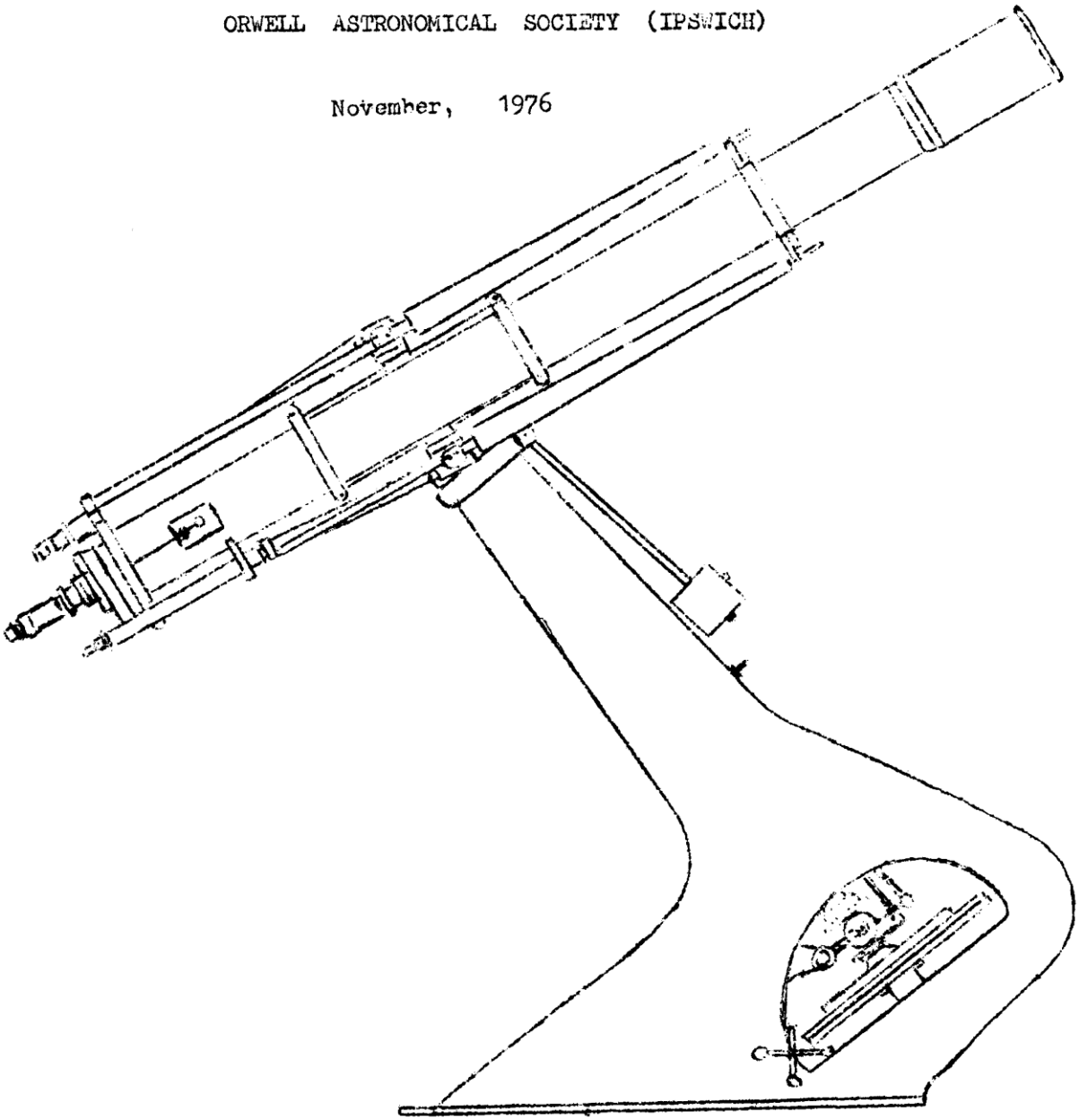
O.A.S.I.

Journal of the

ORWELL ASTRONOMICAL SOCIETY (IPSWICH)

November, 1976



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What's Up ? the solar syst as seen from Ipswich November 1973 J.D.Deans

SOLAR SECTION

The Sun enters the constellation of Libra this month, Sunrise at the start of the month willbe at 07hrs. U.T. and Sunset around 16hrs. 30m. U.T. As we are now back to G.M.T. time no correction is needed for U.T. time, which makes life simpler.

Heliographic Co-ordinates at 12.00hrs. U.T.

