THE JOURNAL OF THE ORWELL ASTRONOMICAL SOCIETY (IPSWICH) AUGUST 1978

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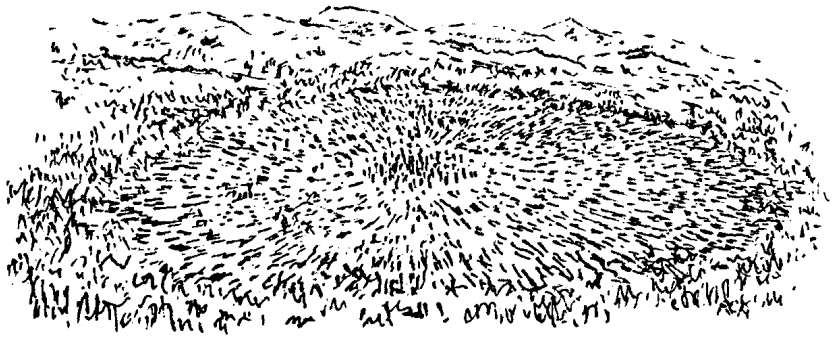
Your submissions of items for the Journal will be welcome.

OASI

THE TUNGUSKA EXPLOSION



Artist's impression

What caused it?

The story so far

At 7.17 a.m. on 30th June 1908, an explosion of catastrophic proportions rocked the desolate pine-forested area of Tunguska in Northern Siberia, 2 200 miles east of Moscow. The sound was heard over 500 miles away, and the impact was felt nearly 400 miles distant from the blast. All over Europe strange glows of various colours in the sky were reported. Eye-witnesses nearer the area spoke of a brilliant blue, log-shaped object hurtling through the sky and exploding with a blinding flash and a roar.

Despite the size and ferocity of the explosion, only a few dozen wandering herdsmen were killed, as the area is almost totally uninhabitable.

It was impossible to get an investigative team to the area because of the hostile climate and terrain, and the official Russian explanation of a falling meteorite was accepted in scientific circles. However, a professor of Leningrad Mineralogical Museum, Leonid Kulik, was determined to discover the site, and finally got an expedition there in 1927 at the fourth attempt, to view an amazing sight.

One thousand five hundred square miles of forest had been charred and flattened, the fallen trunks all pointing away from a central spot like spokes in a giant wheel. In the centre, there was no crater but a grove of trees still standing upright, stripped of all branches and burnt almost to a cinder.

The team dug for fragments to support the meteorite theory, but found nothing. They did discover that newly sprouted trees were growing four times faster than normal, and they found out from local herdsmen that reindeer herds had been covered in sores and scabs after the explosion. Although Professor Kulik was not to know it, the facts pointed to a nuclear explosion having occurred about five miles above the Earth's surface, some 1 500 times more powerful than Hiroshima, long before the atom bomb was invented - here on Earth, presumably, at any rate.

After the results of the Hiroshima and Nagasaki bombs became known, the Russians launched a full-scale scientific investigation to prove once and for all that the explosion was caused by a meteorite or even a comet. Instead, all the evidence they uncovered corroborated the nuclear explosion rumours, and they r[illegible]tantly rejected the meteorite theory. Radioactivity in the area was double the normal count, and genetic mutation had caused plant growth to increase twelve-fold. In addition they found mosses in the region's swamps containing substances unknown anywhere else on Earth.

Alternative theories were now being put forward by world scientists. Two American professors suggested that a black hole could have entered the Earth's atmosphere, producing a shock wave of atomic bomb proportions, and passed straight through the Earth without leaving a trace. But the theory did not tie-in with the eye-witness accounts of the blue log-shaped object.

Russian scientist Dr. Alexander Kazantev then proposed an explanation into which all the evidence slotted neatly. He suggested that a spaceship from another planet had exploded while trying to make an emergency landing. Several young Russian scientists took up the theory and re-examined all the evidence from an 'alien spacecraft' angle.

Firstly, the area would be an obvious landing site, being almost totally uninhabited for miles around.

