magnesium, aluminum, and silicon, because they are coated by the organic material⁹. Specifically for the D-3 ring sample, the data show a higher concentration of phosphorus and calcium. XPS also shows differences in oxidation states of the elements. Further perusal of the carbon data show more of it is associated with oxygen in the ring soils. Evaluation of the sulfur data, which is present in very small amounts, indicates more sulfur is in the form of mercaptans and/or sulfides than in the ring soils. The detailed report can be found in the addendum. Below is the table.

⁹ This had been also noted in a previous SEM analysis done in 1975 at the Oak Ridge National Laboratory.

**XPS Data "As Received" Soils
(Atomic Concentration)**

Sample	C 1s	N 1s	O 1s	F 1s	Mg 1s	Al 2p	Si 2p	P 2p	K 2p	Ca 2p	Fe 2p	S 2 SH/SC	SO _x
•C-3 Ring	27.8	3.4	48.2	0.1	0.5	4.9	12.7	0.14	0.8	0.6	1.0	0.10	0.15
•A-2 Ring	29.7	3.3	47.7	0.0	0.6	4.6	11.8	0.14	0.6	0.6	0.9	0.09	0.15
•D-3 Ring	36.3	4.1	43.0	0.0	0.6	3.8	9.8	0.29	0.6	0.9	0.9	0.09	0.18
•C-8 Control	16.5	1.7	56.9	0.1	1.1	6.0	14.5	0.18	0.9	0.7	1.5	0.05	0.19
•Center Control	15.1	1.3	57.0	0.1	1.0	6.3	16.0	0.20	0.9	0.7	1.4	0.07	0.21
•A-9 Control	16.0	1.3	56.2	0.1	1.0	6.5	16.6	0.20	1.0	0.7	1.5	0.06	0.32

Very limited SEM/EDX analysis was done on two samples (D-3 Ring, and A-9 Control)¹⁰. Mostly soil minerals were observed. The data did indicate the ring soil contained more particulates suggestive of calcium carbonate than the control soil.

Molecular Information: The analysis done on the "as received" soils for molecular identification include FT-IR, XRD, and Headspace GC/MS analyses. Information imparted by these techniques shows the release material contains calcium oxalate, calcium carbonate and a humic substance. It is also noted that the ring soil has not been exposed to heat. Details of each test follow.

Extensive FT-IR examination was done on the total soils and individual particulates. Expectedly, infrared analysis of the "as received" soil samples shows predominant silicate absorption (mostly quartz type) from the soil for both the control and ring samples. However, there are weaker bands noted in the ring samples (between 1700 - 1300 cm⁻¹) which are not present in the controls. These are enhanced in difference spectra generated between the spectra of the ring soils versus the control soils. They are indicated to belong to materials such as calcium oxalate, carboxylic acid (chelated and/or ionic form) containing component, and possibly calcium carbonate. The carboxylic acid component is mostly part of the humic substance identified in later tests (see aqueous extracts). Figures 1a, 1b, and 1c are representative spectra of a ring soil, a control soil, and a difference spectrum.

Numerous infrared spectra were also obtained from particulates isolated from the ring and control soils. More different types of particulates were noted in the ring soils. As above, calcium oxalate is found to be unique to the ring samples and usually found as a white 'fibrous appearing' stratum infused in the soil

¹⁰ The instrument suffered down time and other work prevailed.

lumps. Calcium carbonate is also in higher amounts, especially in the D3 ring soil. (In the D-3 sample this component was visually apparent as numerous white lumps of approximately 1 mm in size.) Additionally noted was a higher concentration of a humic substance which was specifically characterized in the analysis of the aqueous extracts. The following table summarizes the identifications of all the different types of particulates observed and references the attached labeled infrared spectra.

Sample Particulates	Figure	Identification¹¹
•D-3 Ring Light Tan	2a	Calcium Oxalate; Residual Soil Mineral (Quartz); Carbonate and/or Humic Substance.
Black	2b	Insect Droppings (Protein Amide Material); Residual Quartz.
Light Brown Cylindrical	2c	Quartz; Protein Amide Material (Possible Insect Droppings); Possible Calcium Oxalate.
Brown Fibrous Material	3a	Calcium Oxalate; Residual Soil Mineral (Quartz); Carbonate and/or Humic Substance.
White	3b	Quartz; Calcium Oxalate; Carbonate and/or Humic Substance.
Tan	3c	Quartz; Calcium Oxalate; Carbonate and/or Humic Substance.
White Stratum in Lump	4a	Calcium Oxalate.
Colorless Fiber	4b	Polystyrene.
Light Brown Stratum in Lump	4c	Celluloidal Material (Plant Origin - Probably Wood Fragment).
Black Flat	5a	Celluloidal Material (Wood Fragment); Quartz.
White	5b	Calcium Carbonate, $\text{Ca}(\text{CO}_3)_2$.
Sample Particulates	Figure	Identification
White Fines	5c	Calcium Carbonate, $\text{Ca}(\text{CO}_3)_2$.

¹¹ The first component listed predominates.

