

NOV. 2, 1971

DELPHOS KS

INNOVATIVE
NOTEBOOK

SCIENTIFIC SPECULATION BY JUENEMAN

more little games of rings and things

IT SEEMS THAT the silly season is once more with us.

Just recently I read an exposé by Stanton Friedman, physicist turned UFOlogist, about a mysterious landing by an otherworld craft on November 2, 1971, near Delphos, Kansas.

The 'footprint' of this UFO was the impression of an 8-foot diameter ring with about a twelve-inch thickness. Also, the condition of the soil was slightly altered to the depth of roughly 14 inches, where mineral salts of iron, calcium, magnesium and potassium were rendered more soluble within the ring than in the surroundings.

The site was not found radioactive, so the best guesstimate was that the effects were due to very intense microwave heating—but with a power rating of somewhere between two and 20 megawatts!

Now, the pulps are full of stories about peculiar electromagnetic behavior associated with UFOs, ranging from ionizing radiation that adversely affects radio reception to unusual acoustical noises that panic the livestock.

Electromagnetic phenomena is not an unreasonable assumption, but methinks we should exhaust all possible natural effects before conjuring up the likes of a superscience civilization.

The ring structure of the Delphos, Kansas, flap should give us a prime clue. Not only for this incident, but also for a large number of similar occurrences which don't leave such visible spoors.

To digress momentarily, in the June, 1971, *Notebook* I referred to the topological similarity between a sphere and a torus. In practice, if a spherical drop of a denser but miscible liquid falls into a lighter solvent, such as that of a salt solution into water, the drop can be seen to change into a toroid, and by watching the *schlieren* one can follow its descent to where it impinges on the bottom of the container.

Up until a few years ago a toy manufacturer marketed a sonic canon that expelled a toroid of air, much like a high powered but in-

visible smoke ring, which could 'splat' very audibly against a wall forty feet away.

This toy made an extremely satisfying sound, however the acoustical watts it was capable of generating made it dangerous. Hence the reason it was pulled off the market. (For those of you in the 'know', it was no joy to hear the thing go off in the living room on the morning after the night before.)

Now then, if a fist-sized meteorite came zipping full tilt into our atmosphere, became heated to incandescence and vaporized into a superheated plasma, the shock front could well transform the gaseous matter into a luminescent toroidal UFO.

Under such magnetohydrodynamic conditions, backed by several megawatts of power, transduced from mechanical to electrical energy,

Thus we find a direct connection with the legends of fairy-rings which came out of Medieval Europe, frightening the wits out of the superstitious peasantry.

But, in our enlightened age, discretion being the better part of intrepidity we give such places a wide berth. Yet, not a few investigators rushed in to feel the strange white substance delineating the ring, partly phosphorus pentioxide, which esterified the oils of their fingers and made numb the nerve endings

Curiously, one of the very rare examples of circular Greek architecture is located at the Kansas community's namesake, Delphi, Greece. This was, according to art historian Lewis M. Greenberg, the second oldest *tholos*, or round temple, built in the 4th century BC in the sanctuary of Athena, a lesser known edifice than the one dedicated to



what do you think would happen when it hit the ground?

Right on!

Instead of a splat, it would be absorbed nearly instantaneously; although if a noise were heard it would probably be the sizzle of a high voltage corona. The radar oven effect would cook out most of the organic matter, and in so doing would effectively reduce a number of minerals to a more soluble form, if not to the elemental state.

The pale-light glow observed at Delphos was possibly none other than elemental phosphorus eerily manifesting its verb intransitive.

Apollo nearby where the ancient oracle held court.

It doesn't take much imagination to figure that the Greeks assumed the circular patch of ground was pretty special, and with plenty of stone lying around it was a fine place to build a temple. A little out of the way, perhaps, but then people travel long distances to get to such holy places.

Kansas isn't noted for its stone, so I wonder what commemoration to the UFO gods they'll put there.

Frederic B Jueneman, director/research,
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9th December 1977

Dr. J. Allen Hynek,
Center for UFO Studies,
2623 Ridge Avenue,
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Illinois 60201
USA.

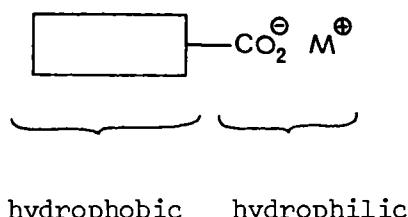
Dear Dr. Hynek,

Here are the preliminary results from the analysis on the Delphos soil samples. I should like to say at the outset that my initial attitude towards Delphos was that the effects described could have been caused by a photo-oxidative degradation under intense visible light of the natural humic acids (the dark brown or black colouring matter of soil) present in the soil. Experiments of this nature have been performed and a number of these refer to a weak chemiluminescence as the unstable oxidised humic acids decompose to products of lower molecular weight.¹⁻³

Certain other substances found in the environment which exhibit chemiluminescence during oxidative breakdown include coal derivatives⁴ and the unstable compounds occurring in cigarette smoke.⁵ Colour is important since these processes may involve electronically excited species generated by absorption of light which convert ground state triplet oxygen to the excited singlet state utilised in the oxidation process. Alternatively the oxidation may proceed without absorption of light to furnish products which by virtue of their extensive chromophores decompose with emission of light. Mechanisms such as these could similarly have been postulated for the dark coloured material of tree bark.

My impression now on Delphos after studying the soil is that this kind of oxidative degradation accompanied by chemiluminescence may still apply but that it no longer involves the soil humic acids or the tree bark.

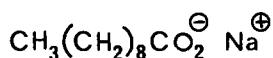
There is present in the soil an organic substance which is responsible for the hydrophobic nature of the soil. Paradoxically this substance can be washed out with water but little else. The resulting aqueous solution is alkaline and easily foams on shaking and these properties are consistent with the substance being an alkali metal salt of an organic acid. Such a compound would consist of an essentially hydrophobic organic residue containing a hydrophilic carboxylate anion:



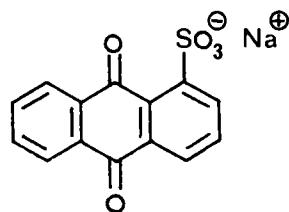
The ionic segment is responsible for the water solubility of the compound and its insolubility in organic solvents (it cannot be removed from the soil by washing with ethanol alone). It appears that in the soil this part of the molecule along with any other polar groups present is bound up to the similar hydrophilic sites of the soil allowing the organic half to act as the new "surface" of the soil and enable it to display the uncharacteristic properties toward water.

Wetting the soil enables the water molecules to disrupt the strong hydrogen bonds between the substance and the soil thus allowing dissolution to occur. There is little doubt that this substance is directly responsible for the hydrophobic nature of the soil since if the resulting aqueous solution is added to the control soil and the mixture allowed to dry it begins to assume the hydrophobic characteristics of the ring soil. The colour of the control soil also changes. These findings strongly suggest that the substance was applied to the soil as an aqueous solution and if this is correct it would also explain the depth of the hydrophobic characteristics.

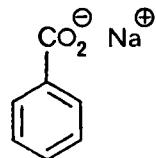
To investigate this further a number of known organic acids were converted to their sodium salts and their aqueous solutions tested with some of the control soil. After allowing the mixtures to dry ordinary water was placed on the surface of each sample to test their absorptivities. Compounds such as sodium decanoate(I) and sodium anthraquinone 1-sulphonate(II) imparted to the soil a certain degree of hydrophobic character. With these samples the water added subsequently would either run off the surface of the soil or momentarily form into a spherical bead before being absorbed by the soil. With compounds such as sodium benzoate(III), sodium naphthoate(IV) and sodium 3-phenyl propionate(V) where the size of the organic residue is relatively small this behaviour was much less apparent. The complete hydrophobic nature of the ring soil suggests that the molecular size of the substance may be quite large.



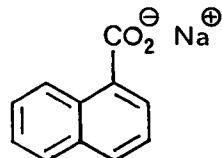
(I)



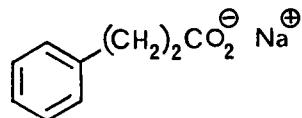
(II)



(III)



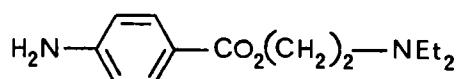
(IV)



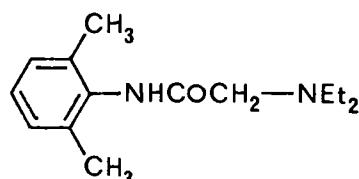
(V)

A moment or two elapses before the aqueous extract of the ring substance is absorbed by the control soil. This is also evident for the solutions of the two more effective test compounds mentioned above and can be explained by reversing the idea discussed previously - in the aqueous solution it is the organic part of the molecules which congregate to form the surface of the drops and the latter are consequently repelled by the hydrophilic sites of the soil. If a similar repulsion had occurred when the ring was being formed it could have resulted in the solution distributing itself on the shallower parts of the ground before being absorbed. Is there a correlation between the ring shape and the surface profile of the soil?

Regarding the alleged numbing effect of the soil surface on the finger tips of the witness' mother it is interesting to note that the basic chemical structure of local anesthetics conforms with that of the substance in the soil in that they almost invariably consist of hydrophobic and hydrophilic segments attached in the same molecule. The majority of the local anesthetics in use today are tertiary amines which can exist as uncharged or positively charged molecules depending on the pH of the solution and the pKa of the compound. Two such examples are shown below:

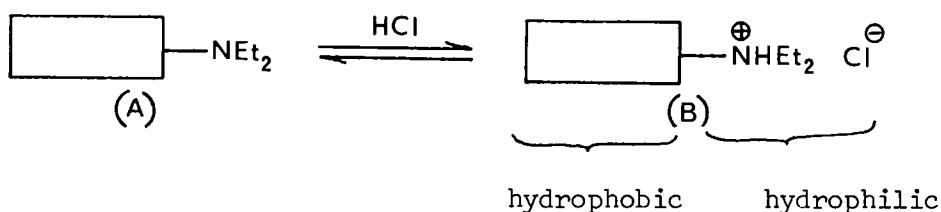


Procaine



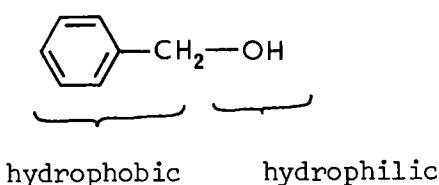
Lignocaine

The aqueous solutions of the salts of these compounds with a suitable acid (eg. hydrochloric acid, HCl) would contain mixtures of the uncharged and charged species, the charge being located at the terminal amino group:



As I understand it local anesthetics act at the cell membrane and the block in the conduction of nerve impulses which they produce is a result of interference with changes in membrane permeability to potassium and sodium ions. The penetration of a local anesthetic to its site of action depends upon its ability to cross lipid barriers and the uncharged form

(i.e. "A" above) will be able to penetrate lipid layers with ease. Once in the nerve tissues the low pH of the environment generates the charged form (i.e. "B") and it is this species which is actually responsible for the anesthetic effect. The substance in the soil would also exist as a mixture of charged and uncharged species when in solution (the latter being the free acid) and it is conceivable that this duality could be responsible for the local anesthetic-like behaviour described by the woman. I should point out that there do not seem to be examples of such alkali metal salts of carboxylic acids displaying anesthetic properties in the literature. However, other non-nitrogenous compounds are known to have such properties and it is notable that these too have the common characteristic of containing hydrophobic and hydrophilic segments in the same molecule, e.g. benzyl alcohol(V1).



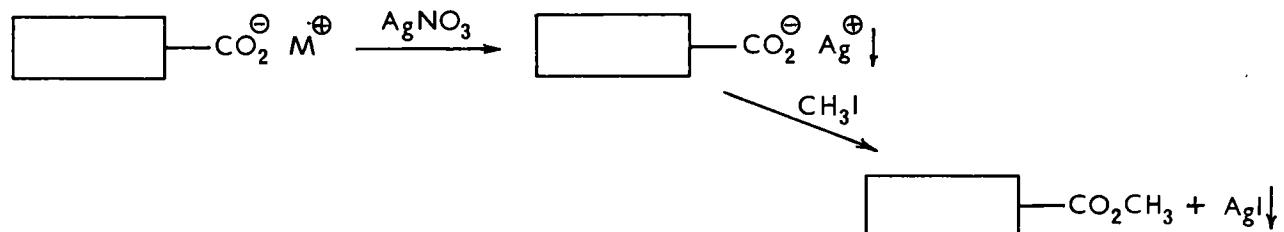
(V1)

Local anesthetics are normally administered to mucous membranes or damaged skin and consequently the effectiveness of such anesthetics on unbroken skin has been little studied. One such investigation was carried out in 1957⁶ when a variety of local anesthetics were administered to the anterior surfaces of the arms and forearms of volunteers and anesthesia tested with the prick of a needle. Both the salts of the anesthetics (charged forms) and the free bases (uncharged forms) were tested, usually by administering as solutions or ointments. Repeatedly swabbing the skin at 15 minute intervals for three hours with 2% solutions of either the salts or the free bases was found to produce no anesthesia. More success was obtained with an occlusive dressing soaked with 2% solutions of a number of bases. In this case local anesthesia was produced in 45-60 minutes and was quite prolonged, averaging two to four hours. Perhaps most relevant was the method of continuous contact in which the solution to be tested was placed into a well formed on the skin with petrolatum. A number of anesthetic salts tested in this way as 2% aqueous solutions produced anesthesia after two hours. These results were interpreted as showing that the free bases (uncharged forms) penetrated the skin more readily than did the salts. The long time interval between application and onset of anesthesia for both types (45 minutes - 2 hours) showed that the outer layers of the skin acted as an effective barrier to penetration. Similar conclusions were drawn from a more recent study in which electrical stimulation was employed to elicit pain sensation without damaging the skin.⁷ If the substance in the soil can behave as a local anesthetic it is surprising that the numbing sensation felt by the woman was described as "immediate". It may be that she touched a highly concentrated solution of the compound. Local anesthesia can be induced far more quickly (1-4 minutes) with 2% solutions of either the free base or salt of an anesthetic if the skin is first stripped with Scotch tape 10-15 times to remove the outer layers but this can hardly apply to the Delphos case.

The problem now is to identify the substance and determine whether the alleged luminescence is compatible in any way with the chemical structure. Fortunately the isolation of the compound has not proved too difficult. The suspension which results after the soil is mixed with water is first filtered or centrifuged to obtain a clear brownish red solution, the procedure being repeated on the filtered soil until little or no further colour is imparted to the extract. There is a marked difference in the colour of the extracts obtained from the surface soil and that taken from beneath the surface, the latter being deeper red in colour. The UV-visible light spectrum of the aqueous extract of the soil taken from beneath the surface gives rise to a broad absorption band which extends gradually into the near UV-visible region (Fig.1:A). In contrast, the spectrum of the surface soil extract shows a much more abrupt loss of absorption towards the visible region (Fig.1:B). Although this difference can probably be explained in terms of the more extensive decomposition of the substance at the soil surface it is difficult to judge at this stage whether this has been caused solely by normal atmospheric oxidation occurring over a relatively long period of time or whether it is linked to the alleged luminescence of the soil surface. The aqueous extract of the surface control soil does show some absorption in the 200-230 nm range (Fig 2:A) but this is much weaker than those obtained from comparative amounts of the two ring soil samples (Fig 2: B & C). (Each were recorded after extracting 70mg of the relevant soil sample with 0.5 ml of water).