	P	Bo	Lo		P	Bo	Lo
Nov. 3rd	+24.2°	+4.1°	55.4°	Nov. 18th	+20.5°	+2.4°	217.6°
" 8th	+23.2°	+3.6°	349.5°	" 23rd	+19.0°	+1.8°	151.7°
" 13th	+21.9°	+3.0°	233.6°	" 28th	+17.2°	+1.2°	85.8°

Synodic rotation number 1647 commenced Oct. 10.90d.
" " " 1648 commences Nov. 4.51d.

MERCURY this month will be at superior conjunction on the 7th at 09 hrs. U.T. thereafter it becomes an evening star moving direct and obtaining 12° Eastern elongation by the end of the month. It will be at magnitude -0.5 and setting only 30 mins or so after Sunset.

VENUS will be at 38° Eastern elongation by mid month setting nearly two hours after Sunset and at magnitude - 3.5 it should be a spectacular sight. 0.76 of the disc will be illuminated,therefore a gibbous phase will be seen.

MARS will be in conjunction on the 25th of Nov. at 01 hrs. U.T. (Distance 2.50 A.U.) and will not be observable this month.

JUPITER is a splendid sight in the constellation of Taurus just below the Pleiades its magnitude is - 2.4. Jupiter reaches opposition on the 18th at 03hrs U.T. it continues to retrograde slowly towards the constellation of Aries. On the evening of the 7th Jupiter will be seen very close to the Moon, at 01 hrs. on the 8th Jupiter will be seen 1° North of the Moon and an occultation actually occurs as seen from the South Atlantic and Antarctica regions. The Moon's selenographic colongitude for 0 hrs. UT on the 8th is given as 102.7° which means that the Moon's phase willbe gibbous and waning. An excellent opportunity exists here for some suberb photographs weather permitting.

SATURN is in the constellation of Cancer it rises at 23h U.T. at the start of the month and is at mag + 0.6. Saturn is moving direct until the 28th when it appears stationary thereafter it moves in a retrograde motion. The Moon will be near Saturn on the 14th at 15 hrs. U.T.

LUNAR SECTION

Phases for lunation 666/667

Full Moon	Nov	6th	23h 15m U.T.
Last Quarter	"	14th	22h 39m U.T.
New Moon	"	21st	15h 11m "
First Quarter	"	28th	12h 59m "

OCCULTATIONS

Nov	1st	ZC 3366*	mag	6.6	D	21h 42.3m
	8th	" 658*	"	4.2	D	19h 33.3m
	8th	" 658*	"	4.2	R	20h 32.7m
	10th	" 934	"	6.4	R	22h 17.4m
	13th	" 1318	"	5.7	R	23h 17.7m

PHENOMENA OF JUPITER'S SATELLITES

	Nov 1st	satellite	11	EcD	23h 5m U.T.
	" 7th	"	1	EcD	22h55m "
	" 9th	"	11	EcD	02h26m "
	" 15th	"	1	EcD	00h49m "
	" 16th	"	111	EcD	20h29m "
	" 16th	"	111	EcR	22h41m "
*	" 23rd	"	1	EcR	23h24m "
*	" 28th	"	11	EcR	23h27m "
	Nov16th	satellite	1	OcR	21h31m U.T.
*	" 23rd	"	1	OcD	21h05m U.T.

..cont'd..

PHENOMENA OF JUPITER'S SATELLITES cont'd

	Nov	24th	satellite	III	OcD	00h 03m U.T.
*	"	26th	"	II	OcD	20h 30m "
	"	30th	"	I	OcD	22h 49m "

* note events indicated with asterisk denote that the satellite suffers an Occultation disappearance initially and then reappears from an eclipse by Jupiters shadow.

Nov	3rd	satellite	II	TrI	19h 41m U.T.
"	3rd	"	II	TrE	22h 09m "
"	8th	"	I	TrI	20h 20m "
"	8th	"	I	TrE	22h 28m "
"	10th	"	II	TrI	21h 55m "
"	11th	"	II	TrE	00h 24m "
"	15th	"	I	TrI	22h 03m "
"	16th	"	I	TrE	00h 11m "
"	18th	"	II	TrI	00h 09m "
"	22nd	"	I	TrI	23h 46m "
"	23rd	"	I	TrE	01h 54m "
"	24th	"	I	TrI	18h 12m "
"	24th	"	I	TrE	20h 20m "
"	28th	"	II	TrE	18h 00m "

METEOR REPORT by Mr. D. Barnard, [redacted], Ipswich,
Director Meteor Section.