More White Particulates	6a	Calcium Carbonate, $\text{Ca}(\text{CO}_3)_2$; Residual Quartz.
•A-2 Ring White Stratum in Lump	6b	Quartz; Calcium Oxalate; Carbonate and/or Humic Substance.
Black	6c	Humic Substance; Celluloidal Material (Plant Origin - Possible Wood).
Off-White	7a	Calcium Oxalate; Residual Soil Mineral (Quartz); Possible Humic Substance.
White	7b	Celluloidal (Wood Fragment).
Light Brown	7c	Quartz; Secondary Amide (Peptide Linkages - Insect Exoskeleton Suspected).
Off-White	8a	Quartz.
White	8b	Quartz; Calcium Oxalate; Carbonate and/or Humic Substance.
White	8c	Celluloidal Material (Plant Origin - Wood Fragment Indicated); Calcium Oxalate.
•C-3 Ring White Fibrous	9a	Quartz; Calcium Oxalate; Possible Celluloidal Material (Plant Origin).
White	9b	Celluloidal Material (Plant Origin); Calcium Oxalate; Quartz.
Brown Material Inside Tiny Pod	9c	Quartz.
Black	10a	Humic Substance; Quartz; Possible Celluloidal Material.
Light Tan	10b	Quartz.

Sample Particulates	Figure	Identification
White Fibrous Stratum in Lump	11c	Calcium Oxalate; Quartz.
Amber - Bug Exoskeleton	11a	Secondary Amide (Peptide Linkages - Insect Exoskeleton). Reference Spectrum.
Orange	11b	Cellulose Nitrate; Phthalate Ester (Common Plasticizer).
Black Pod	11c	Amide Material (Noted in Controls).
White Fibrous	12a	Celluloidal Material (Plant Origin - Wood).
Light Brown	12b	Quartz; celluloidal Indications; Possible Calcium Oxalate.
Spherical Light Tan	12c	Silicate (Probable Clay Type).
White Fibrous	13a	Quartz; Calcium Oxalate.
•Center Control Wood Appearing Fragment	13b	Celluloidal Material (Wood)
Insect Egg Appearing	13c	Barium Calcium Carbonate, BaCa(CO ₃) ₂ .
Fine Soil	14a	Silicate Soil Mineral (Microcline)
Black	14b	Quartz; Humic Substance.
Black	14c	Quartz; Humic Substance.
•C-8 Control Wood Appearing	15a	Celluloidal Material (Wood).
Insect Egg	15b	Barium Calcium Carbonate, BaCa(CO ₃) ₂ .
Black	15c	Quartz; Humic Substance.
Sample Particulates	Figure	Identification

White	16a	Silicate Soil Mineral (Illite).
White	16b	Silicate Soil Mineral (Microcline).
Soil	16c	Quartz; Humic Substance.
Woody	17a	Celluloidal Material (Wood Fragment).
White	17b	Celluloidal Material (Wood Fragment).
Amber	17c	Quartz; Humic Substance; Possible Carbonate.
Gray	18a	Quartz; Possible Carbonate; Possible Humic Substance.
•A-9 Control		
White	18b	Quartz; Barium Calcium Carbonate, BaCa(CO ₃) ₂ .
Fine Soil	18c	Quartz; Possible Humic Substance.
Colorless Fiber	19a	Polystyrene.
Light Brown	19b	Quartz; Celluloidal Material; Possible Amide Material.
Black	19c	Oxidized Asphaltic Material; Silicate Mineral.
Brown Bark-Like	20	Celluloidal Material (Wood Fragment); Residual Quartz.

XRD analysis detects and identifies any crystalline material. The data show soil minerals for all samples. These are identified as mostly quartz and smaller amounts of feldspars and clays. No significant differences between the ring and control soils are detected which suggests there was no exposure to physical effects such as heat. If that was the scenario, the clays in the ring soils would have changed, i.e. they would have been dehydroxylated. Additionally, there would have been alterations to the feldspars¹² and quartz¹³. The diffraction patterns are displayed in Figures 21 - 26.

¹² C. S. Hurlbut, Jr. "Dana's Manual of Mineralogy", 17th Edition, John Wiley & Sons, Inc., New York, 1966, p. 487-490.

¹³ L. G. Berry et al, "Mineralogy", Second Edition, W. H. Freeman and Company, San Francisco, 1983, p130-132.

Headspace GC/MS analysis was done on the air space over the selected soils. This was the first test performed when the tightly sealed sample containers were initially opened. It was an attempt to identify any volatiles which may have originated from the samples, because of purported reports of an odiferous emanation from the samples. No volatiles were detected in the headspace. If present, they may have dispersed over the years.

Aqueous Extracts

The samples were quantitatively extracted with nanopure water. When the water was added round globules of soil floated to the surface showing that it still retained its previously reported hydrophobic nature after all these years¹⁴. On agitation the soil readily dispersed and the water became clear brown in color. This indicates water soluble material coating the soil is responsible for the hydrophobic effect. The amounts of material extracted from the ring samples are substantially higher (ave. 15.6 mg/g - 1.6 wt.%) compared to the control soils (ave. 6.4 mg/g - 0.6 wt.%). These data clearly show that >1% of ring soils consist of water soluble material from a release. (The actual release content is probably closer to 2-3% if one considers the release also contains some water insoluble material, e.g. calcium oxalate and calcium carbonate previously identified by FT-IR analysis of the as received samples.) Following are the amounts extracted from each sample.