New calculations revealed the speed of the object to be 18 miles per second, about right for a space vehicle slowing down to land. The multi-coloured smoke described by some observers is consistent with vapour given off from disintegrating heat shields on space capsules.

Soil brought back in 1927 was properly examined and found to contain microscopic blobs of fused metal and glass with traces of cobalt, copper and germanium - elements not found in normal meteorites.

So the mystery remains. Meanwhile, the Russians are at present engaged in another exhaustive re-investigation, the findings of which are due to be published sometime this year.

P. Burt

(Paul would be interested to hear of any other theories that readers know of.)

GAMMA RAY ASTRONOMY (as described on Patrick Moore's 'The Sky at Night' recently)

Gamma rays are highly penetrative, very short wavelength rays beyond the UV and X-rays in the electromagnetic spectrum. They have been studied for only the past 20 years, and in that time only about a million have been detected. It's estimated that gamma ray photons hit the Earth's atmosphere at the rate of one every ten days per square metre. (As opposed to light photons from a first magnitude star reaching Earth at the rate of a million per second.)

Gamma ray photons are usually collected by balloons 25 miles above the Earth, carrying a gamma ray telescope, which is basically a spark chamber consisting of a series of metal plates, which split the photon into an electron and positron. The gamma rays have to be separated from the 'background noise' of cosmic rays.

Various strong gamma ray sources detected so far include the Milky Way (possibly originating from neutron stars); the Vela pulsar, which is the faintest optical pulsar, but the strongest gamma ray pulsar; and the Crab Nebula, which emits over the whole electromagnetic spectral range. About 40 gamma ray bursts have been detected by satellites monitoring the Earth's atmosphere, but the origins of these bursts are at present unclear. Present theories include comets hitting neutron stars, emission from supernovae, and giant flares on other stars beside the Sun.

Gamma ray astronomy will be exploring several avenues in the future. The Milky Way emission requires much investigation, and gamma rays will help to determine the make-up of dust in nebulae. Another theory also to be studied is the evaporation of black holes due to gamma ray emission.

P. [illegible]

THE NIGHT SKY AS S[illegible] FROM ORWELL PARK THIS MONTH

At this time of year, the Milky Way presents a splendid sight as it sweeps across the sky on a cool, moonless night. Sagittarius, containing the brightest parts of the Milky Way, is on the southern horizon. Cygnus is directly overhead, with the Square of Pegasus and Andromeda to the east. The Andromeda Galaxy can be seen as a hazy blur next to nu Andromedae, which is found by following a line through beta and mu.

Aquarius is a faint constellation in the south-east, next to Pegasus, and Arcturus in Bootes can still be seen in the western sky.

THE SUN

Sunrise is at 04h20m at the beginning of the month, changing to 05h10m at month-end. Sunset changes from 20h00m to 18h50m. The Sun moves from Cancer to Leo during the month.

THE MOON - Phases (August)

New Moon	4d01h01m	Full Moon	18d10h14m
First Quarter	11d20h06m	Last Quarter	25d12h18m

Occultations

Star	Phase	Mag.	Time
677	R	4.8	25d23h59.4m
685	R	6.5	26d01h32.6m
*692	D	1.1	26d01h57.7m
*692	R	1.1	26d02h43.1m
806	R	5.1	27d01h42.1m
820	R	6.0	27d03h30.9m

D = Disappearance
R = Reappearance
Stars listed according to Zodiacal Catalog (ZC) numbers.
*denotes double star.

THE PLANETS

Mercury is in inferior conjunction on the 18th, so will not be well seen this month.
Venus reaches greatest elongation on the 29th at mag. -4.0, but will be setting no more than an hour and a half after the Sun.
Mars is in the evening twilight, setting about an hour after the Sun at mag. 1.7. It will be 1 to 2° N of Venus on the 14th.
Jupiter is a morning star at mag. -1.4, rising 3 hours before the Sun by the end of the month, in Gemini.
Saturn is in conjunction on the 27th, and will not be well seen this month. 5° N of Mercury on the 4th.

Source: BAA Handbook 1978. Please note all times are UT (= BST - 1h).

