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August 2, 1991

Interim Report To: Pat Delgado and Michael Chorost
From: W.C. Levengod
Subject: Analyses of plant material from circle and pictogram formations.

Gentlemen:

The reason I have incorporated the results from the excellent research material you have both submitted, into this single document is simply a matter of efficiently utilizing my reporting time and efforts. It also provides a more coherent outline of what has been done and what further research is intended. In addition, this system also allows me to give each set of samples a laboratory code number as I work on them. Note this coding in the following sections and in the future please refer to these No's when discussing a specific test series. Without this type of system my input into the entire project could become hopelessly complicated and confusing.

You both will be interested to learn that all the samples you have submitted, following the single customs incident in Chicago, have arrived intact. Incidentally Pat, if at all possible I would like to obtain a sample of the mature rape seed from the plants with reduced growth and within the same circle area noted in the crop the preceeding year, and of course the control seeds. As you will note in the following, the seed collection is very important - please place the seed heads in bags separate from the roots and intact plants.

Since it can take as long as 12 days for these samples to reach my lab. the mold formation has been extensive. I have found, however, that if the plants are immediatly taken out of the package, the seed heads removed and air dried, the roots and upper plant material cleaned and placed under refrigeration, the samples can be examined at a later date. Based on the samples received and the number of examinations I want to make it will be well into the winter months before I am satisfied that all the material has been sufficiently examined. Not complaining - just explaining! Keep the samples comming. Incidentally I am keeping a photographic record of any important findings. Most of these recorded samples are still in the camera.

LABORATORY RESEARCH - CHRONOLOGICAL LISTING

In this and in future reports you my note the use of these terms, "statistically significant", "significant" or "NS" (not stat. sig.) as they are applied in the analyses of various data groups. This means that the data have been examined using standard statistical, analytical procedures. The data are considered significant if at the 95% ($P < 0.05$) confidence level or higher.

I. Code- G16-103

Wheat plants with soil samples from - Pat Delgado, received Jan. 18, 1991. Two circles designated "A" and "B" and located about 50 mi. apart - polyembryony and soil color changes found - see letter report of Feb. 24, 1991, for details of the lab. analyses.

II. Code- G16-104

Wheat plants with soil samples from - Pat Delgado, received May 2, 1991. Obtained at Butleigh Wooton, Somerset April 20, 1991. Refer to May 19, 1991, letter report to Delgado - no difference between plant cell structure or soil colors when comparing circle samples with controls. This was later reported to be a hoax.

III. Code- G16-116

Wheat plants with soil samples - from Pat Delgado, received July 12, 1991. Obtained at Newton St. Loe -SW of Bath, England. "Very large pictogram - samples from one of the large circles - controls 300 yards from formations."

Plant cell structure- in the parenchyma cells of the stem nodes the cell wall pits were much more prominent and sharply outlined in the nodes from the circle material than in the control node tissue. More will be said about the stem nodes in a later section.

Soil- color differences same as observed in G16-103 samples. Soil from roots of controls more reddish in color than from the circle sample.

Seed examination- externally the heads and glumes, as in sample G16-103 were of normal appearance. The seeds from both samples were not completely mature. They were white in color and the endosperm had not completely filled out. Between 50 - 100 seeds were obtained from each sample. It was very apparent that there was a large number of grossly malformed seeds in the circle sample - about 40% compared to 0% in the controls. These malformations consisted of brown colored, completely flattened seeds to those with the embryo exposed and extending out of one end of the seeds (photos taken).

Most of these deformations can be explained by a premature dehydration of the seeds. For this to have occurred the development must have been arrested in the circle samples at the time of the pictogram formation. The control plants apparently continued development during the 11-day shipment period. This is the second sample group in which embryo (or seed) development has been altered or suppressed.

IV. Code- G16-120

Grass samples - from Pat Delgado - received July 15, 1991. "They were from a flattened shape in Cornwall - taken 7-7-91." No controls submitted to Pat. The formation was a ring shape with a "Y" inside. At the three junction points where the Y intersected the ring the grass blades were coated with a dead black (non light reflecting) substance. This substance was very uniformly spread on the leaves, but was easily removed by rubbing with the fingers and felt greasy. The dead grass taken from other points in the ring did not show this coating material.