Amounts Aqueous Extracts

Sample	Weight (mg/g)	Wt.% of Soil
C-3 Ring	12.8	1.3
A-2 Ring	15.8	1.6
D-3 Ring	18.3	1.8
C-8 Control	6.1	0.6
Center Control	6.7	0.7
A-9 Control	6.4	0.6

The excessive amounts in two ring samples can be visually observed in the photograph of the extracts below. It shows 3 ml aqueous extracts of equivalent amounts (1 gram quantities) of a control soil and two ring soils. The control is notably lighter.

¹⁴ Ref. 3.



Photograph of aqueous extracts of the C-8 control soil (left), and the two ring soils (A-2 center, C-3 right).

After water removal the appearance of the isolated materials from the ring extracts are also different from those of the controls. The ring extract consists of brittle, clear, amber flat particulates. The control extract contains opaque, light brown, particles in a variety of shapes. Following are black and white microscope photographs of a ring and a control extract.



100X Microscope photographs of the C-3 ring extract (left) and the C-8 control extract (right).

Elemental Analysis: Elemental composition of the extracts was determined by the following tests: EDX; %C; %H; %N. Higher levels of carbon, hydrogen, nitrogen, sulfur, phosphorus, and potassium were detected in the ring extracts than in the control extracts. The composition of the humic substance was estimated to be 43% C, 5% H, 5% N and 42% O. Following are the details from each test.

EDX shows increased amounts of sulfur, phosphorus, and potassium in the ring extracts. The lower level of silicon in the ring extracts is believed to be soil in

association with the organic substance rather than residual soil fines. There has been extensive research which shows that very little humic substances in soil are in free states. Most is bonded to colloidal clay in various ways¹⁵. However, in the control soils the source of silicon is definitely from fines. (See explanation in FT-IR discussion). The data follow:

EDX Elemental Data "Aqueous Extracts"
(Normalized Wt. %)

Sample	Mg	Al	Si	P	S	K	Ca	Ti	Cr	Mn	Fe
C-3 Ring	-	-	3.3	6.7	19.0	49. 1 7	19. 8 9	0.02	-	1.1	0.9 8
A-2 Ring	-	-	6.8	5.3	15.8	37. 0	31. 2	0.15	0.29	0.90	1.2
D-3 Ring	-	1.9	5.0	6.4	9.0	36. 9	37. 8	0.23	0.05	0.70	3.6
C-8 Control	7.5	-	2.1	1.3	4.6	33. 9	49. 8	0.11	-	0.45	0.3 5
Center Cont.	-	11.5	19.3	6.0	5.4	27. 9	28. 0	0.21	-	0.21	1.5
A-9 Control	7.2	8.4	18.5	1.4	3.1	29. 2	28. 1	0.23	-	0.93	2.8

The %C, %H, %N values in the table below are significantly higher for the ring soil extracts compared to the control extracts. These values indicate the predominant organic nature of the release. Additionally, the carbon/nitrogen atom ratios for the ring extracts are lower. For the most part these elements represent a humic substance which was positively identified by ¹H NMR and FT-IR analysis below. When the data from this analysis are examined in context with the following SEM/EDX analysis a reasonably accurate profile of the elements and their amounts is presented. It is noted that the actual C, H, N values attributed to the humate are skewed to the low side by the presence of bonded soil minerals and other inorganics. The minerals/inorganics amount to roughly 27 wt.% based on the SEM/EDX analysis. Taking this into account the actual C, H, N values for the humate are close to 43 %C, 5 %H, 5 %N. The O value determined from the SEM/EDX analysis is roughly 42 %. The humic substance is specifically suggested to be a fulvic acid because of its water solubility, color, and the low %C and O/C, H/C, N/C atom ratios¹⁶. It should be

¹⁵ Jerzy Weber, Agricultural University of Wroclaw, Poland Web Site:
www.ar.wroc.pl/%7Eweber/kombi2.htm

¹⁶ Jerzy Weber, Agricultural University of Wroclaw, Poland Web Site:
www.ar.wroc.pl/%7Eweber/kwasy2.htm; O. Franciosi et al, *Applied Spectroscopy*, Volume 50, Number 9, 1996, p. 1165; O. Franciosi et al, *Applied Spectroscopy*, Volume 52, Number 2, 1998, p. 270; R. Ikan et al, *Analytica Chemica Acta*, 232 (1990) p11; R. L. Wershaw, *Analytica Chemica Acta*, 232 (1990) p31; J. F. Gaffney et al editors, "Humic and Fulvic Acids Isolation, Structure, and

noted that the all of these values will vary depending on the source of the humate, i.e. grassland soil, forest soil, desert soil, peat, river bottom, marine bottom, etc. It is difficult to make a confirmation regarding the humic origin, but we can conjecture at this point. Based on a C/N ratio of close to 6, the fulvic acid in the ring extract most resembles a mull type humus. This humus occurs under conditions of high biological activity. It typically occurs under grass vegetation and is noted in soils under cultivation. In this soil type fulvic acid predominates¹⁷. Although this is also true of the Delphos control soil, the values in the following table as noted above are different enough to show they are not from the same source. Following is a table of the results:

