British UFO Research Association Newchapel Observatory, Stoke on Trent, Staffordshire

SCIENCE PAPER 1

THE USE OF ANALYTICAL INSTRUMENTS IN THE SEARCH FOR EXTRA-TERRESTRIAL SPACECRAFT

Presented by

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of the

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THE USE OF ANALYTICAL INSTRUMENTS IN THE SEARCH FOR EXTRA-TERRESTRIAL SPACECRAFT

Introduction by Tony Pace FRAS

> There is certainly a distinction between this idea and the idea of Unidentified Flying Objects and David certainly likes to keep the distinction there. He is basically using instrumented detection to look for extra-terrestrial spacecraft, if, in fact, these spacecraft exist. David is by profession an electronic engineer specialising in the design and development of scientific instruments for research and industry and he has been involved in equipment for analytical chemistry, nuclear physics and atmospheric sciences and most recently medical electronics. Currently he is one of two people running a small company specialising in micro-computer-based equipment. May I introduce David Viewing.

Thank you very much. Good morning, ladies and gentlemen. As Tony correctly said the talk this morning is about the search for possible extra-terrestrial spacecraft. I am pleased he pointed out the distinction between this and UFOs because I think it very important that I make it quite clear at the start that we are not looking for UFOs. We are, however, interested in the possibility that other civilisations in the universe might have the capability of manufacturing spacecraft and that they might be sufficiently interested in planetary systems to send such spacecraft on exploratory missions. To the best of our knowledge this question has not really been studied properly in the past and consequently we in the Extra Terrestrial Society have set out to evaluate just how detectable such spacecraft would be and whether we would be able to observe them at all. We are at present in the initial stages of a very tentative experimental examination of this topic. There are some direct analogues between this work and the study of UFOS in view of the fact that the most popular interpretation of UFO events is that they are the manifestation of extra-terrestrial technology. That technology is generally conceived in a way which is similar to the one which we have in mind when we speculate that such technology might send spacecraft here. This work, I think, is well within the bounds defined by Professor Taylor when he earlier spoke about the importance of extending our knowledge of the universe from the inside of the existing structure of knowledge. We hope very much that this is what we do.

We are not involved to any great extent in speculation about unknowns although we are looking at what we do know and how that knowledge influences our interaction with the Universe. As some of you may already know our Society has for a long time been operating specialised automatic observatories. These are designed to look at the terrestrial environment for disturbances which might possibly be created by exotic sources. I will discuss briefly a specific technique which we have used. This is the study of the spectroscopy of atmospheric gamma rays. However, I intend also to mention briefly some of the other techniques which are being employed.

The Extra Terrestrial Society is a very small independent and rather selective organisation established in 1971 purely to conduct research activities. It was not established as a Society in quite the way many UFO societies are, for instance, because it has no regular publications and it does not hold meetings.

The sole reason for its existence is to actually conduct research. Its membership is mostly professional scientists and engineers.

Before I proceed to the main bulk of the talk I would just like to comment briefly on the attitude of the Extra Terrestrial Society to the question of UFOs. My feelings now is that it is most certainly not possible to establish any kind of specific origin for UFO phenomena. As to the possible question of extra-terrestrial origin of UFOs we know of no information of any kind which indicates in any way that they are of extra-terrestrial origin. Most members of our Society privately are of the opinion that the UFO phenomenon is explicable in terms of phenomena of natural terrestrial origin. We think that organisations like yours should spend far more time looking at natural phenomena in order to gain a much better understanding of the way in which UFO events as reported can come about. In fact, we feel that our attitude to the UFO problem is best summarised in what we consider to be the only thorough publication on this subject, the "Scientific Study of Unidentified Flying Objects" conducted by the University of Colorado? We feel that the comments made in that publication by Dr Condon and especially the British scientist Professor R V Jones very appropriately and very accurately summarise our own feelings.