The aqueous extract of the substance is difficult to manipulate for identification. Any attempt to evaporate the solution under reduced pressure results in changes in the absorption spectrum indicating that some decomposition occurs. The best way to overcome the problem is to precipitate out the organic acid as its sparingly soluble silver salt by treating the extract with aqueous silver nitrate. The resulting dark red, almost black solid is allowed to coagulate and can then be centrifuged off. After discarding the colourless supernatant the precipitate is washed carefully with water, ethanol and diethyl ether, after which it is dried with a stream of nitrogen and stored under nitrogen at 5°C. 2.5g of the soil taken from below the surface yields approximately 90 mg of the dry silver salt after exhaustive extraction. A similar procedure on the control soil gave a negligible amount of precipitate.

Treatment of the dry silver salt under a nitrogen atmosphere with excess methyl iodide in anhydrous acetone affords the corresponding methyl ester which is much easier to manipulate:



Analysis by thin layer chromatography (t.l.c) of the esterified product obtained in this way from both ring soil samples reveals one major yellow band (the pure methyl ester) flanked by a number of fluorescent

bands (under 366 nm light) showing that extensive decomposition has occurred while in the soil. Since the samples are six years old this is perhaps not surprising. The ester is itself very unstable in air and oxidises within a few minutes to an almost colourless product. This change can best be seen under 366 nm light - the yellow ester shows up as a dark band which gradually gives way to the fluorescent oxidation product(s). Reducing the exposure to air by covering the chromatogram with a glass slide slows down this process considerably. The ester can be eluted off and its absorption spectrum recorded provided this is done rapidly. The spectrum obtained in ethanol (Fig.3:A) exhibits maxima at 220, 290 and 358 nm. The intensities of the two longer wavelength maxima decrease gradually while in solution and a simultaneous increase in the absorption at 220 nm occurs. After an hour the shorter wavelength absorption begins to dominate the spectrum (Fig 3: B). This change may be a result of the oxidation process mentioned earlier or it could be caused by the ester interacting with the solvent. The decrease in the maximum at 290 nm occurs whether the sample is left irradiated at this wavelength or kept completely in the dark suggesting that the influence of light is unimportant for this process. (Fig 3). The maxima at 290 and 358 nm are lost on reduction with potassium borohydride indicating that the chromophores giving rise to these bands are associated with ketone or aldehyde carbonyl groups.

The polarity of the ester on t.l.c. is relatively high with a retention factor (R_f) of ca 0.5 in acetone : methanol : benzene mixture (in proportions 20:5:25) (stationary phase : silica gel HF254). This again indicates a large molecular structure with numerous polar groups present. Treatment with a mixture of acetic anhydride and acetic acid to acetylate any hydroxyl groups present (hence giving a less polar derivative) does not seem to have any effect. The high polarity must undoubtedly contribute to the water solubility of the original ionic compound.

The air sensitivity of the ester presents a serious problem to the purification and eventual identification of the compound. If I can succeed in identifying the compound and it turns out to be one that has never been reported in the chemical literature we may have a case on our hands. I have written to Ted Phillips requesting more ring soil - as much as he can supply and preferably taken from below the surface. The instability of the compound makes it essential that its identification should be attempted without further delay otherwise Delphos will end up as just another frustrating example of a possible UFO landing.

In closing a number of points are worth mentioning for further consideration:

a) 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 I have 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 chartruesis (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 fibres being thinly coated with the organic substance. I would be interested to know what the condition of the ring soil is now. Ted Phillips mentioned during a telephone conversation with Alan Fossey that mushrooms were now growing on the soil. Mushrooms are a type of fungus and their growth could simply be a consequence of the high organic content of the soil.

b) The probability that the organic compound was applied to the soil as an aqueous solution may help to explain the presence of higher amounts of inorganic salts also found in the ring soil. The fact that the ring is horse-shoe shaped with its axis aligned to the direction of wind then prevailing leads me to wonder if the solution was sprayed on. Given the wind velocity could a similar shape be reproduced experimentally by spraying a solution from a ring-shaped object held some way off the ground? (Perhaps the reported rumbling noise was associated with a pump-action of some kind).

c) A number of ambiguities need to be cleared up in light of the analysis results. For example, did the soil feel moist soon after the object departed? How rapid was the onset of the numbing sensation noted by the woman concerned? How similar was this sensation to that produced by a local anesthetic - for instance would the prick of a needle have been felt on the affected area? What was the condition of the soil prior to the alleged landing especially regarding recent rains?

Finally I should like to say that with regard to the analysis so far the probability that Delphos is a genuine case and not a hoax is, in my view, very high. There are too many features of the analysis findings which are consistent with the original story to be dismissed as purely coincidental. A more precise answer can only be arrived at after the compound in the soil is identified.

I am sending a copy of this letter to Ted Phillips.

Yours sincerely,

Erol A. Faruk Ph.D.
(Research Fellow)

References

- 1) D. Slawinska and J. Slawinski: Chemiluminescence of humic acids. Nature Lond., 213, 902, (1967).
- 2) D. Slawinska, J. Slawinski and T. Sarna: The effect of light on the ESR spectra of humic acids. J. Soil Sci., 26, 93, (1975).
- 3) D. Slawinska and J. Slawinski : Spectroscopic study on mild oxidation of humus acids (I) Oxidation with molecular oxygen; (II) Influence of light on oxidation with molecular oxygen. Pol. J. Soil Sci., 8, p.37-58, (1975).

- 4) R.E. Markby, R.A. Friedel, S. Friedman and H.W. Sternberg: Light-induced chemiluminescence in derivatives of coal and petroleum. Fuel, 49, 242, (1970).
- 5) H.H. Seliger, W.H. Biggley and J.P. Hamman : Long-lived chemiluminescence in cigarette smoke. Science, 185, 253, (1974).
- 6) S. Monash : Topical anesthesia of the unbroken skin. Arch. Dermatol., 76, 752, (1957).
- 7) J. Adriani and H. Dalili : Penetration of local anesthetics through epithelial barriers. Anesth. Analg. Cleveland, 50, 834, (1971).

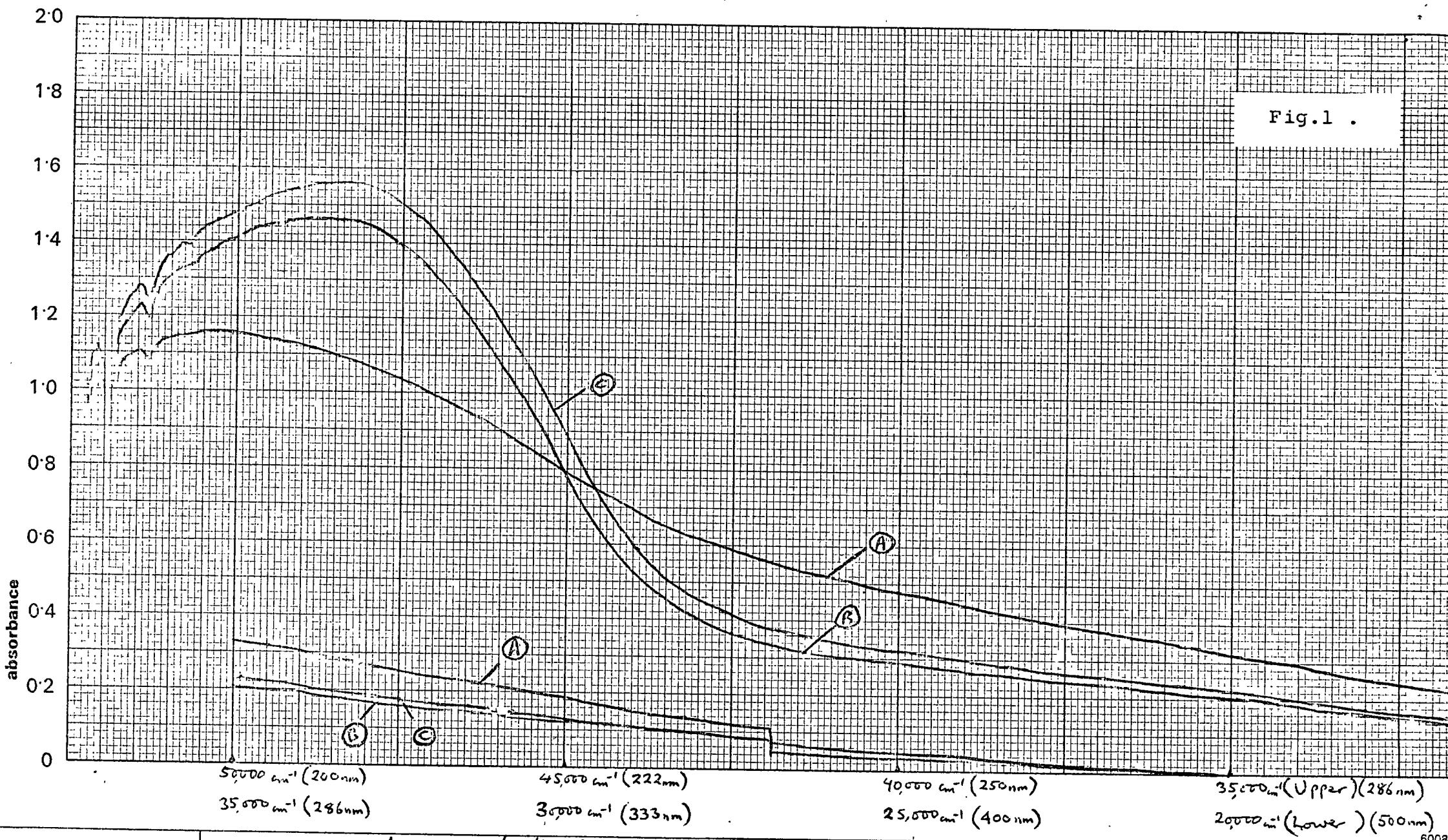


Fig.1 .

ALIGN WITH INDEX ON THE RECORDER ↓	SAMPLE AND FORMULA	Aqueous extracts of soil samples after dilution Ⓐ #2 Ⓑ #1 Ⓒ #1 After extract & evap @ ~70-80° under red. pressure	CONCENTRATION REFERENCE dist. H ₂ O PATH LENGTH 1 mm mm.	SCAN SPEED FAST <input checked="" type="checkbox"/> SLOW <input type="checkbox"/> DATE 8/8/71 OPERATOR E.A. FARUK
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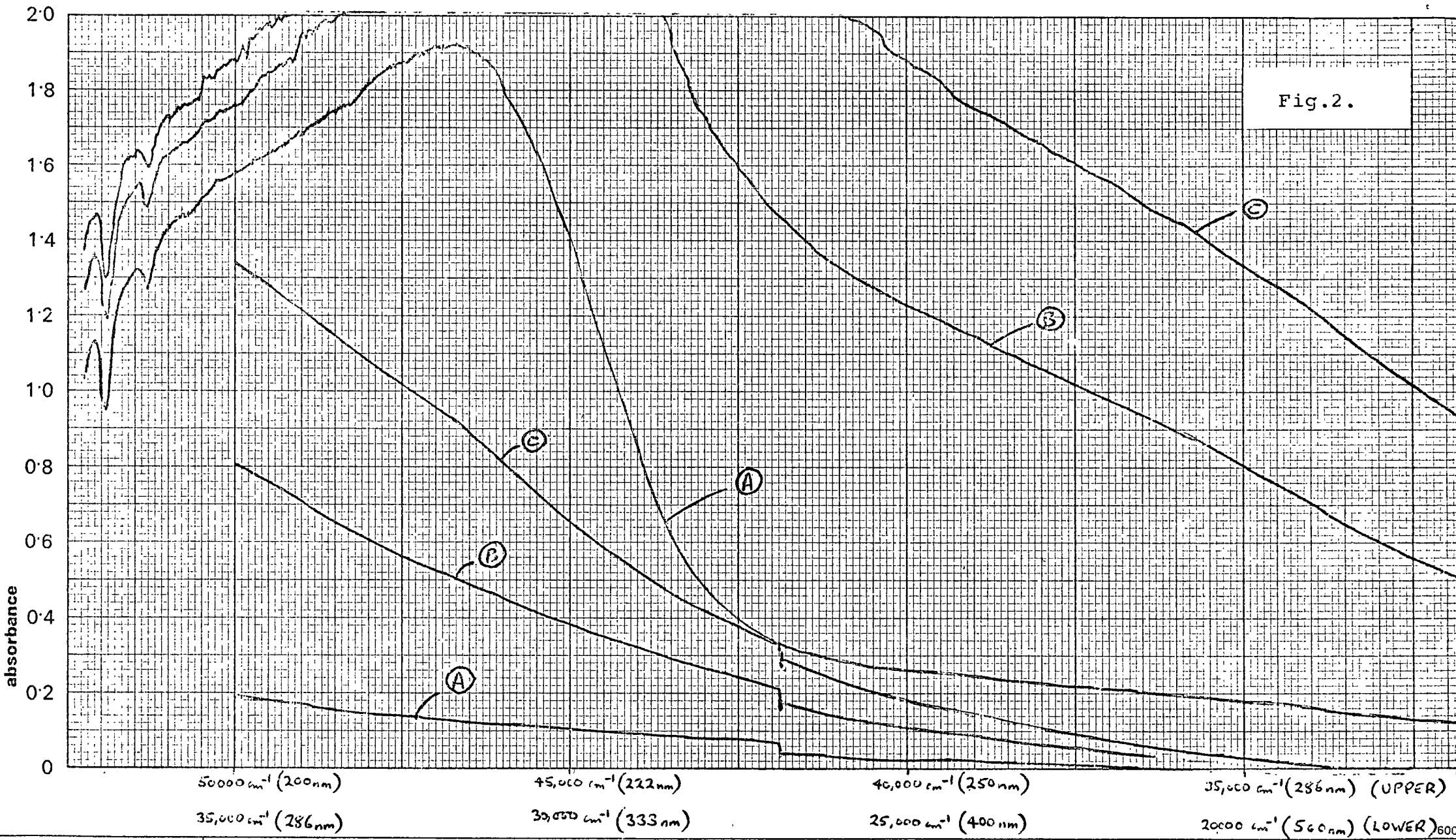
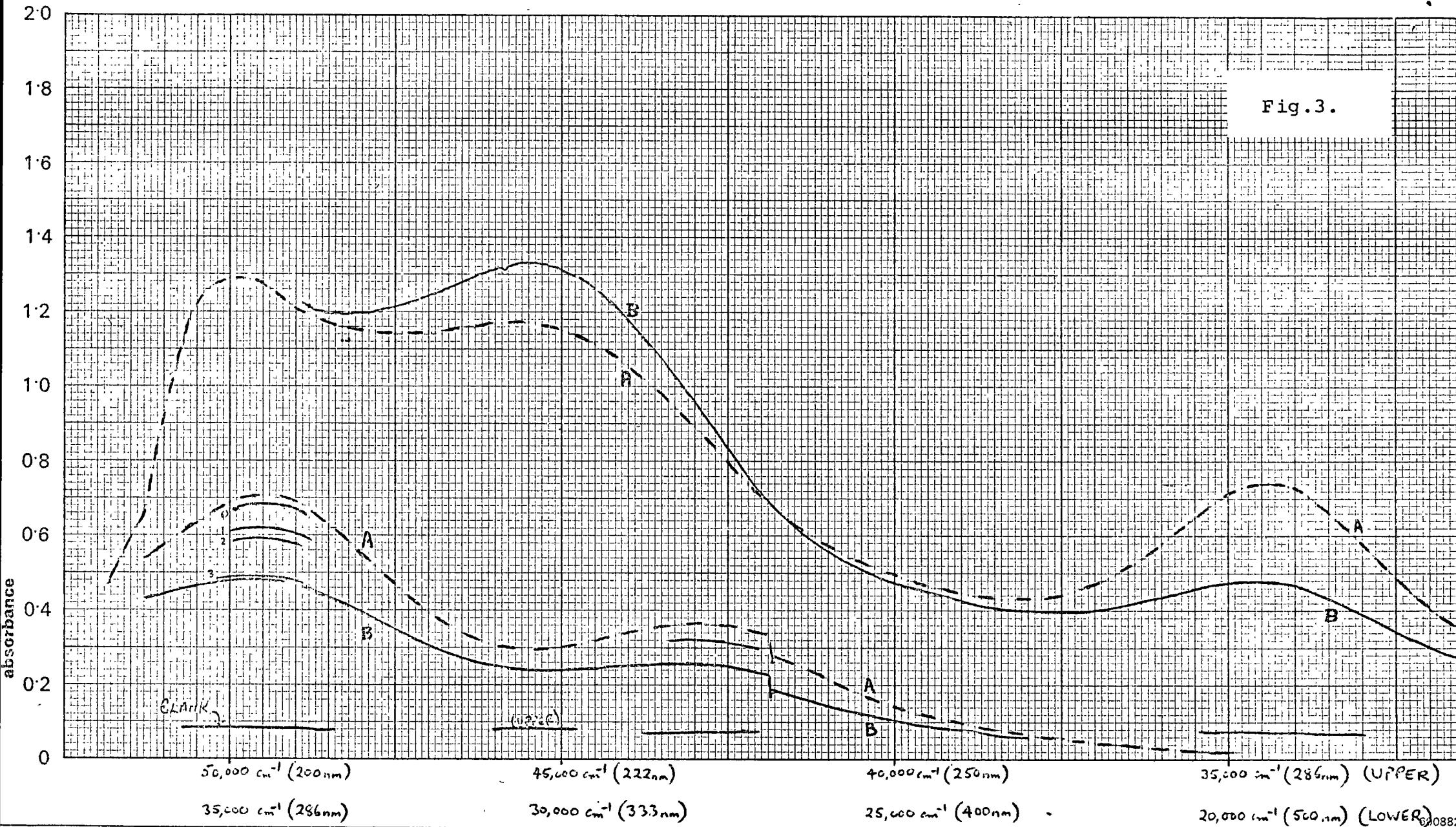


Fig. 2.