**Carbon, Nitrogen, Hydrogen Analysis
(Wt. %)**

Sample	C	H	N	C/N Ratio	N/C Ratio	H/C Ratio
C-3 Ring	32.0	4.2	6.0	6.2	0.16	1.58
A-2 Ring	31.8	4.2	5.8	6.4	0.18	1.58
D-3 Ring	31.6	4.2	6.1	6.0	0.17	1.59
C-8 Control	14.2	2.0	4.3	3.9	0.26	1.69
Center Cont.	16.2	2.2	4.7	4.0	0.25	1.63
A-9 Control	12.7	1.9	4.8	3.1	0.32	1.79

SEM/EDAX analysis was only done on the extract from the D-3 ring soil. This analysis most likely shows all the major and minor elements except carbon¹⁸ and hydrogen present in this extract. Nitrogen and oxygen predominantly belong to the humate substance and smaller amounts to other minerals and inorganics. The minerals/inorganics probably account for almost 27% of the extract. These are indicated by the presence of Na, Mg, Al, Si, P, S, K, Ca, and Mn. Using the results from the %C, %N, %H analysis and the normalized SEM/EDX results, one can determine reasonable absolute wt.% values for the elements in the extract composition. However, one must make the reasonably valid assumption that all of the elements in the extract are detected. Following is a table of the original normalized and adjusted SEM/EDX data.

Environmental Role", ACS Symposium Series 651, American Chemical Society, Washington DC, Chapter 11 (p 151); S. A. Visser, *Environ. Sci. Technol.*, 1983, 17 p. 412.

¹⁷ Jerzy Weber, Agricultural University of Wroclaw, Poland Web Site:
www.ar.wroc.pl/%7Eweber/typy3.htm

¹⁸ Preparation of the extract for this analysis requires carbon coating the sample, so accurate carbon values could not be determined.

SEM/EDX of D-3 Aqueous Extract

Element	Normalized Wt.% ¹⁹	Absolute Wt.%
N ²⁰	17.6	11.3
O	62.2	39.3
Na	0.35	0.22
Mg	1.7	1.1
Al	1.5	1.0
Si	3.5	2.3
P	2.5	1.6
S	2.0	1.3
K	4.6	3.0
Ca	4.1	2.6
Mn	0.14	0.09
Fe	0.82	0.53

Furthermore, one can now approximate the C, H, N, O absolute elemental composition of the humic substance. But this is also based on fairly valid assumptions regarding the amount of oxygen, nitrogen and hydrogen belonging to the soil minerals/inorganics which are: 0.5% H (probably mostly hydrated water); 9% O (oxides and hydrated water); 1%N (ammonium nitrate). Once the math is performed the composition of the humic substance is estimated to be 43% C, 5% H, 5% N and 42% O.

Molecular Information: Three important tests (FT-IR, ¹H NMR, IC) along with the above elemental data provided pertinent information regarding the types of components comprising the extracts. The humic substance predominates the aqueous extracts. It is indicated to be different and in significantly higher levels than the substance native to the Delphos environment. Besides the previous data regarding water solubility, color, and elemental distribution, there is more evidence that the humic substance is specifically low molecular weight fulvic acid. Furthermore, there are indications that the ring extracts contain very slightly elevated levels of sulfate and phosphate. The detailed molecular investigation follows.

¹H NMR spectra of the extracts (Figs. 27-32) are descriptive of humic structures in both ring and control samples. All the characteristic resonance peaks prevail, which match those in literature references²¹ of fulvic acids and humic acids, as

¹⁹ This is the average of two runs.

²⁰ The nitrogen value a felt to be slightly on the high side, and may be due to instrument error. The 6.1 N% value reported by the previous analysis is considered very accurate.

²¹ O. Franciosi et al, *Applied Spectroscopy*, Volume 50, Number 9, 1996, p. 1165; O. Franciosi et al, *Applied Spectroscopy*, Volume 52, Number 2, 1998, p. 270; R. L. Malcom, *Analytica Chemica Acta*, 232 (1990), p19; Z. Wang et al, *Analytica Chemica Acta*, 232 (1990), p. 43.

well as a reference of purchased humic acid sodium salt²². The interpretation follows:

δ (ppm)	Interpretation of proton resonance areas
0.7 - 1.0	Terminal methyls (CH_3) on alkyl groups
1.0 - 1.7	Branch CH_3 s and methylenes (CH_2) on alkyl groups
1.7 - 2.5	Methines (CH) and CH_2 s alpha to carbonyls and aromatics
2.5 - 3.3	CH_3 s and CH_2 s alpha to nitrogen, some oxygen
3.3 - 5.0	Primarily CH_3 s and CH_2 s alpha to oxygen, some nitrogen
6.5 - 8.4	Aromatic and heteroaromatic
8.4	formate group -(C=O)H

Quantitation of the above resonance areas show the humates in the ring soils are different than in the control soils. Following is a table of the integrated areas of the spectra as well as a ratio of the branch CH_x /end CH_3 areas showing the differences between the humic substances. Note the humic substance from the ring extract is more aromatic, contains more branched alkyls (see ratio), and appears to contain slightly less carbonyl containing functional groups. This is additional evidence that the ring humate is not natural to the Delphos area, and is a release. The data follow.