A microscopic examination revealed no hyphae or mycelium thus reducing the possibility of fungi. This material was amorphous in appearance and was very suggestive of carbon black. The underlying leaf cells had completely broken down cell walls with large gaps in them - there was no regularity in the cell outlines as was seen in the comparison tissue taken from other locations along the ring. Any other work on this should involve a spectrophotometric analysis to determine the composition of the amorphous substance.

V. Code- G16-122

Barley plants with soil samples - from: Pat Delgado - received 7-20-91.
Three samples plus controls - taken at Somerset 7-13-91.

Soil - color differences were not definite in these samples.

Seed analyses - one sample from the "oval" formation had no seeds. The other three samples had mature appearing seeds with no obvious external differences in shape, size etc. Since they were mature seeds the decision was made to examine them in my redox system (see reprint I sent you). Although it is a time consuming test it provides precise information concerning very subtle differences in the metabolic processes during the initial stages of germination.

An analysis of these data disclosed significant differences between the control seeds and those from the "dumbbell" and "circle" formations. These data are not discussed in detail here for the following reason - the redox test clearly disclosed that the seeds were in dormancy and this may be a factor in the observed differences. Dormancy was also confirmed in germination tests. The seeds are currently being taken out of dormancy (cold treatment) and the tests will be repeated so that their responses can be compared under more normal conditions of germination.

V. Code- G16-124

Grass and soil samples - via. Michael Chorost, received 6-17-91. "Donut" shaped formation at Dandridge, Tennessee on 5-22-91. About a 24' dia. ring of flattened plants with a 5' dia. circle of standing plants in the center.

Plant material - the dry plants consisted of a heterogeneous mixture of grasses, clover etc. No obvious differences observed in these samples.

Soil - the control soil sample was again observed to be slightly more reddish in color than the samples from the crop circle ring. A sample from the unaffected patch in the center was very similar in color to the control.

Radiation measurements - report by Mr. Marshall Dudley. I am discussing this report (see copy attached) because it is typical of what can happen to the results from very carefully obtained and statistically analyzed scientific data. I found it buried in an extensive and rather meaningless anecdotal report on the above formation.

A gas flow system was used to make long term counts in these soil samples. Both beta and alpha particles were monitored in soil from outside the circle, from the center of the donut and from the ring. No difference was found in the beta particle counts; however, the alpha particle count from the ring sample was significantly LOWER (authors emphasis) than the control. The author states "there is no measurable radiation associated with this event".

We cannot afford to ignore the fact that the alpha count in the ring was lower than the control. Let me suggest one possibility for this unusual but significant data point. Alpha particles are positively charged helium ions. If we continue to apply the concept that ion plasmas are involved in the circle formations, and further, that at least in this particular case this plasma has a high negative charge (negative ion concentration) which penetrates a few cm into the soil. This could leave the soil particles with a negative charge and as the positively charged alpha particles are emitted and pass through this high negative ion environment some would be neutralized and would not be detected by the gas

flow counter; thus explaining the significantly low alpha reading from the ring sample. This type of mechanism would not be expected to influence the beta counts. It is also of interest to note that the alpha count for the center of the donut (standing plants) is intermediate in value between the control and the ring sample.

VI. Code- G16-126

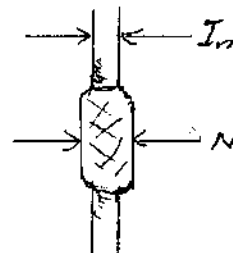
Wheat plants and soil samples - part of a group submitted by Michael Chorost. Received 7-20-91, the three samples discussed here were designated "A, B and C"

Anatomical observations - during a cursory examination of these samples there appeared to be an alteration in the growth nodes on the plant stems. The nodes appeared to be thicker in the circle samples relative to those in the control plants. The following is a quantitative study of node sizes in these plants. Because of the natural growth and size variations in a plant population a size ratio method was employed as explained below.