ALIGN WITH INDEX ON THE RECORDER	SAMPLE AND FORMULA	Aqueous extract of soil samples (70 mg) in dirt. water (0.5 ml)	CONCENTRATION REFERENCE	SCAN SPEED	FAST <input checked="" type="checkbox"/>	SLOW <input type="checkbox"/>
		(A) #3 (B) #2 (C) #2	H ₂ O (dirt) 1 mm	DATE	8/8/71	



ALIGN WITH INDEX
ON THE RECORDER
↓

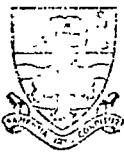
SAMPLE AND FORMULA

0 - After 0 min with λ
1 - " 10 " " λ
2 - " 15 " " λ
3 - " extra 30 min without λ

Sample after t.l.c. of
soil #1

CONCENTRATION.
REFERENCE EtOH
PATH LENGTH 1 mm

SCAN SPEED FAST SLOW
DATE 20/9/77
OPERATOR E.A. FARREK



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28th April 1978

Mr. Ted. R. Phillips, Jr.
P.O. Box 615,
Sedalia,
Missouri 65301
U.S.A.

Dear Mr. Phillips,

I have below more data on the organic compound present in the Delphos soil. The purification of the compound such that a proper analysis can be undertaken is proving extremely difficult. Not only is it highly air sensitive but it also tends to decompose in the presence of a number of organic reagents whenever derivatisation is attempted to obtain a product easier to manipulate. Furthermore it is a problem which needs a full time effort to solve and as I have my own research commitments it is one I can only devote my spare time to. I therefore require more time before any meaningful results are forthcoming - perhaps until the end of the year when my research appointment at Nottingham ends.

I have been asked that Nottingham University should not be mentioned when the final report is prepared on Delphos. Ufology may be acquiring more respectability in the U.S. but unfortunately this is not the case in the U.K. Apparently the involvement of the University with UFOs would be viewed with some concern and I would therefore be grateful if you could discretely leave out any reference to it.

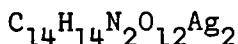
The major problem with the compound is that it is highly polar and purifying it from decomposition products and other impurities given its instability is very difficult. If we assume that Delphos is a genuine UFO case the polar characteristics would imply that the compound was designed with a view to achieving a high aqueous concentration. Its precipitation from solution as the silver salt is still the most satisfactory way of isolating the compound from the soil. An infra-red absorption spectrum (as KBr disc) of the dried silver salt shows strong hydroxyl ($O-H$) and carboxyl (CO_2^-) stretching bands at 3400 and 1600 cm^{-1} respectively (Fig.1), and the presence of both these groups would account for the polarity and water solubility of the compound. The broad band at 1040 cm^{-1} can be attributed to C-O stretching (i.e. of C-OH).

A mass spectrum of the crude methyl ester (obtained by treating the silver salt with excess methyl iodide in acetone) was poor owing to its impure nature and possible involatility and a molecular ion with a characteristic loss of 31 mass units (corresponding to loss of a CH_3O^\cdot radical from the ester group) is not apparent in the spectrum. This may also be due to thermal instability of the ester at the high probe temperature (190°) used to volatilise the compound. The ion with the highest molecular weight occurs at m/e 395 and this is followed by one of similar (but weak) intensity at m/e 377. The difference of 18 mass units corresponds to loss of water

Cont'd

and would be expected for a compound containing hydroxyl groups. The next ion of any significance (though still weak in intensity) occurs at m/e 337 and this also loses water to give a fragment ion occurring at m/e 319. Following this any ions which may be of any importance are hidden amongst the "noisy" baseline. Peaks also occur at m/e 59 and 57 the former being attributable to the species CO_2Me^+ which would result if a methyl ester had indeed been formed. On the whole the mass spectrum leaves much to be desired and I am currently attempting to prepare a derivative of the ester by reacting it with chlorotrimethylsilane. This treatment should convert the hydroxyl groups into the corresponding trimethylsilyl ethers and significantly decrease the polarity and improve the volatility of the compound.

Although the mass spectrum is unsatisfactory it does indicate that the molecular weight of the ester is in the region of 400-500 since after the ion arising at m/e 395 there is a marked decrease in baseline noise. An elemental analysis carried out on the dry silver salt gave 27.55% carbon, 2.40% hydrogen, and 3.83% nitrogen. Another performed subsequently to determine 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 brownish residual ash was principally composed of silver oxide (Ag_2O), the high value indicates the original salt to be that of a dicarboxylic acid (i.e. containing two CO_2^- groups and hence two Ag^+ cations) or at least of one containing two acidic groups. This conclusion can be arrived at only by assuming that the molecular weight of the corresponding (dimethyl) ester is ca 400-500 as indicated from the mass spectrum. If we assume the silver salt to be composed only of carbon, hydrogen, nitrogen, silver and oxygen (whose composition = 32.19% as obtained by difference from second set of figures), then from the figures above a rough estimate for the molecular formula of the silver salt can be calculated 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). Replacement of the silver by two methyl groups would give a molecular weight of 432 for the corresponding methyl ester which would be within the required 400-500 M.W. range. It must be emphasised that this formula can only be used as a guide for interpreting the true formula of the pure compound as it represents an averaging out of impurities, decomposition and oxidation products. If these processes have occurred extensively the formula as written may be quite different from that of the pure compound. As a cross-check similar calculations can be performed to estimate the molecular weights of a mono-silver salt and tri-silver salt which would be consistent with the elemental compositions. These values turn out to be 314 and 940 respectively for silver oxide ash content of 37%. The corresponding mono-methyl ester and trimethyl ester would have molecular weights of 221 and 661 respectively.

If the above formula can be taken as representative of the pure compound its most striking feature is the large number of oxygen atoms. The two carboxyl groups would accommodate two each and the presence of two ketone groups as suggested from the light absorption spectrum of the purified

compound (as explained in my first report) would take up a further two. That would leave six to be accounted for and if the majority of these are present as hydroxyl groups this would explain the polarity and water solubility exhibited by the compound. In my initial letter I stated that the unusual hydrophobic characteristics of the ring soil indicated that the molecular size of the compound was quite large. It now seems that this property is related to the number of polar groups in the compound, rather than to its sheer size, which can bind in template fashion to the similar hydrophilic sites of the soil. The formula as written does not represent a particularly large molecular structure.

An ^1H nuclear magnetic resonance (NMR) spectrum (100MHz) was recorded on 48mg of the silver salt by suspending in deuterium oxide (D_2O) and gradually adding a solution of sodium hydroxide in D_2O until an opaque, dark red solution was formed. The spectrum obtained (Fig 2) is notable for its lack of signals. The strong peak in the centre is due to HDO absorption and is unimportant. The addition of an internal standard to the sample to determine precise chemical shift values (in p.p.m.) was not carried out since I had intended to recover the compound uncontaminated from solution. For the purpose of estimating the chemical shifts of the two broad signals upfield to the main HDO signal it is important to note that HDO absorption normally occurs at around 4.8 p.p.m., indicating that the signal positions have to be corrected by approximately +0.7 p.p.m. When corrected, the broad signal nearest the HDO peak can be seen to arise at ca. 3.8 p.p.m. and may be attributed to absorption by CH adjacent to hydroxyl groups, i.e. $\text{CH}-\text{OH}$. The signal further upfield occurs at ca. 1.3 p.p.m. and can be assigned to saturated methylene ($-\text{CH}_2-$) groups. The absence of signals downfield to the HDO peak suggests that if aromatic or unsaturated groups are present to explain the colour of the compound they would be highly substituted. Any exchangeable hydrogens such as those on hydroxyl groups would be replaced by deuterium and would not appear on the spectrum. The spectrum is very unsatisfactory and I have included it here only because I feel that in a case such as this any information is better than none. One reason for the weak intensity of the signals is that the solution may have been too dilute, although the spectrometer was on high power.

The presence of nitrogen in the compound is significant and will more likely be responsible for the alleged local anaesthetic effects noted by the witnesses. The chemical nature of the nitrogen will have to be determined, however, before this can be decided with any certainty.

In my previous report I was uncertain as to whether the decrease in the longer wavelength absorptions of the purified compound (i.e. at 290 and 358 nm) and the simultaneous increase in the shorter wavelength (220nm) was due to oxidation or an interaction with the solvent. I now believe it to be the former - indeed the band at 220nm may have arisen due to oxidation having already occurred during the elution and transference of the compound following purification. That these bands are present in the spectra of the crude aqueous extracts of the soil is apparent from the spectrum of an extract of soil # 3 (Fig 3). The broad "hump" in the region of 286 nm of the spectrum recorded soon after the soil was extracted (i.e. band 1) can be attributed to the 290 nm absorption band of the pure compound. The air sensitivity of the compound in aqueous solution can also be judged from this spectrum since on completion of the recording (taking just two minutes to scan from right to left) it was immediately repeated and this now gave band 2. The "hump" has disappeared and an increase in the

region 200-222 nm is evident. If more of the same extract is treated with hydrogen peroxide ("40 volume") to accelerate this oxidation the red colour is immediately discharged to leave a pale yellow solution whose spectrum (band 3) shows the extent to which this decrease/increase in absorption characteristics can be affected. On evaporation the pale yellow solution yields a whitish solid, and this result suggests that the surface colour of the ring soil was caused by a thin layer of the oxidised compound. The susceptibility of the compound to oxidation indicates that this layer would have formed fairly quickly after the alleged object departed. The question that continues to bother me is whether this oxidation process was accompanied by an emission of light. Mr. Johnson was sufficiently impressed by the "glowing" soil surface soon after the event to rush back and collect his camera. It is conceivable that by the time he took the photograph the chemiluminescence had already subsided and the white ring had been formed. Does Mr. Johnson claim that the "glow" was as bright the day following the event (as it should have been if it was simply reflected moonlight).

The reason I keep referring to a possible chemiluminescent oxidation is that all the factors necessary for chemiluminescence are present in the compound. These are -(i) the instability of the compound in air, (ii) the fact that the oxidation products are fluorescent when observed under 366nm light (the emission spectrum for a chemiluminescent oxidation is related to the fluorescence spectrum of the oxidised products), and (iii) the aqueous solution is naturally alkaline (many chemiluminescent oxidations are catalysed by alkaline media). We also have to consider what connection there might be between the compound in the soil and the alleged UFO. It seems more than just coincidental that both the soil and the surface of the UFO were claimed to be glowing. 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. I have witnessed such reactions and there is a peculiar quality about the emitted light which is difficult to describe. Perhaps the Delphos UFO found itself too overburdened for its available "fuel" and jettisoned some of the solution to lessen the load. All this is, of course, just sheer speculation at the moment and what I will attempt to do is detect whether emission of light does actually occur when extracts of the soil compound are oxidised.

Now I have to bring the discussion down to earth and mention a colleague's opinion as to the cause of the ring. He suggested that it was a fungal "fairy ring" (the fibrous material would be consistent with this) and that the soil compound was just a fungal metabolite. If this were true then the identification of the compound would become far less important since even if it turned out to be "unknown" it would just be an undiscovered metabolite. In my view this explanation is unsatisfactory as there is too much of compound and not enough fibrous material to account for it. So far the analysis strongly indicates the compound to be an alkali metal salt of a dicarboxylic acid (although this has not so far been proved) and I am wondering whether precedents exist for isolating similar salts as fungal metabolites. Organic acids are known to be produced by fungi but not in association with metals, as far as I know. Extracting the soil with chloroform affords a negligible amount of soluble organic material and this would also be considered unusual if the organic content of the soil was purely fungal in origin. If the "fairy ring" explanation can be eliminated then the data accumulated so far would argue against a simple hoax perpetrated by the Johnson family. I would be interested to know what information you have regarding this question.

I will continue to analyse the soil until the end of the year and return any unused samples I have left. Those I have studied so far contain less of the compound (and correspondingly less of the fibrous material) than the samples you sent initially, and I would be interested to know what the respective positions and depth were of the samples on collection. I would also be grateful if you could let me know which of these samples have been analysed for elemental composition. This may allow me to correlate between concentrations of metals present and the amounts of organic acid isolated.

I hope to have more satisfactory analysis results in my next report.

Yours sincerely,

A handwritten signature in black ink, appearing to read "Erol A. Faruk". The signature is fluid and cursive, with "Erol" and "A." being more stylized and "Faruk" being more clearly legible at the end.

Erol A. Faruk



University of Nottingham

Department of Chemistry

UNIVERSITY PARK NOTTINGHAM NG7 2RD
TEL NOTTINGHAM 56101

MAR 8 1979

27th February 1979

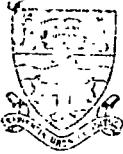
Dr. J.A. Hynek,
C/o International UFO Reporter, Inc.,
1609 Sherman Avenue,
Suite 207,
Evanston,
Illinois, 60201,
U.S.A.

Dear Dr. Hynek,

Please find enclosed a copy of my
third and final report on Delphos.

Yours sincerely,

Erol A. Faruk.



University of Nottingham

Department of Chemistry

UNIVERSITY PARK NOTTINGHAM NG7 2RD
TEL NOTTINGHAM 56101

27th February 1979

Mr. Ted. R. Phillips,
P.O. Box 615,
Sedalia,
Missouri, 65301,
U.S.A.