Hydrogen Distribution (Mole %)

Samples	Arom	$\text{C}(\text{H})\text{C}=\text{O}$	$\text{CH} \alpha \text{ O}^{23}$	Probable $\text{CH}_x \alpha \text{ N}$ + Some O	CH_2 and $\text{CH} \alpha \text{ C}=\text{O} +$ Arom.	Branch CH_3 and CH_2	End CH_3	Ratio End/ Branch
•D-3 Ring	7.2	0.6	40.9	14.5	12.5	19.2	5.0	3.8
•C-3 Ring	8.0	0.8	43.0	13	13.4	17.6	4.2	4.2
•A-2 Ring	6.4	0.7	45.6	13.3	12.8	18.3	4.2	4.4
Ring Ave.	7.2	0.7	43.2	13.6	12.8	18.3	4.2	4.5
•A-9 Control	4.0	1.4	38.9	13.8	15.8	22.4	3.8	5.9
•Center Control	3.3	1.4	40.9	13.2	16.7	21.3	3.3	6.5
•C-8 Control	3.5	1.3	42.0	13.6	15.5	20.6	3.6	5.7
Control Ave.	3.6	1.4	40.6	13.6	16.0	21.4	3.6	5.9

²² Sigma-Aldrich, Humic Acid, Sodium Salt, (tech.), Catalog No.: H1675-2.

²³ Solvent peak interference may cause the biggest variation in this value.

As in previous tests these data also indicate that the humic substance is specifically fulvic acid in both ring and controls extracts. This is evident because of the highly oxygenated (CH/CH_2 alpha to oxygen, 3.3-5.0 ppm) and low aliphatic nature (terminal CH_3 s on alkyl groups and branch CH_3 s and CH_2 s on alkyl groups, 0.7-1.7 ppm) compared to the data from humic acids²⁴.

Infrared spectra of the ring extracts (Figs. 33a-c) also are typical of references of humic substances²⁵. The data from the ring extracts show very strong absorption bands due to ionic and/or chelated carboxylic acid $\text{C}=\text{O}$ (COO^- asymmetric stretch, 1590 cm^{-1} ; COO^- symmetric stretch, 1385 cm^{-1}), $\text{C}-\text{O}$ ($1100-1000 \text{ cm}^{-1}$) and OH/NH (H -bonded $\text{O}-\text{H}$ and $\text{N}-\text{H}$ stretch ca. $3600-3000 \text{ cm}^{-1}$). There are also bands belonging to quartz (1024 , 821 , 529 and 470 cm^{-1}). Since great care was taken to minimize as much as possible any insoluble fines from the soil, and the water extract was clear brown (see above), it is felt that the humic material has bonded to the quartz pulling it into aqueous solution and not residual fines. The spectra of the control extracts are different (Figs. 34a-c). The predominating infrared bands are due to soluble ammonium nitrate (3350 , 2407 , 1760 , 1372 and 821 cm^{-1}) and residual quartz (1024 , 530 , and 470 cm^{-1}). (Some ammonium nitrate is also in the ring extracts but is masked by the overwhelming amount of humic material. (See organic solvent extract section below.) The humic substance is in significantly lesser amounts as exhibited by weak/moderate absorption which is now at slightly different frequencies than that in the ring samples (bonded OH contribution to the 3350 NH_4^+ absorption; COO^- asymmetric stretch, 1625 cm^{-1}). The solutions were cloudy with material that could not be centrifuged or filtered out. As previously noted, there was also significantly less of this material to examine.

UV spectra of the D-3 ring extract and an aqueous solution of humic acid sodium salt extracts are similar (Fig. 35) and compare to that reported in the literature²⁶. There is a maxima at 190 nm which is consistent with $\text{C}=\text{O}$ absorption. Broad tailing between $250-375 \text{ nm}$ is due to the aromatic/heteroaromatic structure of the humate. This test lends support to the ^1H NMR and infrared analysis.

IC (Ion Chromatography) suggests subtle increases of sulfate and phosphate ions in the ring samples. Therefore, to a small extent they are indicated to be part of the release. The following ions are detected.

²⁴ Ref. 21.

²⁵ Ref. 21; J. F. Gaffney et al editors, "Humic and Fulvic Acids Isolation, Structure, and Environmental Role", ACS Symposium Series 651, American Chemical Society, Washington DC, Chapter 1, p. 2.

²⁶ J. F. Gaffney et al editors, "Humic and Fulvic Acids Isolation, Structure, and Environmental Role", ACS Symposium Series 651, American Chemical Society, Washington DC, Chapter 1, p. 2.