N = node diameter

I_n = diameter of stem (internode) taken
about 5 mm acropetally (above) the node

R = ratio = N/I_n



These measurements were obtained with a precision, vernier micrometer containing a ratchet to insure a constant applied pressure for each measurement. Each sample consisted of three plants most of which contained five growth nodes - here No.1 is designated as the basipetal (bottom) node. We therefore have three ratio values for each sample at each of the five nodes. The mean values of these three ratios were statistically analyzed in the three test samples. It was quite apparent that there was no significant difference (NS) between these mean values for nodes 1, 4 and 5. In nodes 2 and 3 the ratios were significantly different as shown in the following table. In each test sample there were six values since nodes 2 and 3 were combined for the analysis.

RATIO OF NODE- N TO INTERNODE- I_n DIAMETERS IN PICTOGRAM FORMATIONS IN WHEAT
(combined data for nodes 2 and 3, $N=6$; controls taken outside formations)

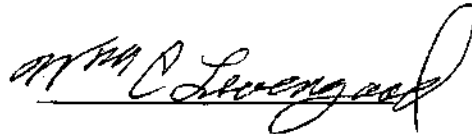
<u>Sample</u>	<u>Ratio N/I_n</u>	<u>s.d.</u>	<u>Confidence Level</u>
(A)-Circle	1.434	0.082	$P < 0.05$ (significant)
(B)-Ring	1.354	0.077	$P < 0.05$ (significant)
(C)-Control	1.242	0.085	-----

This is the first sample group I have examined for the node size differences and intend to extend this into others.

COMMENTS:

One thing that appears to be emerging here is the fact that the energy input into these formations is altering the normal development of the embryo. The type and extent of the embryo alteration depends on the development stage of the plant when the pictogram is formed. The later the growth stage the more subtle the change seems to be - this will be confirmed in future research.

The changes in cell wall pits and enlargement of the growth nodes in the plants from the pictogram formations are both new findings. Hopefully at a later date and with more data it will become evident why only specific nodes on the plant are significantly influenced.

A handwritten signature in cursive script, reading "W.C. Levengood". The signature is written in dark ink and is positioned above the typed name.

Dr. W.C. Levengood
Pinelandia Biophysical Lab.

Sample Addr: G16-174

RADIATION MEASUREMENTS ON SOIL SAMPLES

by Marshall Dudley Date: 4-25-91

Tennelec samples

Richard Slover provided me with soil samples from an area in Dandridge where a grass circle was found. There were 3 samples, one from the center of the circle, one from the center of the band, and a third from outside the circle.

1/2 ounce of soil, with some organic materials, such as grass roots, was measured using a postage scale, and pressed into 3 each 2" X 5/16" deep planchets. Each of these samples were counted for approximately 2,000 minutes in a Tennelec/Nucleus LB4000-8 gas flow low background system. The system had been previously characterized as to background and efficiency. Background was established to better than a 1% confidence level. The estimated error in weighing was 10%.

With efficiency correction, and background subtraction, the 4 sample's activity was determined as follows:

	ALPHA	BETA
1. Control, no sample material:	0.01 ± .004 DPM	0.14 ± .03 DPM
2. Control, soil outside of circle:	17.23 ± 1.7 DPM	68.29 ± 6.8 DPM
3. Center of circle:	16.17 ± 1.6 DPM	66.75 ± 6.7 DPM
4. From the ring:	13.61 ± 1.4 DPM	62.46 ± 6.2 DPM

Because the samples and backgrounds were counted to 1% or better precision, the primary inaccuracy is due to weight measurements, which are estimated to be 10%. Since the statistics add as the square root of the sum of the squares, a 10% deviation and a 1% deviation will result in a 10.05% total deviation. Therefore, for samples which required weighing, a flat 10% standard deviation has been assumed.

Note that the Beta counts are all within one standard deviation of the soil control sample. Also note that only the sample from the ring is outside of 1 standard deviation for the alpha count. It is within 2 standard deviations (95% probability) and is LOWER than the control. Therefore, it is my considered opinion that there is no measurable radiation associated with this event. This does not mean that radiation was not produced during the event, only that there is no remaining residual radiation.