Dear Mr. Phillips,

Here is my final report on the Delphos soil. I regret that I have not been able to identify the compound since it is simply too difficult to handle with the resources and time I have available. A proper, concerted effort will be needed backed up by the necessary analytical techniques before this can be achieved. To illustrate the kind of technical difficulties I have encountered I attempted to record the 100 MHz NMR spectrum of the crude methyl ester obtained from "processing" 5.1 g of a soil sample (*3) but the amount (7 mg) proved inadequate for a satisfactory spectrum to be obtained. We have a Pulsed Fourier Transform spectrometer which can cope with such small quantities but this instrument is limited to rather specialised research and consequently is inaccessible for this problem. The alternative is to extract more soil but this I am reluctant to do at any one time because of the possible unique nature of the soil. The air sensitivity also means that the compound should really be handled under an inert atmosphere. Having said all that I still believe the problem can be solved and I will therefore describe in some detail the procedure used to isolate the compound in the hope that a more thorough analysis may be undertaken in the future.

The soil itself is best kept sealed under an inert atmosphere and deep frozen (-10°C) to minimise oxidation and decomposition. The solvents used for the extraction procedure should be oxygen free. Water may be freed of dissolved oxygen by boiling for some time or evacuating under high vacuum. Organic solvents may also be boiled or purged with a stream of nitrogen. A sample of the soil (4 - 6 g) is stirred vigorously with deoxygenated water (8 - 10 ml) for 20 - 30 min in a stoppered vial and then allowed to settle. The aqueous suspension is removed from the residue and centrifuged in a stoppered tube. Centrifugation is the method of choice since it minimises the risk of oxidation which could arise if the suspension was simply filtered. The residue is re-extracted with water in the same way and centrifuged as before. After about four extractions the colour has diminished to the extent that further extraction is unnecessary. The extracts are combined

(total ca 35 - 40 ml) and treated immediately with a solution of silver nitrate in water. The nitrate solution is added dropwise to the gently stirred soil extract until the insoluble silver salt just begins to coagulate. Only a minimum quantity of silver nitrate should be employed for this procedure since an excess of Ag^+ ions may itself promote an oxidation of the compound. If the precipitation is delayed for any length of time the extract begins to deposit a solid suggesting that some kind of decomposition is occurring. The reddish brown precipitate is centrifuged down, the aqueous supernatent discarded, and the precipitate washed carefully with a small volume of water. The washing is discarded and the precipitate washed thoroughly 3 - 4 times with dry ethanol, centrifugation being employed each time to separate out the solid. This removes the water which would otherwise interfere with the subsequent esterification. Finally, the precipitate is washed thoroughly with diethyl ether to remove adhering ethanol and dried with a stream of nitrogen. The silver salt obtained (ca 30 - 70 mg) may either be stored under nitrogen at 0° or preferably, esterified with methyl iodide immediately. The table below shows the extent to which the amount of isolated silver salt can vary from the different soil samples.

Soil sample	Amount of Ag salt precipitated (averaged) mg. g ⁻¹
2	34.8
*3	12.8
*10	10.6
*7	10.1

* fungal mycelium most prominent in this sample

The salt is esterified by stirring with dry methyl iodide (1 ml) in anhydrous acetone (5 ml) in a stoppered flask protected from light. After 3 - 4 days the acetone solution assumes a distinct yellow colour due to the presence of the free ester. The mixture is allowed to settle and the clear solution removed and evaporated to dryness with a stream of nitrogen. The residual red gum containing the ester is redissolved immediately in a small volume of ethyl acetate and then stored at 0°. This prevents the formation of an insoluble polymer which appears to occur if the product is stored as a gum. The yield of the crude ester is low which presumably reflects the extent to which the compound has decomposed while in the soil. The ester can be reacted with chlorotrimethylsilane using pyridine as base to etherify some (or all) of the hydroxyl groups present and the product is sufficiently less polar to be eluted with an acetone/petroleum ether mixture on thin layer chromatography. Unfortunately I did not manage to find the ideal reaction conditions for this conversion and could only perform it with limited success on small amounts of the crude ester. Significantly the trimethylsilyl derivative which is formed appears to be less susceptible to oxidation on t.l.c. (i.e. takes longer to oxidise to the fluorescent product) and this enhanced stability needs to be exploited in any future analysis of the compound. The bulky trimethylsilyl groups ($\text{Me}_3\text{Si}-$) may be hindering the

attack by oxygen on the derivative.

It may be worthwhile to analyse the hydrolysis products of the crude soil extract after allowing it to stand for some days. Apart from the formation of the deposit there is also a marked increase in the fecal odour of the extract which can be compared to that of manure. The odoriferous component can be extracted into ether and isolated by evaporating under reduced pressure and low temperature. The compound appears to be quite volatile as the smell will disappear if the evaporation is prolonged. It should be treated with caution since I inadvertently inhaled a small amount which was sufficient to produce an immediate but short-lived dizziness. In an attempt to identify the compound which I suspected to be an amine nitrogen gas was passed through some of the extract while the gas outlet tube was immersed into a small volume of concentrated hydrochloric acid. Any volatile amines liberated by the solution would thus have been trapped in the acid in the form of their hydrochloride salts. After two days the acid solution was removed and evaporated to yield a white crystalline solid which was identified as ammonium chloride from the infra-red spectrum (Fig.1). Fig.2 shows for comparison a spectrum of authentic ammonium chloride. This result is curious since the odour is not caused by ammonia. The identification of the compound along with others which are volatile may need to depend on a combined gas chromatography-mass spectrometry technique.

It seems to me that the only explanations possible for Delphos are that it is a genuine UFO-related event or a fungal ring. I have already given reasons why I believe the latter explanation to be unsatisfactory. One way of determining this is to perform a carbon dating on the silver salt. Since ^{14}C incorporation depends on the biological uptake of this isotope from the biosphere a measure of how much is present in the salt could help decide whether it is fungal in origin. If the compound is foreign to the soil (i.e. has been synthesised from components originating from other biological systems) an anomalous result would be expected. Carbon dating normally needs large amounts of sample to be performed satisfactorily (i.e. in the grams range) and this obviously presents problems in this case. However, more sophisticated techniques have been developed recently which require only milligram quantities and it may be worthwhile enquiring whether such methods can be employed here. (See for example the description of the "Tandetron" analyser system appearing on page 3 of the November 1978 issue of "Physics Today").

More circumstantial evidence also needs to be taken into account to weigh for or against the fungal ring hypothesis. The lack of growth of the ring would be one example against such an interpretation. Would it be possible for the photograph of the ring to be sharpened? If the white colour is due, as I believe, to a layer of the oxidised compound it may be possible to discern whether it overlays twigs or other objects on the ground. In your original article you state that the sheriff who was at the site on the day following the event took a sample of the white material. Do you have this in your possession? The absorption spectrum of the sample should give a major peak at ca 220 nm assuming that it hasn't decomposed while in storage. If the ring fungal growth has occurred because of the presence of the compound and not vice-versa the white material should contain little, if any, of the mycelium because of the short time lag between the alleged event and sampling. This, again,

assumes that conditions during storage have been unsuitable for fungal growth. The inherent high water solubility of the compound would mean that the layer would have dissolved away during rainfall.

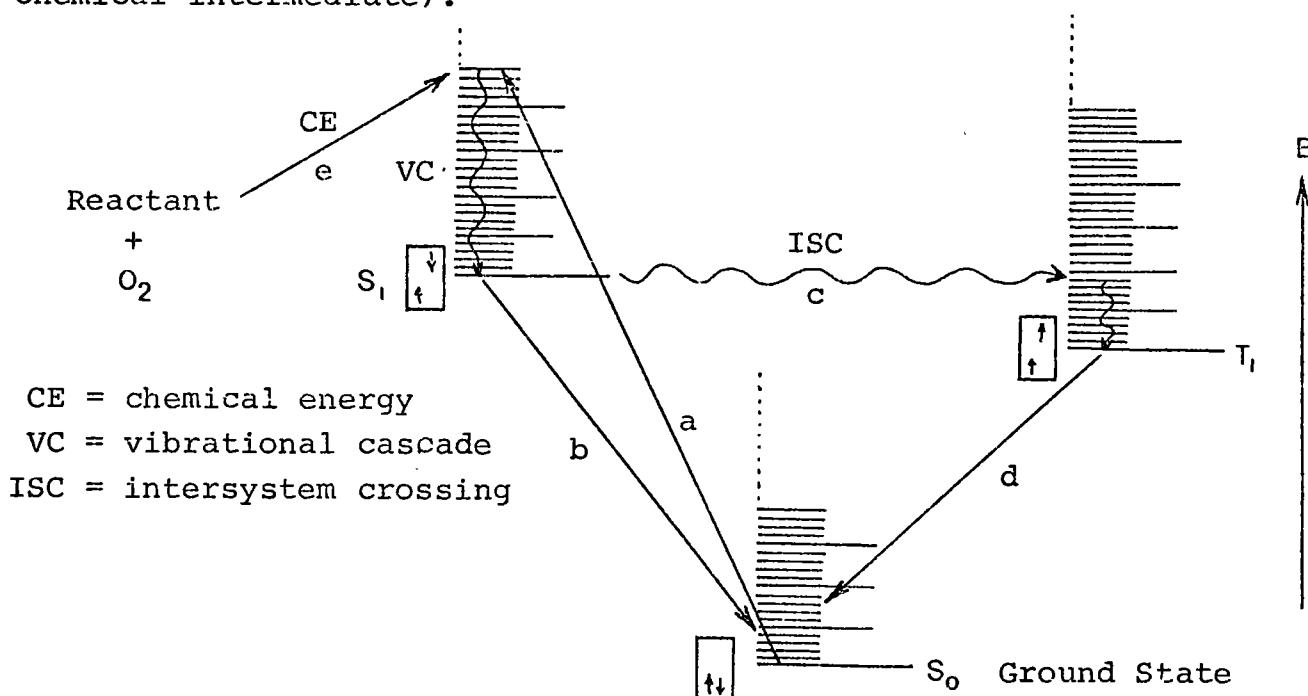
Another fact to be considered in the presence of the metal salts in the soil. How does a fungal ring accumulate over one hundred times the amount of zinc relative to that present in the surrounding soil? The distribution of the compound in the ring could be investigated to find out if this is consistent with the postulated "unloading" of the alleged object. The reported local anaesthesia could similarly be tested using soil extracts which would, if confirmed, substantiate the claim that the soil was moist.

The important question of chemiluminescence remains unanswered at this time. I have tried to detect light emission from aqueous extracts of the soil using a scintillation counter but have been unsuccessful. However, this does not rule out the possibility that the pure compound would exhibit chemiluminescent behaviour. I have discussed the case with someone who has worked with such compounds and he felt that the lack of chemiluminescence might be due to a combination of the high colour of the extracts and the fact that much of the compound has already oxidised or decomposed. Note that the absorption spectrum of the extracts are broader than that of the pure compound and this could lead to self absorption of any emission that might occur. Coloured impurities are known to weaken or quench the light emission from such reactions. The only sure way of settling the problem is to identify the compound and synthesise it for further study.

I still believe that chemiluminescence is the key to this entire case. A consistency becomes apparent to the witness' testimony if this is considered further. Note that there are three glows reported: the object itself, the gap between the object and the ground, and the soil. Now, if a chemiluminescent compound was sprayed out in solution form one would expect it to emit light on coming into contact with the air which might account for the glow beneath the object. The requirement for oxygen might also explain why the object suddenly illuminated. One can imagine the outer perimeter of the object absorbing atmospheric oxygen when necessary for light emission purposes.

I will now give a brief account of the mechanism of chemiluminescence since in the event that Delphos proves genuine certain conclusions can be drawn regarding the illumination of (some) UFOs. If an organic compound oxidises to give a product which 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. 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 antibonding orbital to produce the first excited singlet state (Fig. 3). After 10^{-6} - 10^{-9} seconds the process is reversed and a photon of longer wavelength (in the visible region) is generated. In a chemiluminescent oxidation the energy required (at least 41 kcal mol⁻¹ for emission of red light (700 nm) and 65 kcal mol⁻¹ for blue light (440 nm)) is supplied by the oxidation itself. This means that the fluorescence spectrum of the product should match the chemiluminescence spectrum providing that the product molecule is the emitting species (and not some transient

chemical intermediate).



Process: a,b = fluorescence

a,c,d = phosphorescence (longer lived emission due to spin reversal of triplet state (i.e. $T_1 \rightarrow S_0$))

e,b = chemiluminescence

Fig. 3

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 1 lb of perfectly efficient chemiluminescent material might provide 67,000 lumen hr of light equivalent to the output of a 40W bulb operating for 6 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}) 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 state ($= \phi_{ES}$)
- (iii) the fluorescence efficiency of the product molecule (if this is the emitting species) ($= \phi_{FL}$).

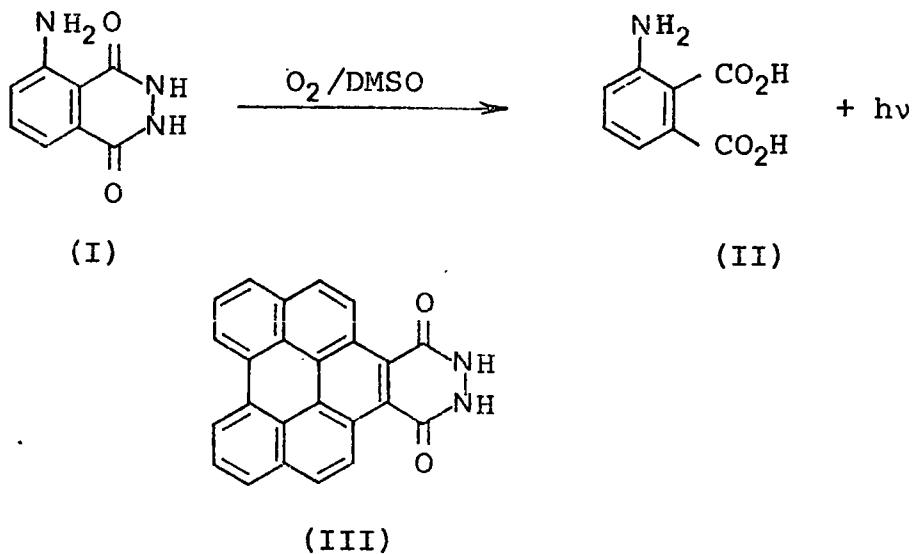
from which:

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

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 Delphos) but if the fraction being generated in the excited state during oxidation is small a low chemiluminescent yield will result. A considerable amount of the work carried out on chemiluminescence has been directed into synthesising compounds for which ϕ_R , ϕ_{ES} and ϕ_{FL} are maximised.