**Ion Identification
(ppm)**

Samples	Cl	NO ₃	HPO ₄	SO ₄
•D-3 Ring	130	74	313	287
•C-3 Ring	160	400	330	640
•A-2 Ring	160	430	330	460
•A-9 Control	115	321	43	101
•Center Control	130	1500	250	340
•C-8 Control	160	400	330	640

GC/MS analysis of the ring water extracts did not detect any components. This is because of the high polarity of the previously identified humic substance. This material would be expected to hang up on the GC column. GC/MS analysis of the headspace above the ring extracts detects a very small excess of carbon dioxide.

Silver Nitrate Precipitations from Aqueous Extracts

A precipitation using 0.1 normal solution of silver nitrate was done on the D-3 ring aqueous extract and an aqueous solution of the sodium salt of humic acid. The precipitation was similar to that performed by Erol Faruk²⁷. There was not much soil extract to work with because of sample limitations. So the precipitate was not washed for fear of losing some of it. Expectedly, both the extract and the humic acid solution completely precipitated leaving clear colorless solutions. This was due to the chelation of the Ag to the humic substance. FT-IR spectra of the precipitates (Figs. 36a, 36b) show bands typical of ionic/chelated acid groups (COO⁻ asymmetric stretch, 1550 cm⁻¹; COO⁻ symmetric stretch, 1370 cm⁻¹). These are shifted to lower frequencies than the humic substances before silver nitrate treatment because the acid groups are now bonded to Ag. OH (H-bonded O-H stretch ca. 3600-3000 cm⁻¹) and C-O (1100-980 cm⁻¹) modes are also noted. These spectra bands are similar to those observed by Faruk. However, Faruk's carboxylate shifts occurred at higher frequencies. This can be explained by the fact that his sample preparation for infrared analysis involved pelleting the sample in a KBr matrix. Carboxylic acid functional groups notoriously bond with potassium using this preparation, so we are predominantly seeing the potassium salt rather than the silver salt of the humate. Infrared data from the precipitates in this study were examined "au natural" using the relatively new Harrick SplitPea™ ATR (a single pass attenuated total reflectance) cell. Additionally noted in the above spectra is residual silver nitrate.

²⁷ Ref. 3

Organic Solvent Extracts

Very little material was extracted from two selected soils (D-3 ring and A-9 Control) using progressively polar organic solvent systems, i.e. pentane, followed by chloroform, then 1:1 acetone:methanol. Specifically, there was no detectable amount of pentane soluble material in either ring or control soils. A small amount of oxalic acid salt and residual quartz fines was exclusively found in the D-3 chloroform extract. Small amounts of materials were found to be 1:1 acetone:methanol soluble in both samples. The ring soil extract contained oxalic acid salt, ammonium nitrate, and residual quartz fines. The A-9 control extract consisted of mostly ammonium nitrate, possibly some carbonate, and residual quartz fines. The above extracts were identified by FT-IR analysis (Figs. 37a-c).

Acknowledgments: I wish to thank the following people for their contributions to this effort: Dr. Bruce Asamoto, consultation; Bruce Budinger, proofing and consultation; Dr. Susanna Butler, ion chromatography; Dr. Erol Faruk, private communication and consultation; Richard Gerron, XRD analysis; Dorothy Lukco, XPS analysis; Suzanne E. Mocadlo, constructive criticism; Dr. J. Robert Mooney, consultation; Sheryl A. Schmidt, support; Chuck Vandergriff, %C, %H, %N analyses; Dr. Loring Weisenberger, NMR analysis; Richard Wilson, GC/MS analysis.

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Phyllis A. Budinger

Distribution:
Erol A. Faruk
Mark Rodeghier (CUFOS Scientific Director)
John Timmerman (CUFOS Financial Officer)
William E. Jones (Ohio MUFON State Director)
Wendy Ban (Ohio MUFON Secretary/Treasurer - Ohio MUFON files)

Appendix H: Initial letter (first page) received from Ted Phillips.

CENTER FOR UFO STUDIES 2628 RIDGE AVE. - EVANSTON, ILLINOIS 60201

J. ALLEN HYNEK, DIRECTOR
PROFESSOR OF ASTRONOMY
NORTHWESTERN UNIVERSITY

May 11, 1978
P.O. Box 615
Sedalia, Missouri
65301

Dr. Erol A. Faruk
University of Nottingham
University Park Nottingham NG7 2RD

Dear Dr. Faruk:

Thank you for your letter of April 28, 1978. The Delphos report is coming along, slowly. I drove to Delphos for the fifth time April 15, 1978. Much has happened since the original event, I'll pass some of the information along in the very near future.

In your letter of December 9, 1977 you had some questions:

Condition of the ring soil now: As of April 15, 1978, the ring soil appears to have returned to its original state. Moisture content of the ring soil was the same as the control. Weeds are now growing in the ring for the first time since the original event. No mushrooms were growing,

Could a similar shape be reproduced by spraying a solution from a ring-shaped object held some distance off the ground? Interesting that you suggest this - given the wind direction on the night of the observation, an object hovering above the ground venting could have created such an effect. The ring is somewhat elongated toward the east, the wind was out of the west. The one section of the ring which indicated no change was on the western edge, that is also the narrowest part of the ring effect. I have felt this to be the case for the past six years. I need not mention the importance of the case if this should be vented fuel residue.