Now, we are interested in extra-terrestrial spacecraft and for the purposes of this discussion we will call these spacecraft "starships". The existence of starships would be not excluded even if it were shown that no UFOs are extra-terrestrial. Simply because starships may not be observed as UFOs, there is still no reason to think that they do not exist as they may be very subtle in the way they conduct their affairs.

Now a few words about gamma radiation. Gamma radiation is electromagnetic radiation of the same nature as visible light. It is emitted however by transitions in energy levels in the electron structure of what we call radioactive materials. A typical radio-active isotope is Cobalt 60, which is often used as a calibration source for the kind of equipment we use. The basic isotope has a half-life of 5.26 years. This means that any one atom of this material will, on average, decay in 5.26 years. It decays to lower energy states and in this process emits photons of radiation at specific energies. Such radiation energies are characteristic of this material and it is possible with the equipment I am going to describe, to identify the material source of radiation from its spectral signature.

In considering starships I am talking about vehicles which we speculate may have travelled here from the distant stars. The stars of course are very far away. In order to cross interstellar space, starships would need very large amounts of energy. They need this because it is impractical for them to take long periods of time, where long is of the order of tens of millions of years. We feel that to cross interstellar space usefully, vehicles would have to travel on time scales of the order of tens or hundreds of years and to do this, they have to go at high speeds. These high speeds can only be achieved using very large amounts of energy. Now a number of groups in the western world are currently looking at the question of the propulsion of starships because it is becoming apparent that it may be possible for terrestrial technology to build starships and to send them to the stars in the foreseeable future. Because of this, we have been able to extract quite a lot of specific information about how these vehicles might operate. We can then suggest that that technology would be available also to any other civilisation in the universe and at some point in their development might be used by them. We are stressing here that we are looking at concepts which we can work with here on Earth, not speculating about 'magic' means of

propulsion which evade the consequences of relativity. These things are fine for amusement but you can't actually do anything about them because you can't specify how they work. In the case of the starship, however, we do have some methods which we can specify.

The vast amounts of energy needed can be extracted in basically four different ways. One used by us now in terrestrial technology is nuclear fission. Another used in weapons is nuclear fusion. In the far future it may be possible to extract energy by the annihilation of manufactured anti-matter and matter. This is speculative in that we do not know how to manufacture anti-matter and we may never be able to do it. If we could , and could contain it, then in the process of combining matter and anti-matter it is easy to show that energy is liberated with 100 per cent efficiency. The fourth means of obtaining energy might be the use of gravitation. Professor Taylor has alluded to some aspects of this in his talk yesterday but this is again more speculative. However we can to some extent define the parameters of these mechanisms. Basically we have no concept of the technology which might be employed but the physics is known to us. None of these mechanisms violate any existing physical laws and this is very important.

Now I am going to discuss nuclear fusion because nuclear fusion is the technique which has been used in several hypothetical starship studies and specifically is employed in a study currently being conducted in Britain by a group of British Interplanetary Society members[**] This is the project Daedalus study. We are very impressed with Daedalus because we think it is a very courageous and very effective study of a mechanism for building a starship which might be employed in the next century. To give a basic idea Daedalus operates by exploding thermonuclear devices - bombs - behind it and collecting the energy of the explosion in a shield. The shield transmits energy to the spacecraft and smoothes out the detonations of the bombs into a regular flow of energy. Bombs are detonated at a high rate - say 30 a second. The bombs are very small and consist of deuterium/tritium pellets which may be only a few milligrams in mass. These pellets are injected into the beam of an intense laser. The laser causes the thermonuclear material to ignite and the consequent thermonuclear burn of the small pellet produces a substantial amount of energy which can be coupled into the spacecraft. Basically the performance of the Daedalus starship gives it a maximum velocity of about one sixth thespeed of light. It is then able to cross to the nearest stars in periods between 30 and 100 years. The Daedalus team think that this is a possibility for interstellar fly-by missions and they believe that it may be possible to manufacture such ships. Certainly the equations which define the energies and performance of such ships are well known now. They do work and they do not violate any existing physical laws. So star travel from that point of view is feasible. Daedalus is a 'fly-by' project and like the early space probes sent to Mars and Venus it is not intended to stop. However it would give us our first glimpse of other star systems.