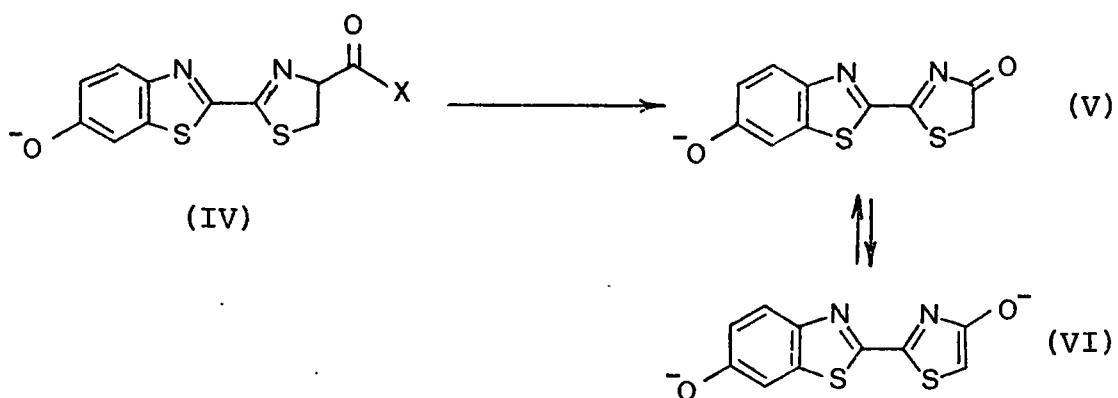
One of the most studied chemiluminescent oxidations is that of the hydrazide, luminol (I). In alkaline dimethyl-sulphoxide luminol reacts with molecular oxygen to produce amino-phthalic acid (II) with simultaneous emission of blue light (480 nm). The emission spectrum corresponds to the fluorescence spectrum of amino-phthalic acid. The chemical yield (ϕ_R) of the process can be as high as 85%. The fluorescence efficiency (ϕ_{FL}) 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 synthesised is the benzoperylene compound (III) 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. Many synthetic chemiluminescent compounds are structurally relatively simple (e.g. luminol) and emit in the blue region of the spectrum.

Another factor which may have an effect on the chemiluminescence spectrum is the chemical environment. Depending on the solvent, pH etc., the product molecule may exist in different forms and so cause different emissions. An example is the oxidation of the firefly luciferin analogues (IV) in alkaline dimethyl-sulphoxide. With low concentrations of alkali red light (626 nm) is produced while higher concentrations cause emission of yellow-green light (562 nm). The emitting species for the two processes are the monoanion (V) and dianion (VI) respectively. In addition, the quantum yield for the oxidation varies with the nature of the substituent X.



How does all this relate to Delphos? If a chemiluminescent oxidation had occurred at the soil surface one would expect the soil extracts to contain the fluorescent species responsible for the glow. The surface soil extracts do indeed exhibit a bluish-white fluorescence when viewed under 366 nm light. This bluish fluorescence is apparent in all the ring soil samples I have analysed. A sample of control soil on extraction with water also gives a solution which fluoresces but this is considerably weaker. In an effort to quantify these observations a sample (1.00g) each of the surface ring soil (*1) and control surface soil (*3) were stirred vigorously and at the same rate for 45 minutes with deoxygenated water (8.0 ml). The mixtures were allowed to settle and the aqueous suspensions removed and centrifuged. The control soil gave a very pale yellow solution while the ring soil solution was deeper yellow in colour. The fluorescence spectrum (Fig.4) of the undiluted control soil solution shows a maximum at ca 443 nm (λ (excitation) = 350 nm). The corresponding excitation spectrum (i.e. that light which is only absorbed to cause fluorescence) (Fig.5) shows a broad absorption with a maximum at ca 334 nm. For the fluorescence spectrum of the ring soil to be recorded the solution had to be diluted by a factor of five. The spectrum shows a similar broad emission but with a maximum at ca 432 nm. (Fig.6). The corresponding excitation spectrum is shown in Fig.7. The broad nature of the excitation spectra for both ring and control soils (i.e. in the region 230 - 290 nm) may be due to the fact that further oxidation of the fluorescent species has occurred at the soil surface. An excitation spectrum of a sample of the ring soil taken below the surface (*9) shows less absorption in this region (Fig.8). The fluorescence spectrum of this sample (Fig.9) shows again a broad emission in the blue region with a maximum at ca

433 nm. The difference in intensity between the fluorescences of the ring and control surface samples can be seen to best effect if the latter is corrected for the dilution factor and superimposed on the former. The result is shown in Fig.10. The ring soil thus fluoresces more brightly than the control soil and this finding is therefore not inconsistent with the claim that the soil was glowing. The connection with the pure compound so far unidentified is that on oxidation on the t.l.c. plate the latter gives rise to a fluorescent species which is also decidedly blue in colour (under 366 nm light). Indeed the pre-oxidised compound appears as a dark band situated in a continuum of bluish bands due to the extensive oxidation which has already occurred. With this in mind it is surprising that the fluorescence of the ring soil is not brighter still in comparison with the control soil. This I attribute to the yellow colour of the solution which may be absorbing some of the fluorescence. This certainly appears to be apparent when the solution is viewed under 366 nm light. The similarity in shape and λ_{max} of the ring and control soil fluorescences may be purely fortuitous.

If the witnesses are sincere in their account the "grey-white glowing" of the soil is likely to have been a blue emission masked by the dark soil. A fluorescence spectrum of the white surface material should show this to better effect. One could go further and suggest that if the soil compound was responsible for the surface glow of the UFO the blue colour claimed to have been observed by Ronald should have predominated. That the object was multicoloured may suggest different chemical forms of the emitting species. What colour did the boy claim the glow to be between the object and the soil? The red and orange glows observed are, in fact, more difficult to rationalise since these would imply species which would fluoresce in the red region of the spectrum which are clearly absent in the spectra of the soil extracts. One possible interpretation is that these colours were due to those sections of the object which were not chemiluminescing, i.e. what was being observed was the natural colour of the aqueous solution (caused by the tail absorption of the 358 nm) illuminated by the blue emission. Does Ronald describe the orange and red colours to be self-luminescent? There is, of course, a danger of over-hypothesising from a given amount of raw data, but these kind of considerations can, at least, be checked against the witness' observations.

It would be ironic if UFOs emitted light through a chemiluminescence mechanism. This would put them in the same category as fireflies (and other bioluminescent systems) with regard to the chemical processes involved. Chemiluminescence can be easily demonstrated with the commercially produced "Cyalume Light Stick" available from the Aldrich Chemical Company. Although the reaction involved is somewhat different (the oxidant is hydrogen peroxide contained in a glass tube which has to be broken to initiate the reaction) the green emission that occurs does so for essentially the same reasons. In this case the energy liberated during oxidation is transferred directly to a fluorescent compound which is mixed in with the reactants (and thus undergoes no chemical change in itself). For a description of the chemistry involved see reference - 5. A stock of such tubes could, in fact, be carried by the UFO investigator to gauge

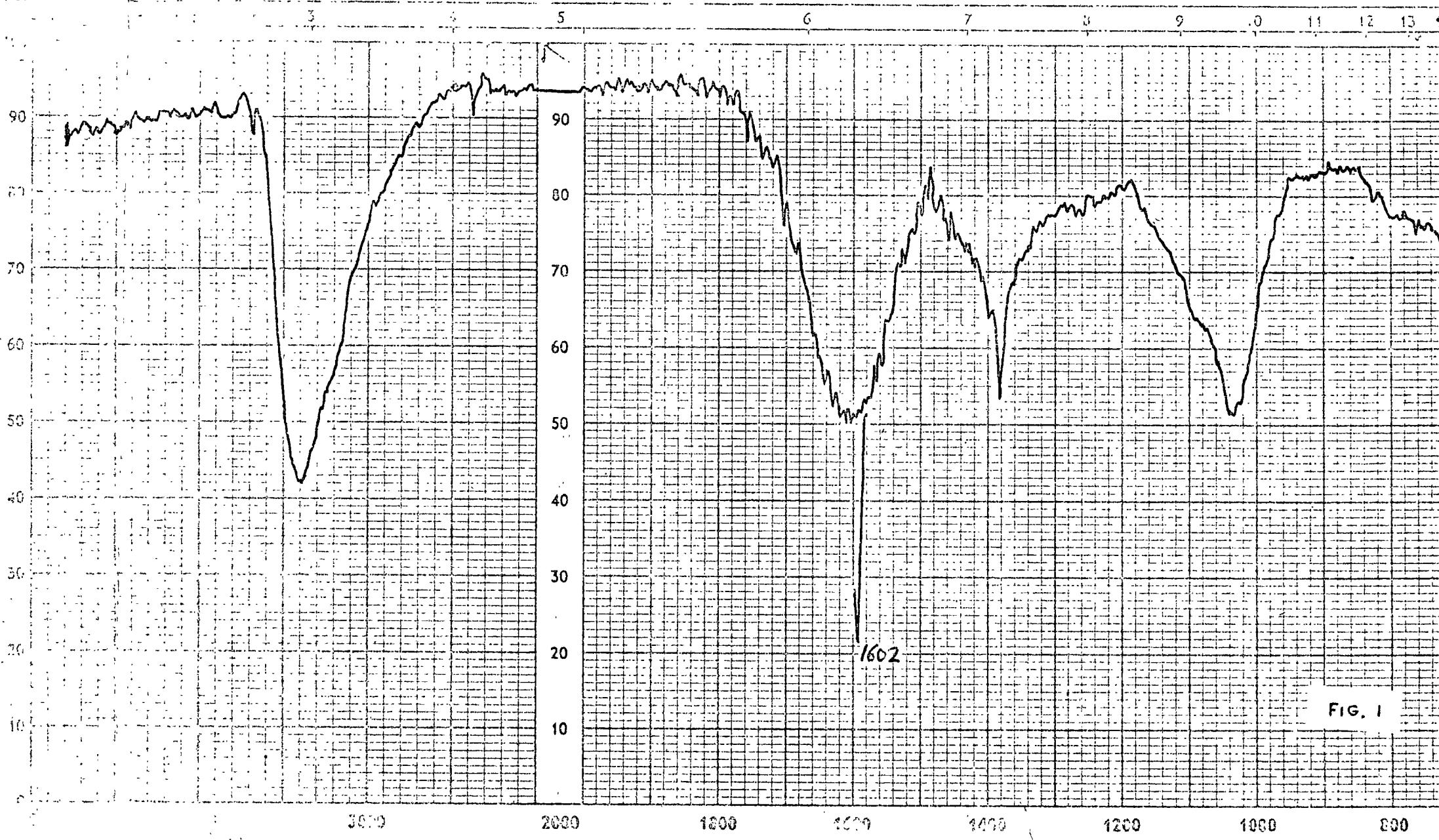
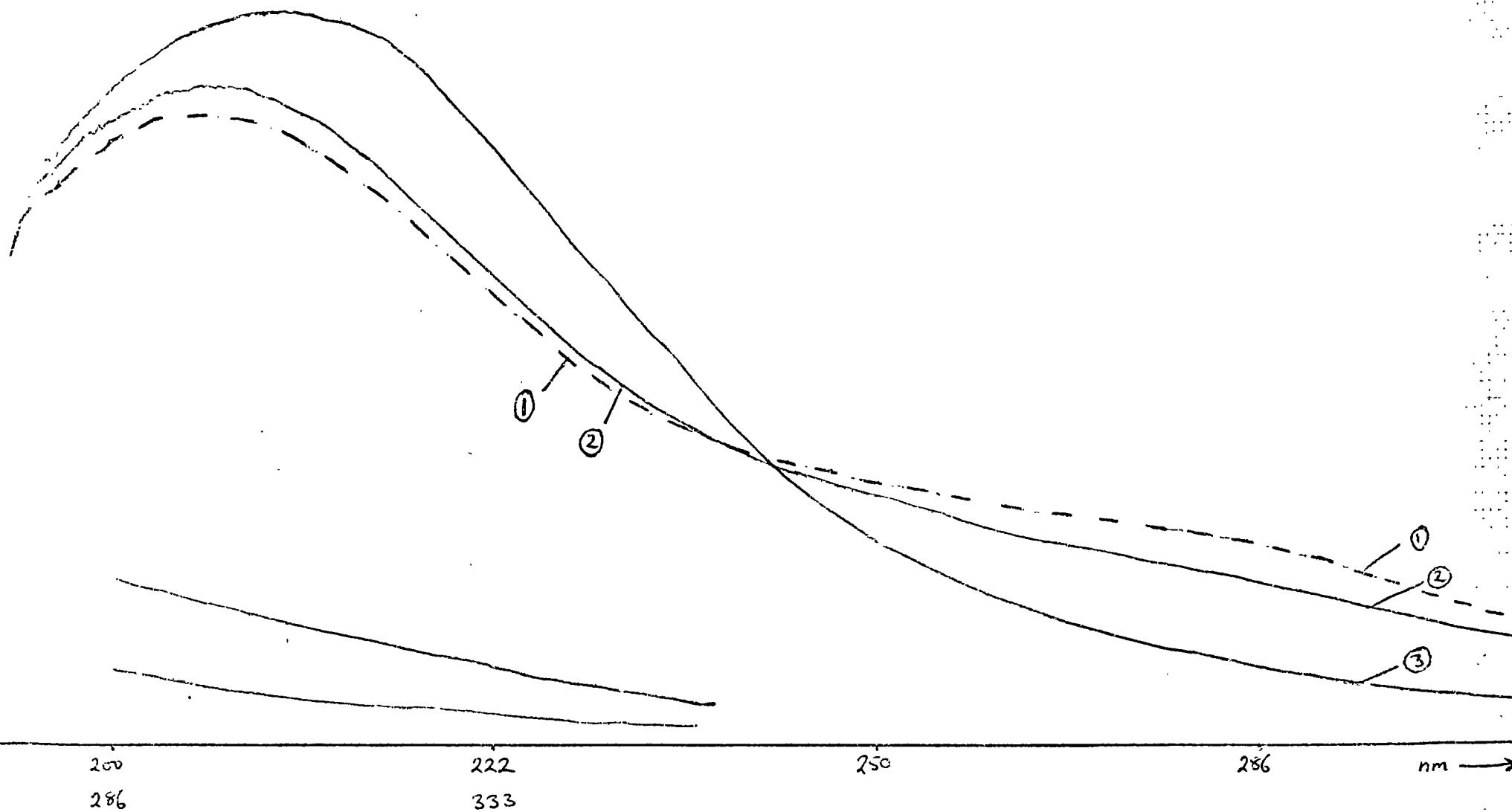


FIG. I

ALUMINIUM OXIDE ON KBr DISC	SAMPLE Any "salt"	FORMULA UNKNOWN	PHASE KBr DISC	NUMBER DATE 24/2/78
P.P.M.	EXPOSURE Air	THICKNESS REMARKS Slow speed	OPERATOR E.A. FARU	Ref.

FIG. 3



Soil #3

- ① - Aqueous extract
② - — after a couple of minutes
③ - -+— after add^s of H_2O_2 (4% vol)

HO
1 mm

8/2/78
E.A. FAUCRE

witness reaction to the light (the emission lasts for several hours).

Some chemiluminescent oxidations are catalysed by metal ions and this might explain the presence of such ions in the ring soil. In particular, transition metals such as iron and manganese are known to have such an effect. I need hardly emphasise the importance of identifying the compound if Delphos proves genuine. Its structure and chemiluminescence efficiency would give a considerable insight into the intelligence behind its design.

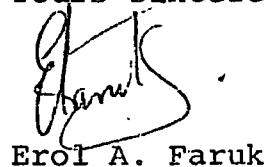
Although chemically generated light may be the means by which UFOs are luminescent there are other ways of providing the necessary energy than by the simple oxidation mechanism described so far. One method is electrogenerated chemiluminescence which employs the principle that electron transfer from a radical anion to the radical cation of a fluorescent aromatic hydrocarbon can cause light emission. The two species are generated by periodically changing the potential of an electrode which is immersed in the solution. For this process oxygen has to be excluded. Interestingly the intensity of the emission (but not the wavelength) is influenced by an external magnetic field. For a full account of this and other chemiluminescent reactions I would refer you to a number of reviews which have appeared in recent years and which are listed below.¹⁻⁴ The examples I have used to illustrate my discussion can be traced to the original workers in these publications.