Did the soil feel moist soon after the object departed? Mrs. Johnson stated that as she touched the soil (within 5 or 10 minutes of the ascent) it did indeed feel moist with a cratered effect. She stated that there were slight "blisters" on the soil surface which she described as being not wet but slightly moist.

How rapid was the onset of the numbing sensation? Mr. & Mrs. Johnson both stated that the numbing was noted instantly as they touched the soil.

How similar was the sensation to that produced by a local anesthetic - would the prick of a needle have been felt? Mrs. Johnson compared the numbing to just that - a local anesthetic. A needle could not be felt, this was introduced by the local doctor. The area on her leg is still numb and has no feeling.

What was the condition of the soil prior to the alleged landing? There had been 0.82 inches of rain on the preceding day with rain ending at 1500 on that date. There had been no rain for 16 hours at the time of the observation. Climatological

Appendix I: Second letter received from Ted Phillips.

P.O. Box 615
Sedalia, Missouri
65301 U.S.A.

Dr. Erol A. Faruk
53, Grove Crescent,
Colindale, London N.W.9. OLS
England

October 19, 1979

Dear Dr. Faruk:

Thank you very much for your letter of October 3, 1979, I'm very sorry for the long delay in responding to the material received earlier this year. The main reason I have waited to write you is that we have new tests under way at a laboratory in St. Louis, Missouri. I had hoped to have the results to send with my reply but I have not yet received same. I have been contacted by the ~~finest~~ soils laboratory in this country and asked for samples (I'm not sure why). I received a phone call from personnel at that laboratory which I cannot name two weeks ago. I have prepared a copy of your work to include with the samples. I have been told that it will take quite some time to get the work done but they certainly can followup on your work. I will send you any information I receive from this lab or the one in St. Louis.

Yes, a full report is under way at this time. It will be published by the Center for UFO Studies I would think in the first half of next year. Obviously we will have to wait on analysis to publish. We are currently putting together a summary of all the analysis done to date. I should have that in the mail to you within two weeks. We finally have some limited funds to cover the cost of this any other research areas and perhaps can move more quickly now. I plan to make my final trip to Delphos next month to bring together information for the final report. It now appears that there was quite a change in the ring soil within a few days following the event. The samples taken the day after the event showed no indication of fungal growth while the four week old samples do. The sheriff & the witnesses state that the soil changed from a white-grey color to the light brown color in a few days. We may indeed be looking at what appears to be a fairy ring a week or so after the event but not in the first samples. More information on this with the test results.

Thank you again for your help and interest, I will keep you informed!

Sincerely,

Ted
Ted Phillips

Appendix J: Third letter received from Ted Phillips.

May 13, 1981

Route 1, Box 23
Reeds Spring, Missouri
65737

Dr. Erel A. Faruk
53, Grove Crescent
Celindale
LONDON NW9 OLS

Dear Dr. Faruk:

First of all, please excuse the very long delay in answering your letter of January 6, 1981. Please notice the new address above, I have moved over the past months and have started a photographic business here, taking most of my time away from UFOs! I am now trying to "catch up". As soon as I had moved I had to prepare my paper to be presented at the Massachusetts Institute of Technology in July, the paper is 74 pages in length taking a good deal of time to prepare!

I have been (slowly) forming a physical trace research group made up of very solid researchers from the U.S. and other countries. The purpose is to gather trace data and exchange that information quickly. I also plan a quarterly report on the data gathered. I have received information from Maurizio Verga (Italy) and will be working closely with a small research group being formed to study European Type-1 cases. I would like to ask you to join us in this very important step in UFOLOGY.

In answer to your question, no I have not yet heard from the two laboratories working with the Delphes material. I have written them on numerous occasions and have been assured that work continues. You make an excellent point - who would they inform of any outstanding results? These particular laboratories are working with a high percentage of government contracts! Perhaps the work has been done? They certainly have had time.

Regarding my report on Delphes, I have included a good deal of information in the M.I.T. paper. I plan to do a full report on Delphes when the info comes in from the two remaining laboratories. I plan to do the report by the end of this year even if I don't hear from the labs. Would it be possible for me to get a copy of the paper you presented at the First London International UFO Congress?

Again, I am very sorry for the delay in writing, if you have any questions I will try and answer them, if you have any comments I would welcome them. Please consider joining our international research group, it will be informal in nature but of great help to us all.

Sincerely,

Ted
Ted R. Phillips, Jr.

Appendix K: Fourth letter received from Ted Phillips.

November 12, 1985

Dear Erol:

My wife tells me that you called and as usual I've been working 18 hours a day and just cannot get caught up. Allen Hynek and Mimi were here in July for a two day visit and I gave him a copy of your report to read and comment on. Allen just had a tumor removed from his brain and is very ill. He had spent a month in Canada after leaving here, went into a hospital and was just released. He was never able to give me his comments on your report.

I can only say that I agree with your report and find it of great interest (as I know Allen would have). It is a fine piece of work and I only wish that I could add to it with new information, however, it is quite evident that new information will not come, it has been far too long and for some reason the people who could provide that information have chosen not to do so.