Becuase of the November Journal going to print early the Orionid Meteor watch will be reported in next month's Journal.

There is a lot of meteor activity this month:

1. THE TAURIDS, Max on November 8th normal limits 20th Oct. to 30th Nov, ZHR of about 12. This shower has a double radiant which is rich in fireballs. Transit time 0050hrs. B.A.A. describes this shower as 'Partly favourable'.

** There will be a meteor watch to observe this shower on Saturday 6th November starting at 9p.n.

2. THE LEONIDS

This shower is associated with comet 1886. Transit time 0626hrs U.T. The maximum is on November 17th (at0700hrs) Normal limits Nov 15th to 19th) ZHR of about 10 though this figure varies.

*** There will be a meteor watch to observe this shower on WEDNESDAY 17th Nov starting at 7.30p.m until about 10.30p.m. The B.A.A. describes this shower as 'rather unfavourable'

For both these meteor counts please meet outside the Golf Hotel, Foxhall Rd. Ipswich irrespective of weather conditions.

In DECEMBER there are two rich meteor showers to look forward to, viz. the GEMINIDS and the URSIDS.

NEW MEMBERS.

We would like to welcome the following new members to our Society:

David Cockburn, [redacted], Nacton.
Peter Wright, [redacted], Nacton.
Mr. G. Pozzani, [redacted], Ipswich.
Mr. M. Harlow, [redacted], Felixstowe, Suffolk.
Mr. B.R. Stollery, [redacted], Ipswich.

FOR SALE.

8" Reflecting telescope, F. 6 on equitorial mount with slow motion controls and a 50x eyepiece. This instrument is in very good condition.

Price £145 O.N.O. buyer would have to collect.

apply: Mr. A.R.J. Paine,
[redacted],
WALTON,
Felixstowe, Suffolk, 'Phone Felixstowe [redacted].

LECTURES:

Our November lecture at the Friends Meeting House, Ipswich is on Friday 19th starting at 8p.m. and is being given by Dr. Brian Morgan of The Imperial College, London. The subject of his talk is 'Observation of Galaxies and Binary Stars using the Isaac Newton Telescope.

The admission is FREE so please come along and support this lecture. Also please put the poster advertising this lecture in a prominant position to advertise this lecture.

THE GEOLOGY OF THE SOLAR SYSTEM. by Mr. R. Markham, B.Sc.

As advised in last month's Journal this article covers four sides of paper which is being inserted in our November and December Journals. This article is also in the Ipswich Geological Group's Journal in full. As our Journal is quite big we have split it into two so side two of the article unfortunatelly ends in mid-sentence.

THE HANDBOOK OF THE BRITISH ASTRONOMICAL ASSOCIATION.

The above Handbook for 1977 is now available costing £1.50 to non members of the B.A.A. If you would like a copy please apply direct to

The British Astronomical Association,
Burlington House,
Piccadilly,
London, W1V ONL.

GRAZING OCCULTATION on Saturday 27th November, 1976.

The grazing occultation of star ZC 3199 Mag 6.8 occurs about 18.30 on Saturday 27th November. Anyone wishing to come along to Timworth Green, Bury St. Edmunds to observe this event should contact Mr. R.M. Cheesman, [redacted], Ipswich who is arranging to observe the graze and who is organising transport. It is hoped that as many members as possible will come along so that we can have as many stations as possible. We will leave the Whitton Maypole public House, Norwich Road, Ipswich atabout 5.15p.m. It is hoped that on this meeting we will be able to have a radio contact between the phone box and the stations.

There are no grazing occultations forcast for 1977 within easy reach from Ipswich so make a point not to miss this one!

THE VIKING MISSION TO MARS.

by Mr. S.G. Harvey, [redacted], Ipswich.

As you all must know by now N.A.S.A. (the National Aeonautics and Space Administration) has sent two automatic probes to Mars.

The two probes can be said to have two main objectives:-

1. To find evidence of life on Mars and whether it has existed in Mars' past.

2. To obtain information that will improve man's understanding of how our planet Earth developed as a body able to support life, and how best to preserve and protect the Earth's enviroment.

Viking finding life on Mars is not only an achievement in itself, but it also means that in the hundred thousand million or so stars in our galaxy chances of life on some of those star's planets is greatly increased.