In the future vehicles like Daedalus which explode thermonuclear bombs may be hopelessly primitive. Bussard has discussed a thermonuclear ramjet which operates in interstellar space by burning up the interstellar hydrogen and simulates the operation of conventional aircraft. However there may be some reasons why it would not work. So basically what I would like to say is that we can specify that the Daedalus kind of concept does work. It was defined originally in the American thermonuclear Orion project which actually used fission bombs. However if we contain ourselves to thinking about vehicles of the Daedalus kind we can see that they are very detectable. They look like a point source of flashing radiation. They may have some parallels with certain pulsars as astronomical objects and they will be very powerful, very bright and very observable.

They will also give rise to a very large number of disturbances in observable parameters. Quite apart from pulses of light and nuclear radiation they will emit intense magnetic fields, infra-red radiation, etc, because such a machine is what engineers call a white noise generator. It generates noise in the form of energy in just about every definable parameter. So if some of you are thinking that because it emits radiation and magnetic fields, it looks like a UFO, forget it, because it is a white noise generator. To some extent UFOs are white noise generators but any correlation between these two is coincidence. UFOs are not Daedalus vehicles.

JONES DROVE LABORATORY

I will now move on to the experiment which has been operated at the Jones Drove Laboratory of the Extra Terrestrial Society (shown in Fig 1) which is concerned with atmospheric gamma ray distribution and the spectroscopy of that distribution. *(Fig 1 shows a block diagram of the experiment).* We have a large sodium iodide scintillation detector which is sensitive to gamma radiation in the range of 100 kilo-electron volts to 10 million electron volts. Radiation entering this detector is converted into pulses of light. The pulses of light are detected by a photomultiplier which is a sensitive photo cell. The photomultiplier sends electrical signals which are amplified and sent to various kinds of analytical equipment. This equipment has been operating on a continuous basis for several years. It produces outputs in various forms: conventional paper strip charts, punched paper tape, print-outs and other kinds of outputs. If an event occurs causing a significant change in the gamma ray distribution being measured by the system then the system is triggered into alternative operating modes.

One of these, for instance, produces a very high resolution punch paper tape which dumps out all the information being recorded by the equipment at the time of this event. This means that we can then extract every usable piece of information from the system and effectively reconstruct the event even if members of the team are not present at the time when the event occurs.

Fig 2 shows a representative radiation detector which uses a sodium iodide crystal. This is a 3"x3" artificially grown single crystal. It is very expensive, very difficult to make and very fragile. It has an optical interface, a glass window which couples light pulses caused by scintillations which are themselves caused by the gamma ray photons passing through the detector. These light pulses are optically coupled to the photomultiplier.

The whole assembly is mounted in a container, a large tube, and magnetically shielded. It's basically placed and operated in a position where it is not effectively screened from the gamma radiation in the atmosphere, near the roof of the building.

Fig 3 shows an instrument bay primarily used for nuclear physics experiments. We have a clock which times the experiments and basically controls them. We have a spectrum analyser which takes information from the radiation detectors and sorts it out into a distribution. It is effectively a small computer having a fixed program. The rest of the instruments are associated with operating the detectors and carrying out signal processing tasks on the information.

An analogue chart recorder is used to record outputs from the spectrometer on a routine basis. At the time this particular machine was being used to obtain hourly data on the gamma ray spectral distribution in the atmosphere, which we have been using as a background to further work.