Once again I thank you for your efforts and time and I wish you the very best in the days to come. I continue to hope that one day we will see another Delphos and that when we do I trust that we will see solid conclusions with answers, not questions.

Sincerely,

Ted
Ted Phillips

Appendix L – Email communication with Ted Phillips in 2004

Ted Phillips, I.A.I. <archaeoanom@inter-linc.net>

Wed 2/4/2004 1:21 AM

No other testing is going on that I'm aware of. I wish we could get the quart container of the soil taken by the Sheriff the day after the event. I hand delivered it to Dr Paul Hostetler at the University just days after I first visited the site. Hynek and I went to the university after they had the stuff for weeks and asked what was being done. The reply was - they were still trying to determine what kind of tests should be run - then we find out that Hostetler had rather quickly moved to Australia and they could not find the material. Hynek was as mad as I've ever seen him and made it clear to the university big wigs just what he thought. The plastic encased samples were given to Buddy Rich, he has died and his wife wants to keep it. The second was given to Hynek and is now locked away by some religious group in Arizona along with Allen's files. The third and last one I gave to Joe Firmage (I still had more samples at that time) and he will not even answer his phone.

What a damn mess.

Ted

Ted Phillips, I.A.I. <archaeoanom@inter-linc.net>

Mon 2/9/2004 3:31 PM

HiI just thought of one person who should still have soil samples – Dr. James Harder - he and I trenched the flight path section of the ring in August, 1972 and he took all the soil (lots of it) with him. I have no idea how to contact him but he was at the University of CA at that time. He also experienced the hand numbing at the time.

Ted

Ted Phillips, I.A.I. <archaeoanom@inter-linc.net>

Tue 2/10/2004 2:39 PM

Hi Erol, I talked about an hour with Jim and he indeed did just throw out the Delphos material. I asked if he knew of anyone else that might have

samples and he did not. I know he had several lbs of the soil - I helped him.

Sorry guys, running out chances..... Ted

Ted Phillips, I.A.I. <archaeoanom@inter-linc.net>

Tue 2/10/2004 11:22 PM

Hey Guys,

There were three samples, each was a clump some 25mm in size. The samples were from my first trip there, 30 days after the event. They went to

Hynek (locked away by the weird group in Arizona along with his files), Joe Firmage (who will not take any calls), and Buddy Rich (the greatest jazz drummer ever) and his wife will not part with the piece because Buddy was so proud of it. There is no way we will get these back.

Harder said, Oh no, I dumped those years ago, what could be done with them now anyway? He has moved beyond investigating cases and is involved in much more advanced work on the subject. He is sending me reports on his current work (dealing more directly with ETs than checking out cases).

Dr. Hostetler, geochemist, University of MO had the best samples, they were taken by the Sheriff the day after the event. The university wouldn't admit to doing any testing, couldn't find the quart container of soil and Hostetler suddenly moved to Australia - end of story there. Oak Ridge had numerous samples but the project director has retired and I'm betting those samples have long disappeared.

Ted – also frustrated

Appendix M: Similar 1957 French case to Delphos CE2

4/21/57 - Mrs. Gilberte Ausserre and Mrs. Rol...

Page 1 of 2



4/21/57 - Mrs. Gilberte Ausserre and Mrs. Rolande Prevost, Montlucon, France, 1:45 AM

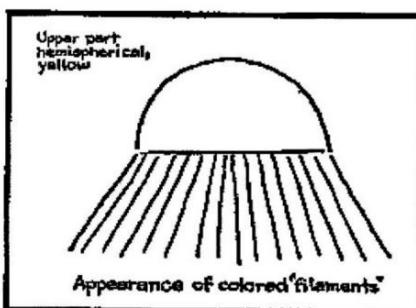
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"These witnesses saw a yellow, hemispherical object in the sky; its apparent diameter increased to that of the full moon and then it... suddenly disappeared from the view of the witnesses., and reappeared a few minutes later at a point situated to the right of the first sighting position. This new period of visibility lasted for about 5 mins, then the object vanished again for 5 mins and came back. It went out completely at 2:30 AM. From the underside of the object emerged several filaments of a green and purple color spread like a fan. The brightness was blinding and the shape reminded one of a jellyfish... at some of the reappearances, the object had lost its jellyfish aspect and appeared as a double-bodied object.... Aime Michel... points out that similar observations had been made in 1954 in other parts of France (especially in Lievin, Rue, Marcoing, Armentiers, Milly, Champigny, Corbigny, [and] Montbeliard), but these reports had drawn absolutely no interest except in the local press."[\[footnote 1\]](#)

Report Summary
Hynek NL
Classification
Original
Vallee Type IIIc
Classification
Current
Vallee MA1
Classification
Minimum Distance Unknown

Object Appearance



Object Behavior Appeared and disappeared at 5 min intervals, sometimes displaying fan-like luminosity beneath, other times appearing to be a double object.
Physical Effect None
Medical Effect None
Comments / Conclusion Part of the "Jellyfish" [correlated](#) category.

Written with [HTML Author](#)

<http://209.1.224.14/~mcashman/ufo/report/570421.htm>

14/01/1999