The Viking spacecraft are designed to make three basic types of scientific study of Mars. First, the orbiting part of the spacecraft will continue mapping Mars supplimenting the pictures taken by earlier Mariner spacecraft. Secondly, the lander will search for life forms on Mars. Thirdly, both spacecraft will obtain information about Mars' physical features and the atmospheric constituents. The landers will also find out if Mars is still geologically 'alive', by detecting 'Marsquakes' with it's seismometer. If 'Marsquakes' are recorded then scientists should be able to deduce whether or not Mars has a core, a mantle and a crust as the Earth does. Thus we will be able to compare the internal structures of the Earth, Moon and Mars. The lander will also identify elements and compounds in the soil.

The orbiters will carry out Thermal mapping of Mars' surface, that is, detect hot and cold spots such as volcanoes and general heat flow anomalies. There are numerous more features of the Viking spacecraft although I believe I have listed enough to give the general importance of the Viking probes.

THE VIKING PROJECT.

The Viking project is actually managed at N.A.S.A.s Langley Research Centre, Hampton, Virginia. The Martin Manetta Corporation designed and built the landers together with the two Tital III launch vehicles. The Jet Propulsion Laboratory, California was responsible for building the orbiters and is now responsible for craft tracking and mission control. The scientific projects are handled by eighty scientists in thirteen different science teams.

THE LANDER.

The lander is roughly a box shaped object with three protruding legs. The main features of it are:-

1. The uppermost part, an S-band high gain antenna.
2. At the sides, two radioisotope thermo-electric generators which together provide power for Viking's scientific operations.
3. The two cameras located near the soil retractable boom. They contain mirrors which blink so to speak, as they operate by moving at different horizontal angles so producing a strip picture of Mars as seen through the camera's slit (one each). The two cameras can also move round so that a picture being received at J.P.L. will consist of strips making up a picture of the Martian landscape. I shall have more to say about these cameras later.
4. The all important soil boom which has caused so much trouble on Viking 1 (jamming twice), this reaches out, scoops a sample of Martian soil up, retracts and deposits the soil into a couple of soil receiving funnels which leads to the crucial biology experiments package.
5. The propellant tanks for descent engines. These are located, one each, under the RTG's.
6. The landing legs which before the landing there was so much contraversey as to whether the Vikings would land on permafrost layers, sand, or rock, the importance of which of these it would be meaning the life or death of the mission.

THE ORBITER.

The orbiter is the larger of the two spacecraft, having the lander attached to it by a truss connected to the Viking landing capsule (lander). The Orbiter is actually a larger version of the successful Mariner of course, the Viking landing capsule seperates from the orbiter on re-entry. The orbiter has a large surface of solar cell panels which supply 620 watts for the orbiter systems. .

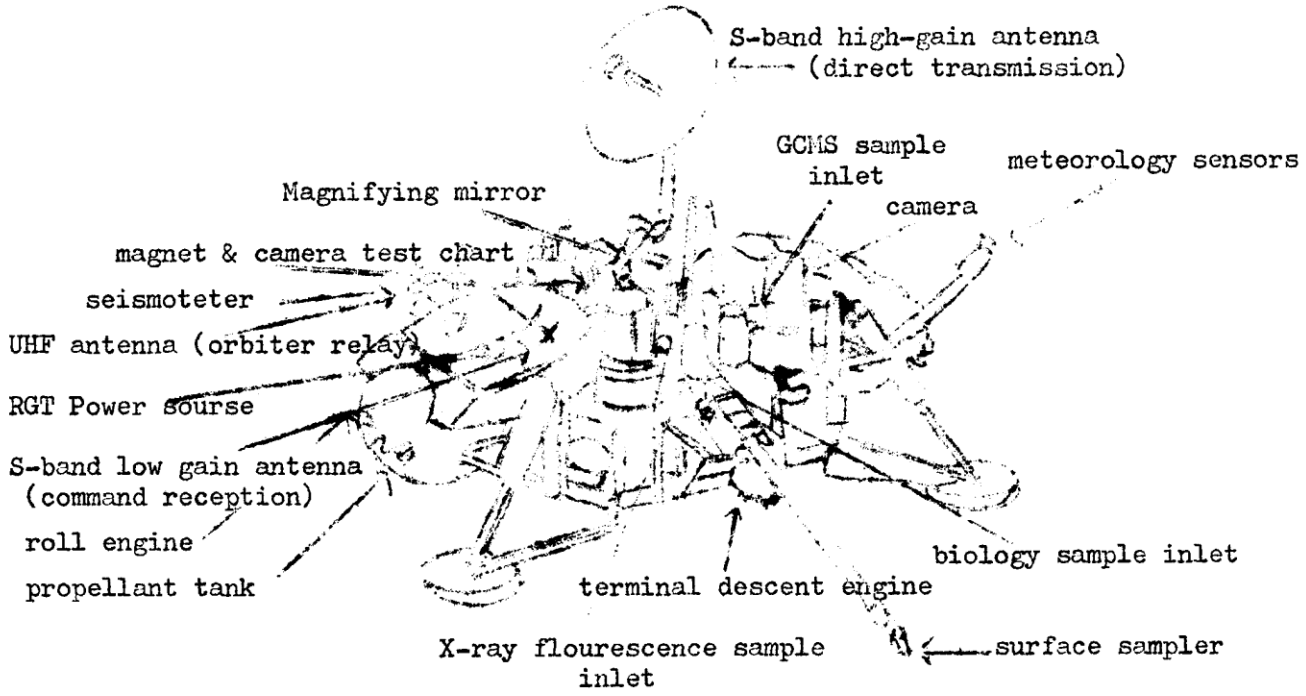
continued.....