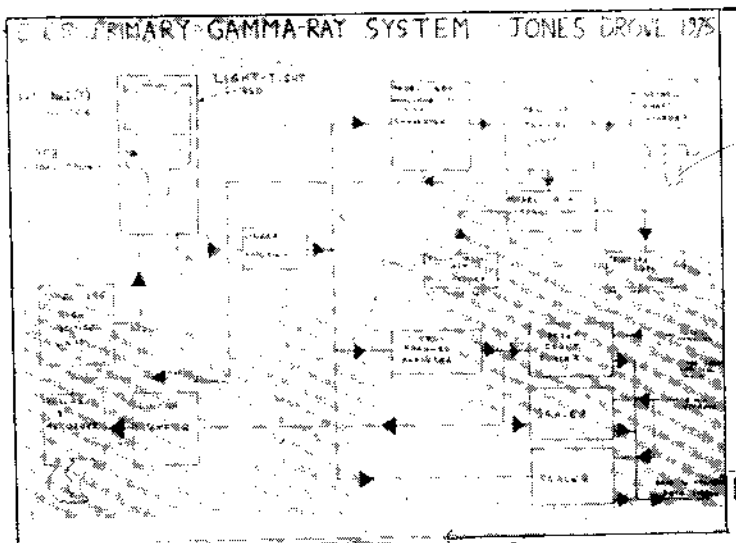
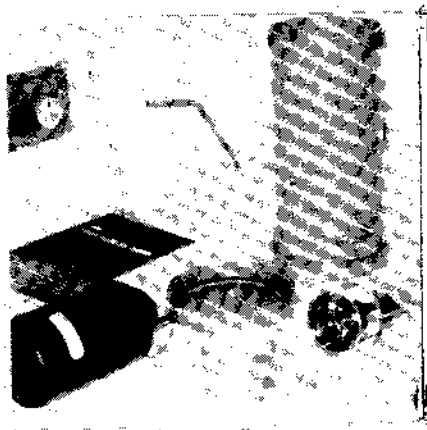


FIG 1

FIG 2



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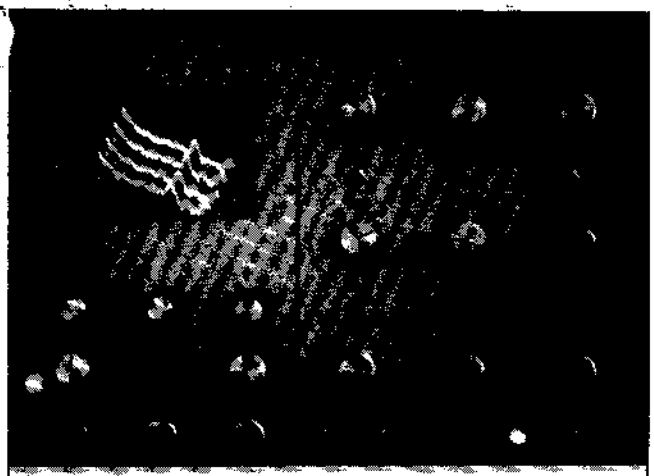

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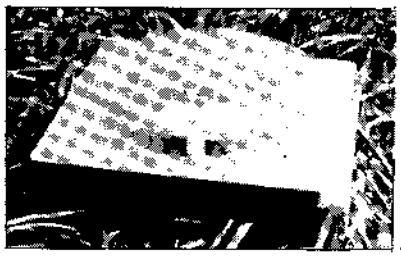