There I have to leave it. I hope enough data has been obtained from the soil analysis to warrant a fuller investigation. The information so far may not be sufficient to establish what the compound is, but it should be enough to decide what it is not. I would be most grateful if you could keep me fully informed on the outcome of any future work carried out on the soil. The samples I still have will be returned to you within a short while. I will also be enclosing a sample of the silver salt (ca 60 mg isolated from soil *7) on which further tests (eg. carbon dating) could be performed. A more extensive elemental analysis might, for example, reveal the presence of elements which would preclude the possibility of the compound having a fungal origin. Needless to say there is potentially enough information in the soil to prove this one way or another. Please use my London address shown below for any future correspondence.

53 Grove Crescent,
Colindale,
London, N.W.9 OLS.

I am sending a copy of this letter to Dr. Hynek.

Yours sincerely,



Erol A. Faruk

References

1. K.-D. Gundermann: Recent advances in research on the chemiluminescence of organic compounds. Topics in Current Chemistry 46; Photochemistry, Springer-Verlag, Berlin, Heidelberg, New York, 1974, pp. 61-139.
2. M.M. Rauhut: Chemiluminescence from concerted peroxide decomposition reactions. Accounts Chem. Res., 2, 80 (1969).
3. E.H. White and D.F. Roswell: The Chemiluminescence of organic hydrazides. Accounts Chem. Res., 3, 54, (1970).
4. F. McCapra: The chemiluminescence of organic compounds. Pure Appl. Chem., 24, 611, (1970).
5. A.G. Mohan and N.J. Turro: A facile and effective chemiluminescence demonstration experiment. J. Chem. Educ., 51, 528. (1974).

Postscript

I have just recorded the fluorescence spectrum of the bluish bands (taken collectively) which are less polar than the unstable compound on the t.l.c. system. This is shown in Fig.11 (solvent = spectroscopic acetonitrile). The corresponding excitation spectrum is shown in Fig.12. As can be seen the fluorescence spectrum is very similar in appearance and λ_{max} to that of the crude ring soil extracts. Since the unidentified compound on oxidation gives rise to a bluish fluorescent band almost identical in appearance to those for which the spectrum (Fig.11) has been recorded, this strongly supports the contention that the fluorescence spectra of the ring soil extracts are related to the as yet unidentified compound.

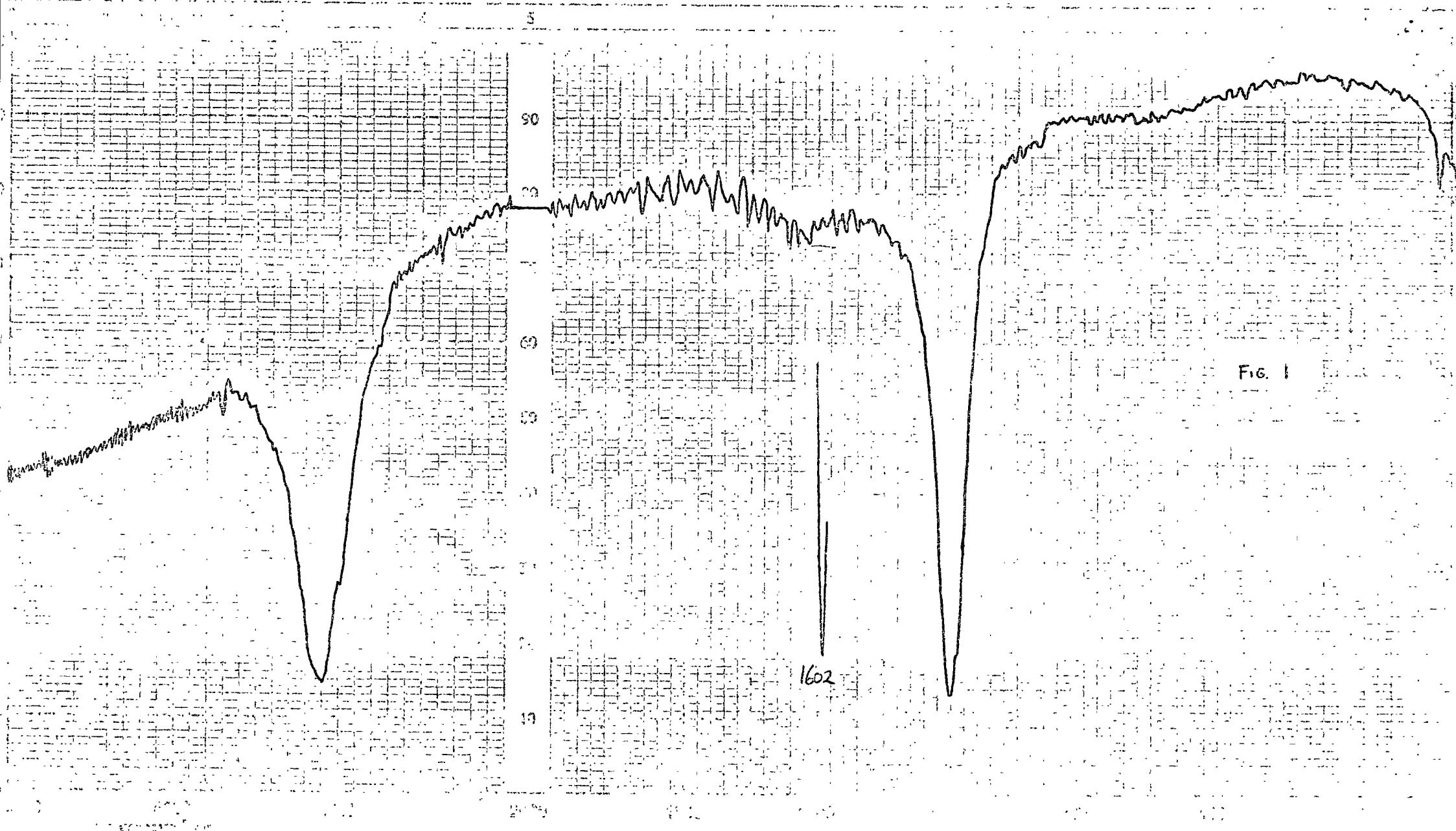


FIG. I

Crystalline Amine Hydrochloride
from soil extract

FORMULA

KBr disc

INTERFACES

S. C. S.

Fast speed

NUMBER

DATE

S. C. S.

7/7/78

E. A. GAREK

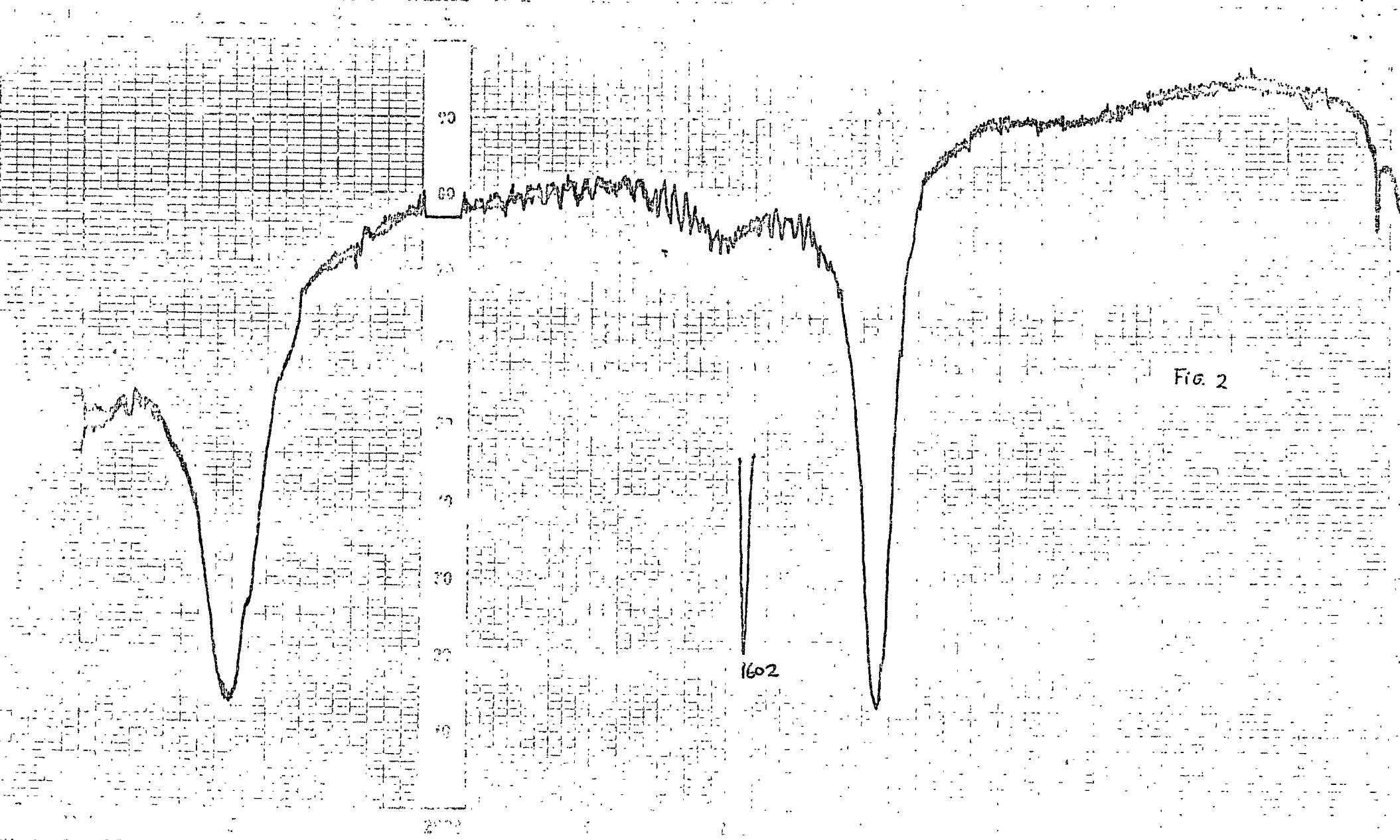


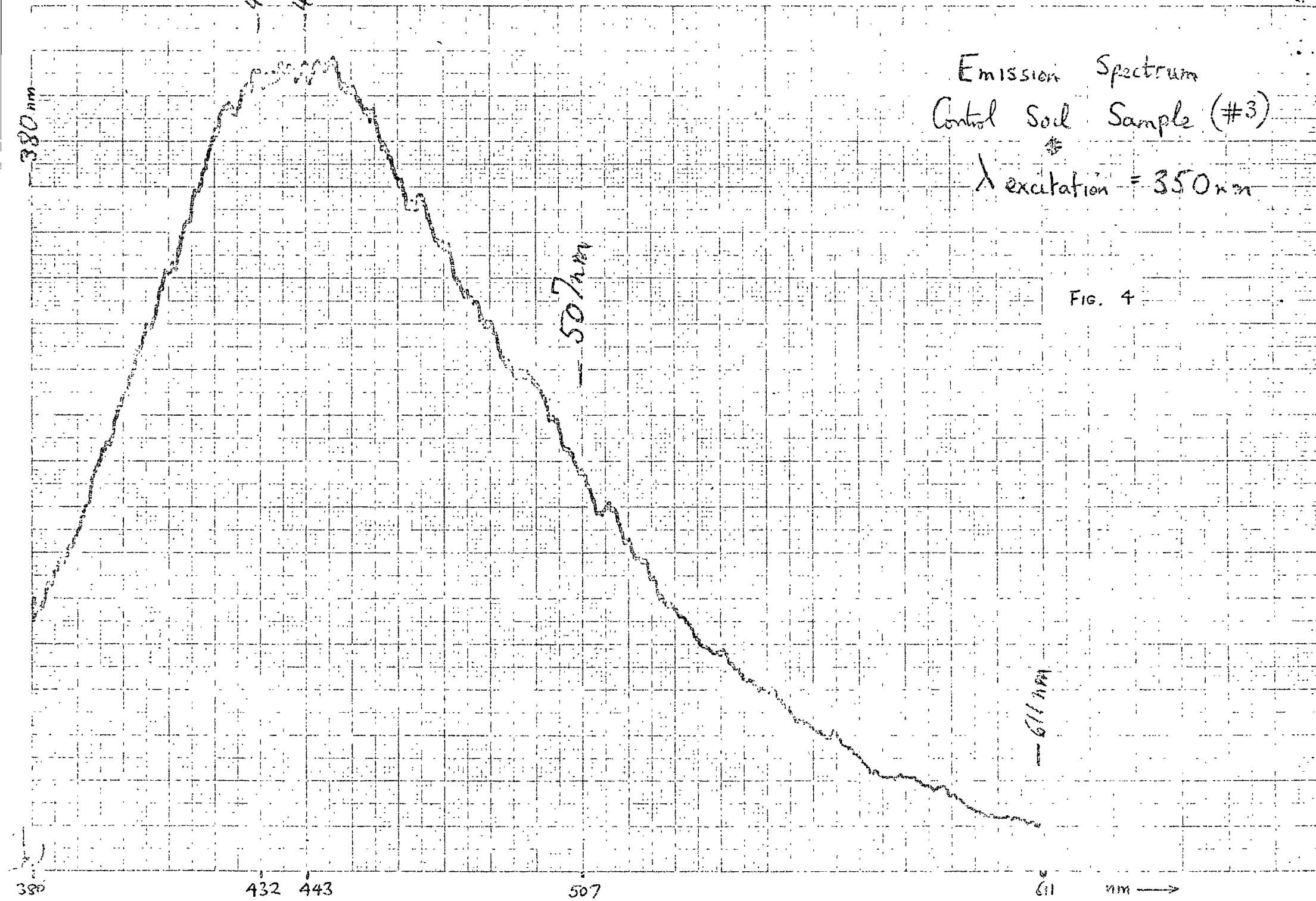
FIG. 2

SAMPLE	Ammonium Chloride	FORMULA	NH_4Cl	IN	KBr disc	NUMBER
RECORDING				100	100	100

Emission Spectrum
Control Soil Sample (#3)