It also has a large bowl (parabolic antenna) which is kept pointing continually towards the Earth to provide a tight communications link with N.A.S.A.'s Deep Space Network which has receivers all over the world.

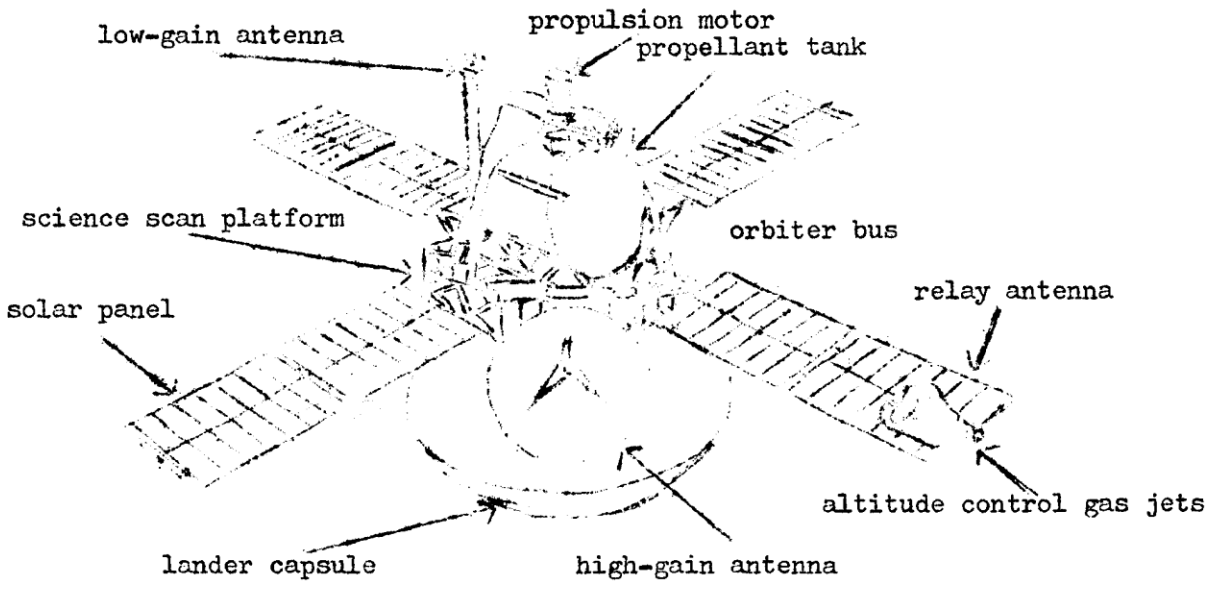
I hope that I have given you a rough account of some of the Viking's aspects, Meanwhile let us hope that Vikings 1 and 2 survive the Solar conjunction in Mid-November.

I would like to thank N.A.S.A. for certain information included in the above.

THE VIKING LANDER.



VIKING ORBITER.



U.F.O.'s and the Plasma Hypothesis

By Mark Howe, Assistant Editor.

To many people the terms 'U.F.O' and 'flying saucer' are synonymous with 'extra-terrestial'. This is probably the reason why students of the U.F.O. phenomenon-ufologists- are generally held in low regard by a large proportion of the public. After all, everyone knows that interstella travel is impossible - don't they? Scientists also tend to shy away from the subject, for a variety of reasons.