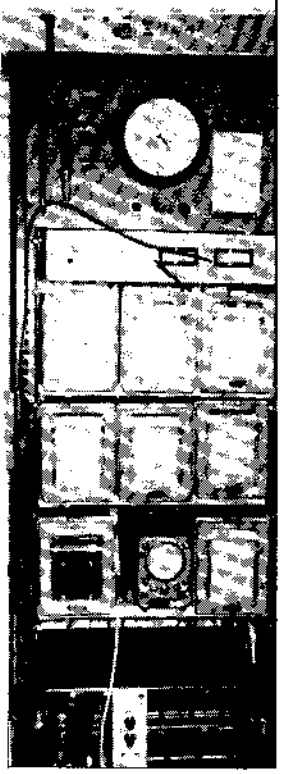

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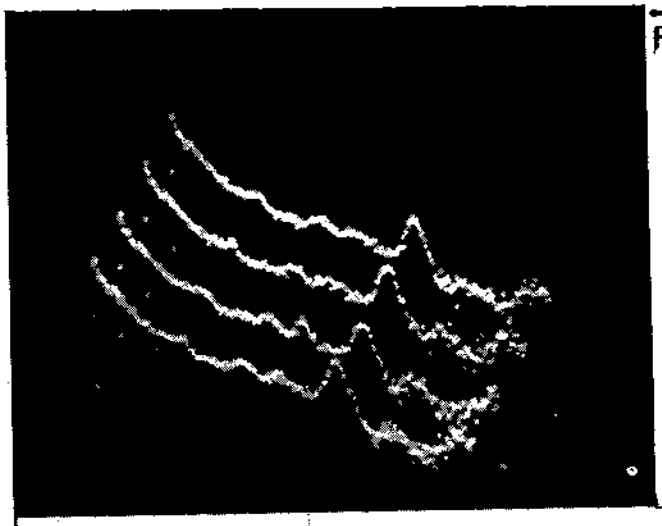

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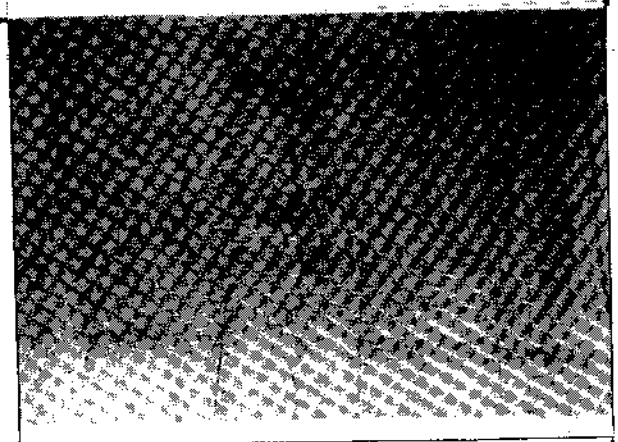

FIG 10

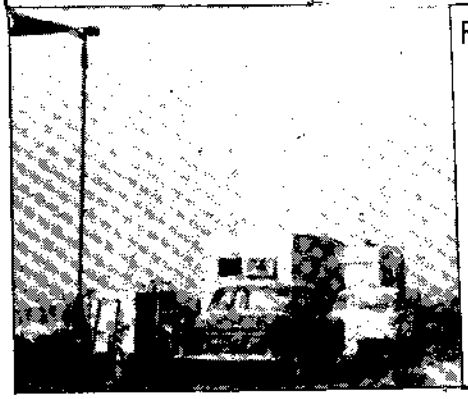

FIG 11

To date something like 15 000 of these particular type of spectra have been recorded by the experiments.

In Fig 4 we have a rather different spectrometer which is used with truly significant events. The spectrometer can detect a change in the distribution of radiation. It analyses the radiation at fairly high resolution and then outputs it in the form of paper tape. We can then feed the tape back into the machine at a later date and recreate the situation. This system is currently operating.

Fig 5 shows on a cathode ray tube spectral distribution of energy against number of events. On the X axis we have the energy of the incident gamma ray photons in electron volts in the range of about 100 kilo electron volts to about 3 million electron volts. On the Y axis we have the number of events. The display is made up of a number of discrete points which are actually related to memory locations in the machine. The machine builds up a statistical plot -but when there are enough points it looks smooth. Peaks are due to geological radiation; for instance the decay of the radioactive isotope Potassium 40 which is present in large quantities in the earth's crust. The other significant feature of the spectrum is the continuum of increasing number of events of low energy. This is due to the partial absorption and scattering of gamma ray photons in the atmosphere and in the earth. The origin of these photons is due to both geological radiation like the Potassium peak and also to cosmic ray flux.