λ excitation = 350 nm

FIG. 4

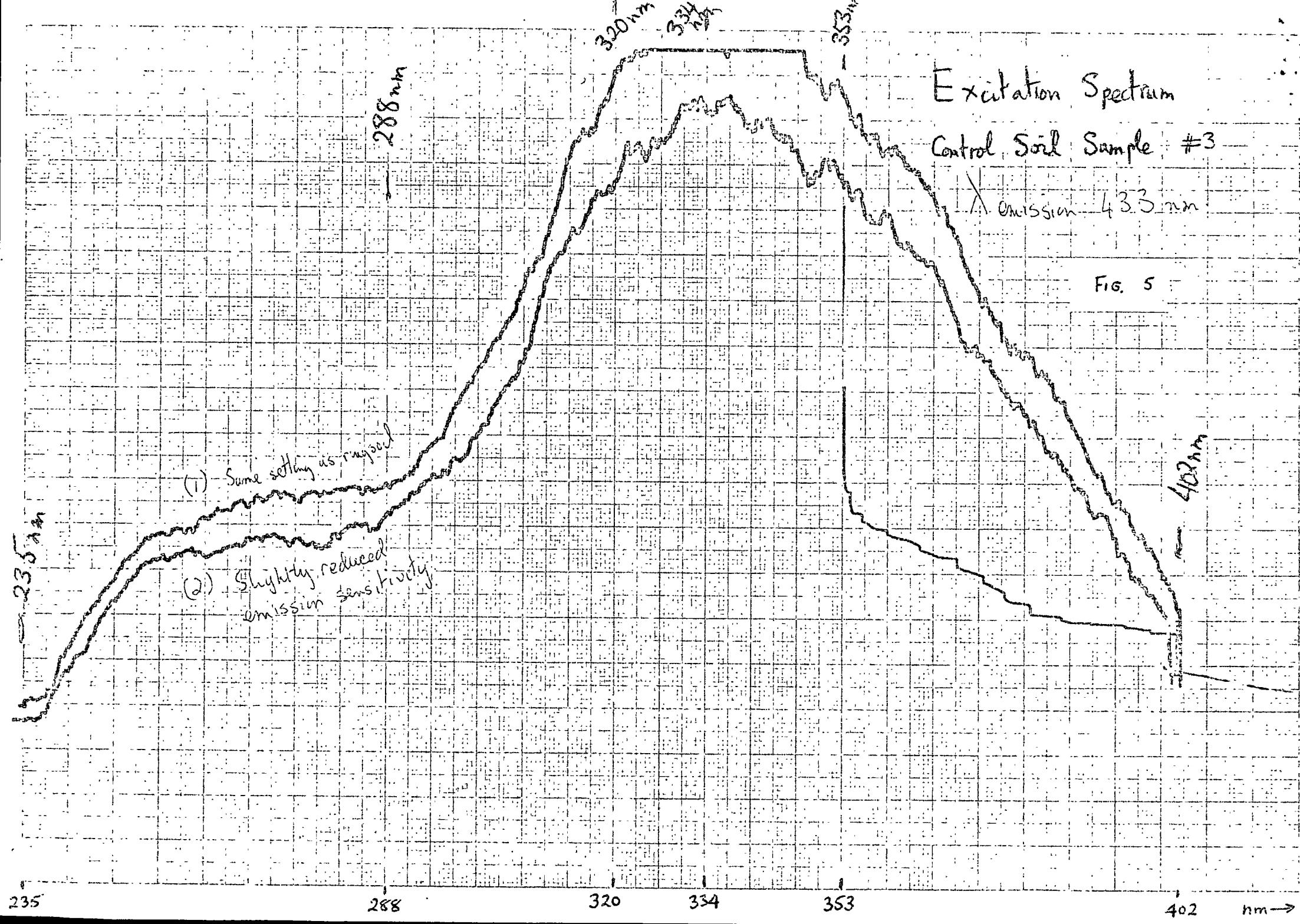


Excitation Spectrum

Control Soil Sample #3

Emission 433 nm

FIG. 5

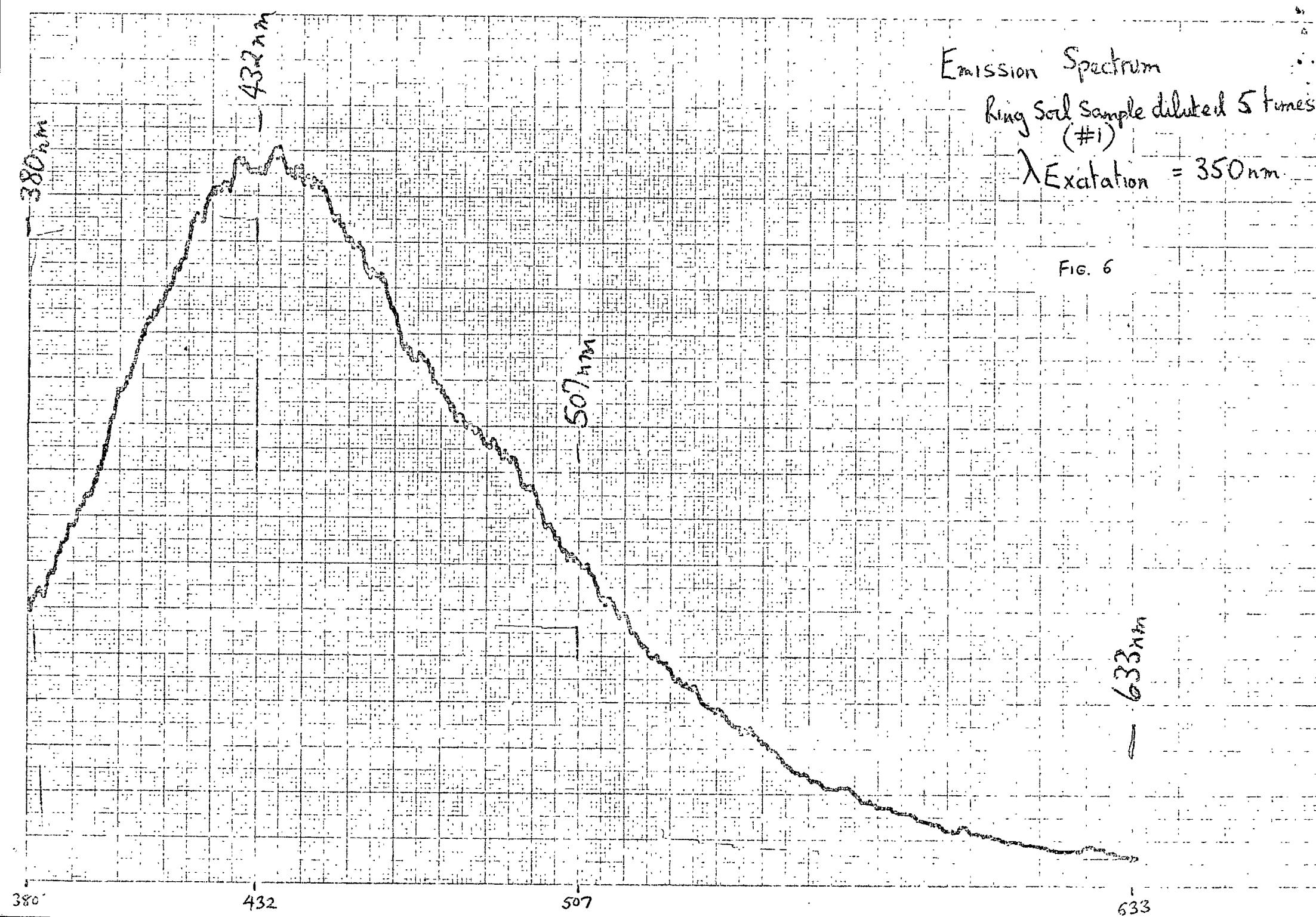


Emission Spectrum

Ring Soil Sample diluted 5 times
(#1)

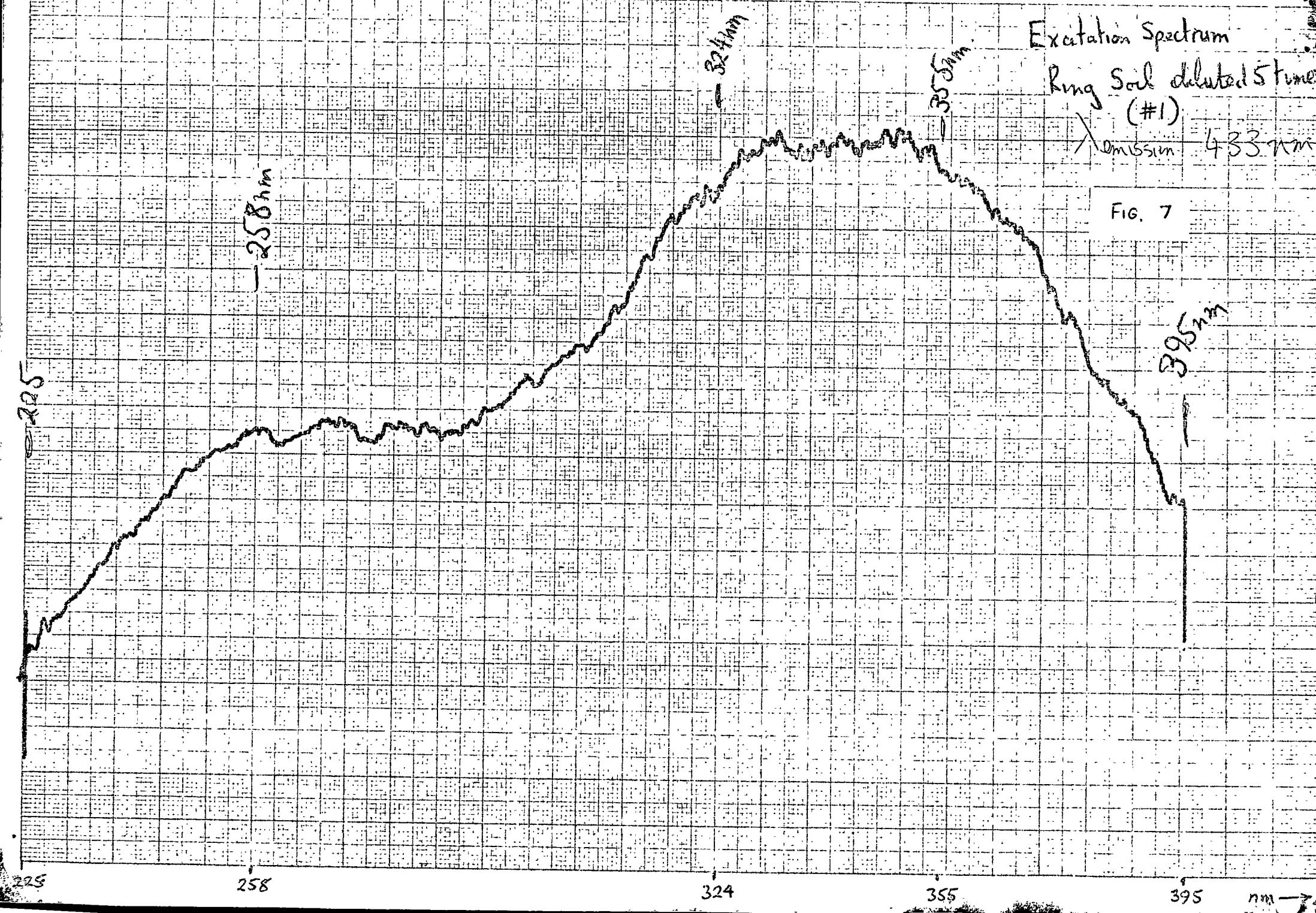
$\lambda_{\text{Excitation}} = 350\text{nm}$

FIG. 6



Excitation Spectrum
Ring Soil diluted 5 times
(#1)
Emission 433 nm

FIG. 7



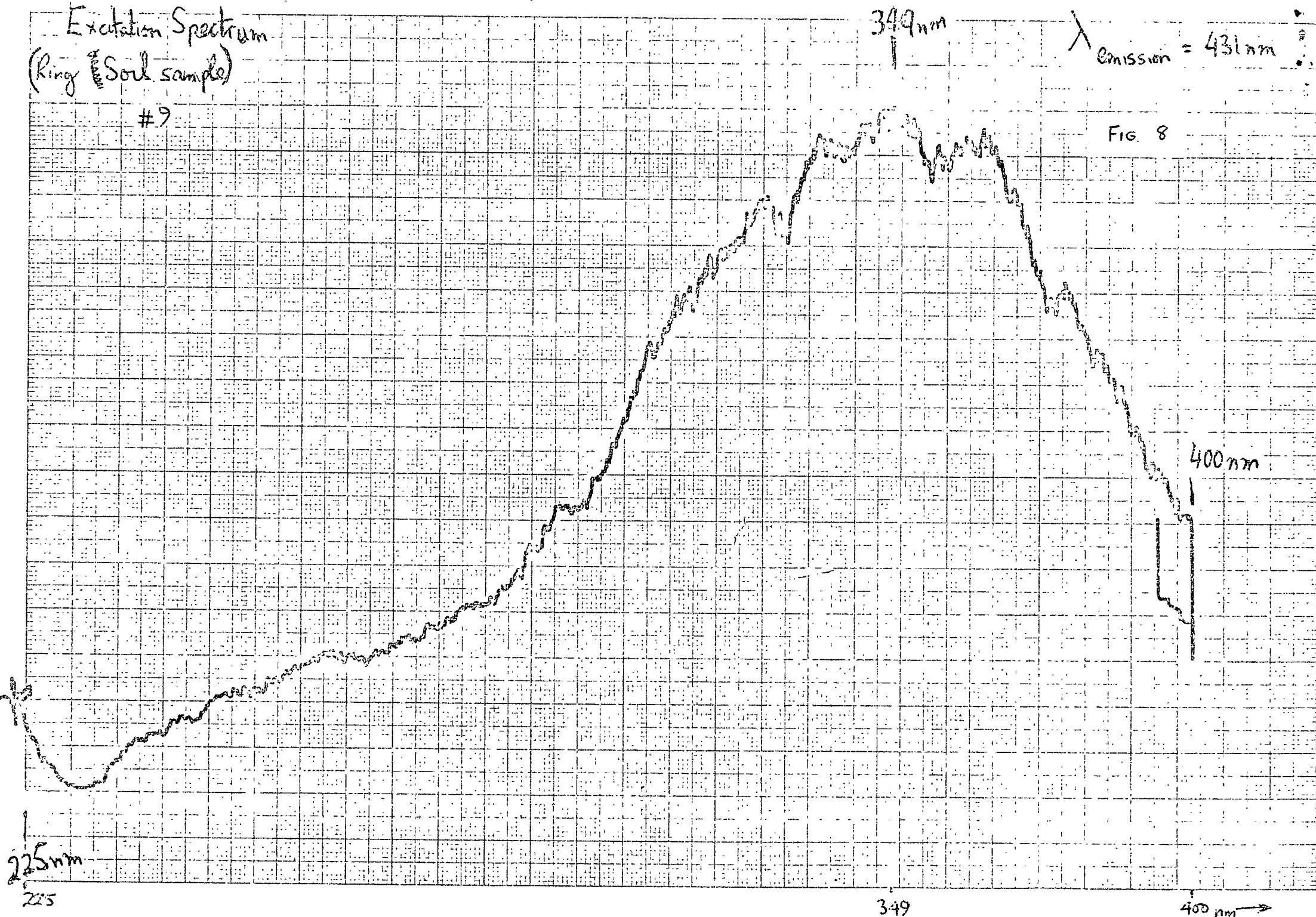
Excitation Spectrum
(Ring Soil sample)