While it is true that many ufologists still cling to the extra-terrestial hypothesis (ETH), many others subscribe to different theories. In one theory, U.F.Os originate from within the Earth's interior and periodically 'surface' through a mysterious hole in the North Pole; no one has yet accounted for the Earth's apparant solidity! Another theory, due to Caroll Godsell of BUFORA, is that U.F.O.s, or a large percentage of them, are 'future flying projections' (FFPs), images of the Earth's future which have somehow travelled in time. Many scientists follow Carl Jung in believing that all U.F.Os are semi-real products of the human mind.

One reason for the abundance of alternatives to the ETH is the great distance between stars. Even though, in all probability, there are thousands or millions of extra-terrestial civilizations, it has been calculated that there should be no more than ONE visitor from outer space EACH YEAR. Yet in Britain alone there are probably dozens of authenticated sightings per annum. Another fact which tends to contradict the ETH, the 'Hollow Earth' and the FFP theory, is the great variety of flying saucers. Since 1947 there have been thousands of U.F.O. sightings yet only a handful of the UFOs seen have actually had the same appearance. It seems hard to believe that any civilisation would manufacture thousands of different U.F.Os for the sole purpose of visiting Earth.

My own belief is that a fair proportion of U.F.O. sightings - particularly those of the 'lights-in-the-sky'(LITS) variety - can, however, adequately be explained by the use of what is known as the 'Plasma Hypothesis'. This first came to my attention not long ago in an article in the Journal of the British U.F.O. Research Association.

Plasma has been referred to as the fourth state of matter. In consists of ionised gases at temperatures of 50-100 million ^{o}C- far hotter than the Sun's interior. A plasma may be about the size of a car, have a metallic lustre and be of discus or egg-shape. Sometimes it can show openings which may glow colourfully or emit coloured sparks. The sun itself may be thought of as a huge plasma.

Recent years have seen the developement of atomic power to a point where the successful harnessing of nuclear fusion may be just around the corner. The key to the problem lies in the controlled production of hydrogen nuclei - protons- at a temperature great enough to cause them to fuse together to form helium nuclei. This occurs together with the emission of a large amount of energy, which is enough to keep the plasma at the required temperature and to act as a source for other energy requirements such as electricity generators. These conditions are afforded by plasma.

If we accept that many U.F.Os are in fact plasma, many observed facts about U.F.Os can be accounted for. Often U.F.O.s seem to follow magnetic faults in the Earth's crust or high voltage electricity cables - consistent with the idea of an ionised gas. The presence of U.F.Os has been known to stall or stop completely any car engines in the vacinity and to cause radio interference. Descriptions of .U.F.Os seen at fairly close quarters could often be mistaken for descriptions of plasmas.

Personally, I find the Plasma Hypothesis appealing because it is based on well-known, sound, scientific fact. After all, no-one has proved that there are extra-terrestial civilisations capable of visiting us or that time-travel is possible, or that the Earth is hollow; but plasma is a scientific reality, indeed, man is already turning it to his own use. It may also serve to bring the much needed attention of scientists to the study of ufology.

Of course the Plasma Hypothesis cannot explain all, or even nearly all, of the flying saucer sightings of the past thirty years. There must, I believe be some other process at work, the most likely alternative being something to do with Jung's mind projections. The term U.F.O. itself is in a way misleading because it tends to conjure up images of little green men flying around in glorified spinning tops with fairly lights on, even though 'Unidentified Flying Object' does not overtly imply this. A better term, in my opinion, is 'aerial phenomenon' , which covers about everthing from car headlights reflected off low altitude clouds to ball lightning

After all's said and done though, I must admit I still believe wholeheartedly in the possibility of extra-terrestials having visited us in the past and still doing so to a small extent. ETH, all is not lost!

GEOLOGY OF THE SOLAR SYSTEM.

(A write-up, with additional material, of the slide show given to the Orwell Astronomical Society (Ipswich)/Ipswich Geological Group joint meeting, 5 December 1975.)

Geology is the study of the composition and origin of rocks, and of the history of the Earth as told by the layers of rocks and their contents.

Space probes are now adding to our knowledge of geological processes operating in different physical environments; difficulties may arise in how to interprete data.

In the Solar System, bodies of predominately geological interest are 'high density' (over 3) and rocky, -Mercury, Venus, Earth, Moon, Mars, Io, and Eurppa. 'Low density' bodies (less than density $2\frac{1}{2}$) may have a large percentage of ice(s); these are Jupiter, Saturn, Uranus, Neptune, and most of the satellites of these planets.

Only some aspects of the Geology of the Solar System can be given in this account.

EARTH.