I earlier mentioned that the system monitored the radiation and detects changes. For instance one particular instrument counts the number of events occurring at an energy of 511 kilo electron volts. When it sees an excess count it goes into some special routine.

I mentioned that the system is controlled by a special clock, shown in Fig 5. Time information is presented to various instruments in the system and is recorded on the printout. It can provide timing pulses and is really at the heart of the system and is controlled by a quartz crystal. The printout is basically a summary of information being presented by the system. This is generally recorded at hourly intervals although it can be commanded by the special sequences. It shows data from many instruments measuring parameters like atmosphere pressure and various others.

Fig 6 shows a field installation which is designed to measure atmospheric parameters close to the ground. It measures wind speed on a ground level anemometer, temperature and various other parameters.

Of particular interest is the electric field mill which is shown in Fig 7 The field mill is a very sensitive instrument. It detects electric fields in the atmosphere normally caused by thunderstorms. However it may be interesting in the study of starships. It is basically an electromechanical chopper which measures pure fields and which takes no current from the source of potential.

Fig 8 shows a recorder bay, using a standard type of analogue chart recorder. The top centre recorder is measuring very small variations in atmospheric pressure, plus and minus half a millibar. Work done elsewhere has shown that it is possible to detect distant nuclear explosions for instance, by the shock waves which travel round the earth. It is interesting because if a vehicle like Daedalus which involves thermonuclear explosions did come into the atmosphere then the shock waves from it would be very noticable!

I would now like to discuss some of the results we have obtained with this equipment. It is important to stress that we are at least as interested in

the study of natural phenomena as we are in the question of starships. Some of us are quite deeply involved in various aspects of the atmospheric sciences. One of our early experiments was a repeat of the search for ball lightning which was conducted by a group at Harwell. The Harwell group suggested that ball lightning might be due to the presence of antimatter meteorites in the upper atmosphere. This work was published as a letter in *Nature* in 1971 and we were sufficiently interested that we decided to repeat the work. We have not, incidently, observed ball lightning during something like 10 000 hours of operation. The results are considerably inconsistent with the Harwell ones and we hope to publish something on this soon.

In Fig 9 we have four spectra in a three dimensional display. There are four successive spectra taken during a violent thunderstorm quite recently. The spectra are interesting in that in a typical situation all spectra are the same; they are due to geological radiation. Geological structure and distribution does not change significantly unless you have a volcano in the garden. If you look at this diagram you will notice that the second spectrum has an extra peak. When we first saw this we were quite excited. We remained excited until we worked out what it was. This was done by identifying the energy of the peak and several other peaks which are in that spectrum with a specific radioactive material, Bismuth 207. This is associated with nuclear explosions and subsequently we were able to show that that peak was of Bismuth 207 washed down from the upper atmosphere during a violent hailstorm in a down draught, trapped in hail, we believe, and was present at our detectors as long as hail laid on the surface of the building. As soon as the hail melted and ran off the radiation went away. These spectra are approximately 20 minutes apart. This is an example of a transitory event, very unusual, very interesting and in a way representative of the kind of thing that we are looking for. A starship might give a peak in the radiation spectrum. It might be of that kind of amplitude. That's very difficult to detect by the way! If you were using a geiger counter you wouldn't be able to detect that by a factor of about a million which indicates how sensitive these instruments are.

I have mentioned the number of hours which this particular instrument is operating. Instruments operated by our group in total have achieved about 30 000 hours of operation. We have about 20 000 hours of gamma ray monitoring. It is interesting to reflect on what Mr Tim O'Brien said last night about skywatches and observability because basically we have a great many hours of experience here and that has some effect on Tim's numbers. He took a typical observing time for a human individual of I think 10 minutes and we are saying here that we observe 24 hours a day. Consequently if you take Tim's figures for an object entering the atmosphere at 100 miles range and if you assume that this instrument would respond to an object a 100 miles away, then you can see that we should have detected two by now!