#9

349 nm

λ
Emission = 431 nm

FIG. 8



225 nm

225

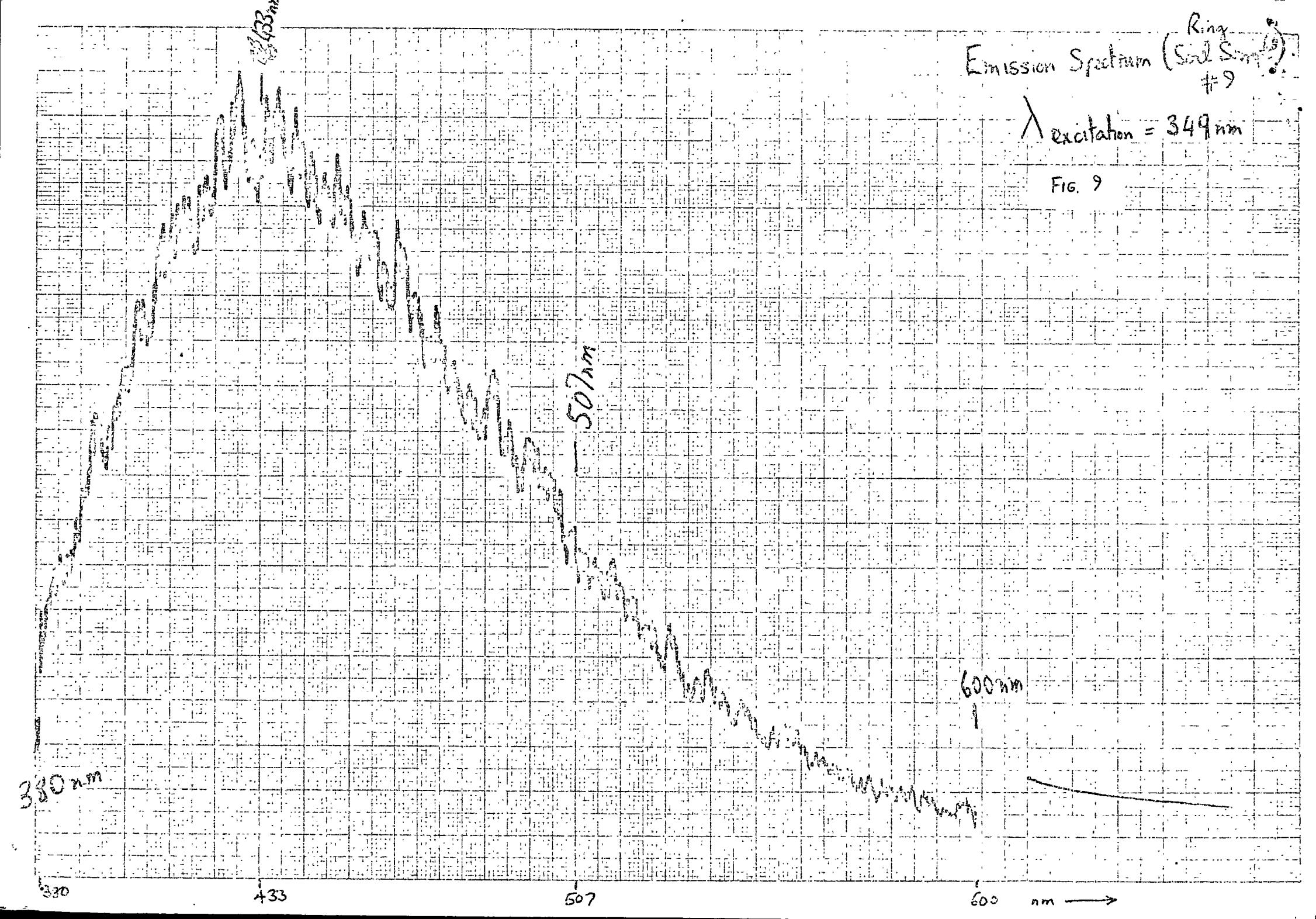
349

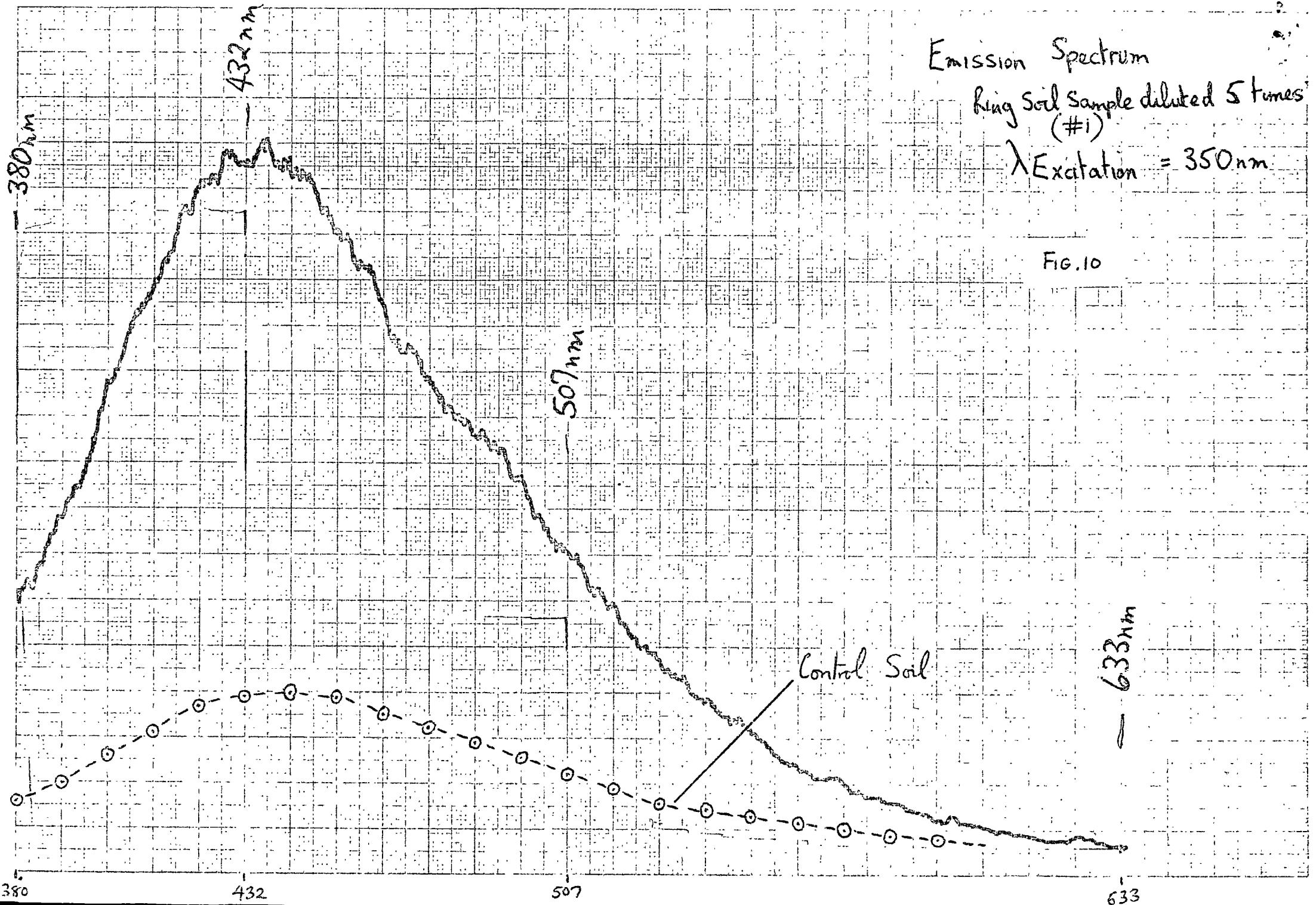
400 nm →

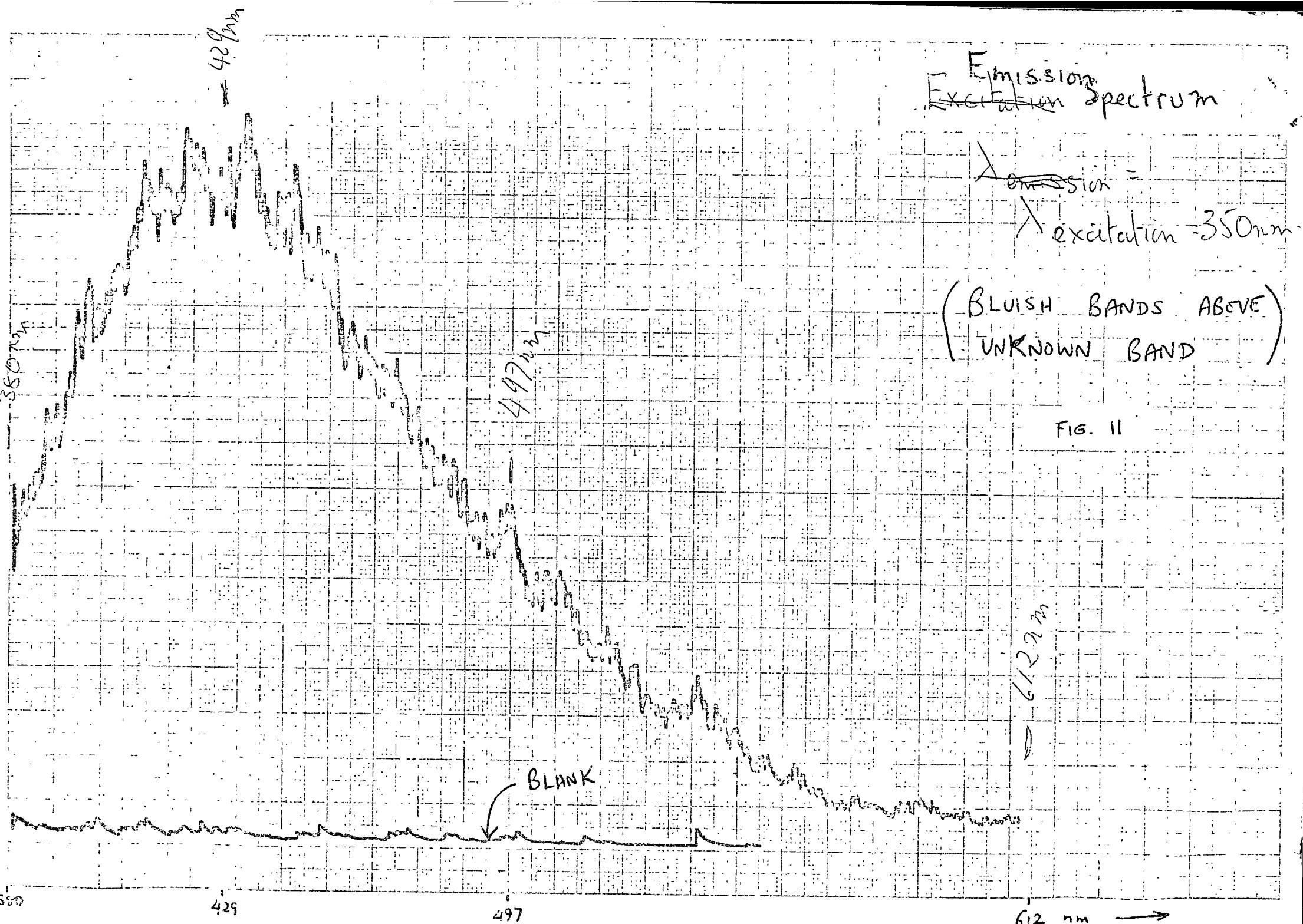
Ring
Emission Spectrum (Sod Silicate)
Fig. 9

$\lambda_{\text{excitation}} = 349 \text{ nm}$

FIG. 9







Mark Rodeghier

From: "Erol Faruk"
To:
Cc:
Sent: Thursday, February 16, 2006 3:52 AM
Subject: Re: Delphos Update

Dear Mark,

Thanks for your reply. As you are aware, my analysis of the ring soil identified an unstable water-soluble organic compound which had rather special characteristics – i.e. it readily oxidized to give a fluorescent product. This put the active component into the category of potential chemiluminescent material, and from this finding I proposed a model in my original report implicating novel technology of unknown origin, which could explain the ring and the case in all its salient features.

This model suggested the deposition of the water-soluble compound in the form of a spray, which in turn, would then explain the general shape of the ring with its wind-spread characteristics. This model further proposed that the white coloration of the ring would then be explained as the oxidation product resulting from the chemiluminescent emission occurring at the ring surface, and described as glowing by the witnesses soon after the event. It therefore follows that the regions of the ring with the greatest concentration of white material would be those which had emitted the most light on the night in question. If you take a look at Figure 2 in my report (i.e. photo taken 19 hours after the event) the whitest portion of the ring appears to be that which is downfield (i.e. to the right of the picture). If now you inspect the photo of the glowing ring taken by Erma Johnson, it is this portion of the ring that has been targeted by her. In this era of digital analysis of photographic evidence, is there no one that you know who might be interested enough to investigate this aspect of the case in much more detail. For example, all of the ring photos could be digitally enhanced/sharpened as well as analysed for whiteness distribution where possible. Could the enhanced images then be corrected for angle of shot so that an expanded PLAN VIEW of them be obtained for proper comparison against each other? The photograph of the glowing ring taken by Erma could similarly be properly analysed by experts to determine whether a flash was actually used that night. I would have thought that the difference between flash-reflected light and emitted light would have been sufficiently great

to technically differentiate in some way. If it could be established beyond doubt that a flash was not used, and that actual chemiluminescent light emission was recorded on the film, then this would be a highly significant finding!

From the study of the soil extract fluorescences the chemiluminescence emission would be anticipated to be bluish-white in color with a maximum at 432nm in aqueous solution. The color of the object itself was described as like that of an arc-welder, which again suggests a bluish white emission. If a spectrum of an arc-welder emission could be obtained and shown to be very similar in profile to that of the ring soil fluorescence, this would again be powerful evidence for a genuine case in my opinion.

Finally, would it not be possible to simulate conditions whereby the deposition of a circular aqueous spray (powered?) from approximately 2ft off the ground with an 8mph wind acting upon it would lead to a similar ring shape. Again this would entail experts in the appropriate field which would need funding.

These are some of my thoughts regarding what could still be done on the Delphos case. Primarily it depends upon accumulating enough hard data to establish beyond reasonable doubt that a highly unusual physical event entirely consistent with what was described by the witnesses occurred at Delphos.

I do have some soil material left, but almost certainly the active species I originally saw will have long since disappeared through oxidation and general decomposition. One could try and discover isotopic anomalies on the degraded material, but this I guess would be expensive to carry out and a bit of a long shot in terms of successful outcome (e.g. using mass spectral analysis on esterified material derived from the silver salt. Phyllis – any thoughts here?). I believe Prof. James Harder originally had stored many pounds of material but then decided to throw it all away – an amazing thing for someone of his background to have done, in my opinion.

I look forward to your reply and thoughts on this matter.

Mark Rodeghier

From: "Phyllis Budinger"
To: "Erol Faruk"
Cc: "Mark Rodeghier"
Sent: Thursday, February 16, 2006 10:42 AM
Subject: Re: Delphos Update and New Email Address

Hi Erol,

It was good to hear from you again. I have a new email address
. The one you sent to will be discontinued in two weeks.

Funding would be nice. But I'm sure Mark will tell you it is hard to find.

Isotopic analysis would have been a nice addition to the Delphos soil analysis. But, it should be done on an element that had a high probability of being from the craft. One of the most probable is carbon from the fulvic acids. I thought of measuring C-13 satellite peaks by NMR. However, there was not enough of the extract to do the analysis. High resolution MS would have been good, but BP did not have this instrumentation. It would have to be sent out and incur an expense. They would not have approved it. The man-hour and instrument time was donated by the individual analysts. I am also amazed that Harder threw the soil away! What was he thinking? By the way, he is still alive.

Of course, main stream science would have a problem with the above. But, over the years, and for many reasons, I have become convinced that what we call paranormal is also associated with the UFO phenomena. (These include poltergeist activity, balls of light, ghost sightings etc.) My view is science just hasn't discovered the explanation for some of these events. When they do the phenomena becomes 'normal'. At any rate at the current time if it is true, the question is "How do you prove it?"

Delphos remains an enigma. There may still be remnant's of evidence at the site, and probably in the buried ring soil. It would require someone to get Ron's permission to dig around, and a lot of noval and in-deph scientific analysis. I think Ted did some digital work on Erma's photograph. It was fairly recent using some new software he acquired, ca. two years ago. I can't find the email. I think it indicated the soil in the circle was elevated.

Best Regards, Phyll

From: "Erol Faruk" <erol_faruk@hotmail.com>
To: markrod@xsite.net
CC: budingerpa@email.msn.com
Subject: Re: Delphos Update
Date: Thu, 16 Feb 2006 09:52:38 +0000
>Dear Mark,
>
>Thanks for your reply. As you are aware, my analysis of the ring
>soil identified an unstable water-soluble organic compound which had
>rather special characteristics - i.e. it readily oxidized to give a
>fluorescent product. This put the active component into the category
>of potential chemiluminescent material, and from this finding I
>proposed a model in my original report implicating novel technology
>of unknown origin, which could explain the ring and the case in all
>its salient features.
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