The Earth has a radius of 6,378 km. (c. 4,000 miles), a mean density of 5.5, and a thin rocky crust on a very hot interior. There are large quantities of surface water (the only planet with oceans of water), a nitrogen and oxygen atmosphere, and abundant living organisms. There are, at the present time, polar ice caps. The formation of this environment during geological time is studied by stratigraphers deciphering the events preserved in the sequence of rocks.

Seismological measurements of the Earth suggest that it has a solid core (of nickel-iron alloy), surrounded by a similar alloy in a molten state (where the Earth's magnetic field is thought to originate), with a mantle of silicate rocks essentially of the mineral olivine or of olivine and pyroxene. The crust, generally 6-30 miles thick, forms the outer rigid shell of the planet.

There is evidence of major horizontal movements of great crustal 'plates' (as the result of convection currents,generated by radioactive heat,within the mantle), these plates sometimes colliding and pushing up chains of 'fold' mountains, at other times and places pulling apart along rift zones such as the mid-Atlantic and East Africa.

Igneous rocks solidify from hot molten lava-like material from within the Earth; the constituent minerals forming an interlocking mass of crystals.

Sedimentary rocks are formed of fragments and particles eroded from the surface of the Earth, by disintegration and weathering, followed by transporting and deposition (generally in water); they may be cemented together by minerals precipitated from solution.

Metamorphic rocks are formed by the alteration of other rocks, as the result of intense pressure and heat within the crust; new minerals and structures are formed.

Low-lying areas of continental crust are subjected to continuous slow up and down movements leading to marine inundation (and sedimentation in shallow seas) and uplift to form new land.

Meteoric impact craters have been recognised on Earth. They are sometimes associated with fragments of meteorites; however there is no meteoric material known from most of them, and then the formation of the crater by impact is made likely by its shape, shattered and broken rock at the bottom of the crater, and the presence in the crater of minerals formed only under extremely high pressures, such as coesite (a form of quartz). With some craters there is no very convincing evidence that they were caused by a fall of a meteorite.

A number of 'fossil' craters are known, e.g. on the Canadian Shield, which have been preserved by burial under sediments.

The oldest rocks known on Earth are about 3,700 million years old, dated by the radioactive element breakdown method.

Fossils are the remains and traces of once-living animals and plants, and show the evolution of various groups of organisms.

The use of geological information to date the suggested 'capture' of the Moon by the Earth has led to some highly speculative ideas. The major break (at most localities) in the geological succession at the Pre-Cambrian - - Cambrian boundary, nearly 600 million years ago, has been suggested as that date by some, while others place it about 3,000 + million years ago, based on growth patterns (? evidence of lunar influenced tides) in stromatolites (fossil plants).

The appearance of green (photosynthesising) plants on Earth in Pre-Cambrian times suggests that the Sun has been shining for a very long time.

The apparent correlation of the cyclic nature of annual growth-rings in trees with the Sun's sunspot cycle (including the virtual absence of both cycles in the second half of the seventeenth century) suggests a method of studying the Sun's activity in the geological past by means of fossil trees.

METEORITES.

Meteorites are extraterrestrial fragments (thay are different to Earth rocks) that have fallen on to the Earth's surface. They are of three main types-

(1) 'Irons'(Siderites) -metallic composition, often 90°/o iron, about 8°/o nickel, and traces of other elements. There are several types, e.g. the 'octahedrite' sub-division, containing the minerals kamacite and taenite.

(2) 'Stony-irons'(Siderolites) -silicate mineral(s) associated with iron. There are several types, e.g. the 'pallasite' subdivision, with nickel-iron alloy enclosing olivine.

(3) 'Stones'(Aerolites) -mainly silicate minerals. Most belong to the group called 'Chondrites' (usually containing spherical particles known as chondrules); they total about 85°/o of all meteorites, and are subdivided according to the minerals they contain.

Radioactive dating shows that most meteoric material is about 4,600 million years old.

Mineralogy of meteorites gives clues to the temperature and pressure at their formation, palaeomagnetic evidence gives data on primordial magnetic fields, measurement of abundance of certain elements may give clues to the temperature of the early Sun, and tracks left by energetic sub-atomic particles give indications of the post-formational history of the meteorite.

Meteorites are different to lunar rocks, and are not derived from the Moon. Spectral studies show that they compare well with Asteroids.