I would like to suggest that although perhaps to the non-engineers among you this equipment might appear to be particularly sophisticated. In fact it is not and it has not presented us with any great difficulty to establish it and to run it.

Fig 10 is a diagram which shows a number of strip charts. There are 6 of them, all different parameters. They were taken at the time of the event in Fig 9 and show atmospheric pressure, atmospheric electric field, total radiation count, and power supplies - the sort of housekeeping measurement that tells us if things have gone wrong. Telluric measurements (induced earth currents by changes in magnetic field) are also made. These measurements give us a fairly good run down on what has been happening.

The electric field chart (R.H.S.) has on it a rapid series of variations lasting several hours which are clearly identified as a thunderstorm.

Fig 11 shows our observatory at Warminster which operated for about two years and made a study of discrete phenomena there just to evaluate what Warminster was about. It involved instruments of the kind that I have discussed and it operated reliably and we think effectively. We were able to show that there certainly was no physical stimulus for the phenomena at Warminster while we were there. Maybe the UFOs went away when they saw us! Editorial note: The Wiltshire town of Warminster, in south west England, is well known in Britain as the site of intensive alleged UFO activity.

CONCLUSION

My conclusions concern the question of interpreting results . Basically what I would like to say to you is that the Warminster installation was pretty suitable for detecting UFOs. It wasn't very sensitive, it wasn't very powerful but it was good enough to detect UFOs in the way that they are described in UFO literature. We think we were able to show comprehensively that there were no UFOs of that sort in Warminster. We think that this kind of operation could be extended to a global basis if people were actually interested in investigating UFOs in the way that they are reported. We think that the typical interpretation of UFO phenomena involving large spacecraft with tremendous magnetic fields and so on is hopelessly naive. We don't think they are like that because if they were and if they occur with the kind of frequency people suggest then we would be saturated with them . Magnetic observatories wouldn't be able to operate; their instruments would be continually broken by them!

We are interested in communication with extra-terrestrial intelligence, or at least detecting extra-terrestrial intelligence, because we think that is very important to the future of the world. Indeed we think the future may be determined by contact with extra-terrestrial intelligence. If that occurs then I think we are all well aware of the possible effects of it. Therefore it is important that we get the right answers and don't jump to conclusions

We feel that ufologists in general are guilty of jumping to the most appalling conclusions. I am not accusing BUFORA specifically, they very wisely don't have any corporate views on this topic. I also know that their officers have a very sensible and realistic view. The same can't be always said of their members and other groups. It is very important that we don't jump to conclusions about UFOs. It is very important that we don't spoil the whole business as far as the scientific community is concerned by making it so disreputable that no self-respecting scientist will get involved. I want to stress to you that it is important not to interpret UFOs before you have the data; and you don't have the data. Keep on reporting it, keep on finding it but whatever you do in the magazines, the books, the journals you publish don't interpret it, don't say that it is anything that you don't really know. Find out about natural phenomena; find out what happens in the dark when people are alone and worried; find out why they see the things they do; look at it carefully. If you go on publishing results which allege that UFOs are extra terrestrial spacecraft without foundation then it is going to make work of the kind that I have described virtually impossible.

So that is basically the conclusion of my remarks. I would just like to express my thanks to Robin Lindsey who prepared the slides, Chris Borswell who prepared the exhibition and of course Mr Roger Stanway and Mr Tony Pace who kindly allowed me this opportunity of speaking to you.

References:

Scientific Study of Unidentified Flying Objects D F Gilmore (ed) Bantam 1969

Project Daedalus: the interim report of the British Interplanetary Society starship study (May 1974)

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