One of the groups of chondrites (the carbonaceous chondrites) contains carbon compounds, including amino acids; there is dispute as to whether this is terrestrial contaminant or indigenous, and if indigenous, whether it is of biological origin or not. Some stones, e.g. the Orgueil Carbonaceous Chondrite, contain 'organised elements', which some people have suggested may possibly be microfossils; again, there are similar disputes as with the amino acids.

Tektites are pieces of glass of disputed origin (terrestrial or extraterrestrial, or both), dated between 0.3 and 30 million years old. The 'moldavite' tektites in Czechoslovakia have been suggested as being correlated with the 14.8 million year old Ries crater in Germany, and some Far East tektites have been suggested as being correlated with Tycho crater on the Moon.

MOON.

The Moon is about $\frac{1}{4}$ the diameter of Earth. It has a density of about 3.3; there is no atmospere, no water and no life. Erosion has not destoyed the record of past events (showing the absence of atmospere and water in the past).

There are two main surface areas, the Uplands or 'Highlands', and the Maria or 'Seas'.

The 'Highlands' are the light-coloured areas of the Moon; they are rugged and contain craters in profusion.

The Maria are the dark areas, low-lying and relatively smooth; they are filled with deposits. There are two main types, the first nearly circular and surrounded by near circular mountain arcs (e.g. Mare Imbrium), the second having an irregular outline with no bordering mountain walls (e.g. Mare

ORWELL ASTRONOMICAL SOCIETY (IPSWICH)

programme for

NOVEMBER 1976.

At Orwell Park Observatory Nacton, Nr. Ipswich.

MONDAYS from 7.30p.m. General Observations Section.
Director Mr. N. Gage, [redacted], Felixstowe, 'Phone Felixstowe [redacted]
and Mr. S. Flory, [redacted], Ipswich, 'Phone [redacted]

1st November
8th "
15th "
22nd "
29th "

WEDNESDAYS from 7 pm. Solar, Lunar & Planetary Section.
Director Mr. R.M. Cheesman, [redacted], Ipswich.

3rd November
10th "
24th "
1st December.

THURSDAYS from 8p.m. Double Stars Section
Director Mr. D. Bearcroft, [redacted], Ipswich, 'Phone [redacted]

4th November
18th "

FRIDAYS from 7.30p.m. Nebula and Faint Objects Section.
Director Mr. R. Hazelwood, [redacted], Ipswich 'Phone [redacted]
and Mr. R. Gooding, [redacted], Ipswich.

5th November.

SATURDAYs. Visits to Observatory organised by Mr. R.M. Cheesman.

from 7.30p.m. 13th November, Whitton Womens Club.

from 7.30p.m. 20th " Chelmsford Astronomical Society

*** LECTURE: at the Friends Meeting House, Fonnereau Road, Ipswich.
***** Friday 19th November at 8p.m. admission FREE lecture entitled
'OBSERVING GALAXIES AND BINARY STARS using the Issaac Newton Telescope'
given by Dr. B. Morgan of Imperial College, London.

METEOR SECTION. Director Mr. D. Barnard [redacted], Ipswich
'Phone Ipswich [redacted].

SATURDAY 6th November, Meteor Watch to observe 'The Taurids' shower

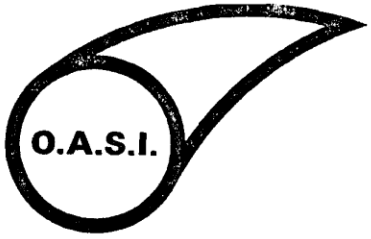
Meet outside Golf Hotel, Foxhall Road, Ipswich at 9p.m.

WEDNESDAY 17th November, meteor watch to observe the 'Leonid Shower'

Meet outside the Golf Hotel Foxhall Road, Ipswich at 7.30p.m.
This watch will be from 7.30p.m. to 10.30p.m.

These two meetings will take place irrespective of weather conditions.

SATURDAY 27th November. Lunar Section, Director R.M. Cheesman.
Special meeting to observe grazing occultation of star 3199.from Timworth Hall
Meet outside the Whitton Maypole at 5.15p.m.
(Please contact director if you require transport)



Orwell Astronomical Society (Ipswich)

presents

a lecture entitled

OBSERVATION OF GALAXIES AND BINARY STARS

(Using the Isaac Newton Telescope)

by

Dr. B. MORGAN

of Imperial College, London

at

The Friends Meeting House

Fonnereau Road, Ipswich

on

FRIDAY 19th. NOVEMBER 1976 at 8p.m.

REFRESHMENTS

ADMISSION FREE

Secretary: Mr. M. Stow,
13 Ladywood Road,
Ipswich