METEOR NOTES for August 1978 by D. Barnard

So far this year there have been low attendances for meteor watches. But this month, we all hope to see some Perseids.

First of all, a quick run-down on the shower activity this month. There are three major showers:

1 The iota Aquarids. Maximum occurring on August 6th, although active from July 15th to August 25th. ZHR = 6 (at max.) Radiants, RA 22h32m, Dec -15°; RA 22h04m, Dec -6°. The shower is favourable this year, meaning that moonlight doesn't interfere. Iota Aquarid meteors have a velocity of 33.8 km/sec.

2 The Perseids. The chief shower of the year. Maximum on August 12th at 1000hrs (G.M.T.), active from July 25th to August 18th. ZHR at maximum of 68 (over 1 a minute!) Radiant RA 03h04m, Dec +58°. Comments from other sources include, 'Many bright, flaring meteors' and 'fine trains'. They are very fast and fragmenting - velocity, 59.4 km/sec!

There is a Meteor Watch scheduled to observe this shower on Saturday, Augus[illegible]t 10 pm, meeting outside the Golf Hotel, Foxhall Road, Ipswich, irrespective of weather conditions.

3 The Kappa Cygnids (not as stated in the BAA Handbook, 1978, the 'Chi Cygnids'). Maximum on August 20th to 21st. ZHR of 4 (at max.) Shower active between August 19th and 22nd. Radiant RA 19h20m, Dec +55°. Flaring fireballs occur, though unfavourably this year because of moonlight. Meteors are bright and exploding in nature.

Minor showers in August There are two, both having maximum on August 14th.

1 The Zeta Draconids Normal limits August 14th to 16th.
2 The Theta Cygnids Normal limits August 14th to 17th.

Both of these showers are very weak, giving a ZHR at maximum of only one meteor every one or two hours.

There are no daylight streams this month.

From now on, I'm commencing a sort of 'guide to observing meteors' to consist of about 40 parts. Part 1, following hereon, is called,

AMATEUR WORK ON OBSERVING METEORS

Meteors offer a very fruitful field for amateurs, but a loosely- or undocumented work is unlikely to yield results of any real value. The observation of meteors is still to a large extent in the hands of amateurs, despite the work of radar observers (e.g. Jodrell Bank) and Whipple's application of the super-schmidt to meteor observation. Also, the study of meteors requires no costly or complex equipment.

The observing programme operated by the BAA Meteor Section falls into two parts:

1 Visual

a Routine observations by a single observer - determination of group radiants from individual meteor paths.
b Routine observations within an observing group - real paths and absolute radiants.
c Programme for meteor storms.
d Routine meteor counts.

2 Photographic

Individual photographs, two-station photographs and spectrograms.

Also, there is the wide field of telescopic meteors which is open to amateurs, although requiring a lot of patience. Radar, though extremely fruitful, is too expensive for amateurs, so this is ruled out.

For the visual observation of meteors, the qualities most prized in the amateur observer are accuracy, pertinacity and good knowledge of the sky. All of these three will produce a body of observational data which is accurate and extensive enough to merit statistical discussion.

A knowledge of all stars down to the 4th or 5th magnitude is essential. The experienced observer will go down to 6th magnitude, and will develop his/her own technique for describing stars down to the naked-eye limit without recourse to maps.

Part 2 will follow in the September 1978 issue (postal services permitting, says Barney).

METEOR COUNTS will be twice this month - another is to be arranged for the Kappa Cygnids on August 20th. Remember - meet at the Golf Hotel, 10 pm, outside if clear or cloudy, inside if raining.

PITMAN HOME STUDY ASTRONOMY COURSE written by Patrick Moore

Roy Cheesman has obtained a leaflet on this course and discovered the price, which appears to include textbooks and maps and extra tuition help to GCE O Level, to be £30.

FROM OTHER JOURNALS - Skylab

The Skylab space station, which has been prematurely falling-in toward the Earth, was successfully redirected back into orbit a couple of months ago.

Its premature fall has been blamed by some American scientific circles, on NASA's unwillingness to acknowledge warnings in 1976 that sunspot activity would be greater than predicted, causing Skylab to fall more quickly. (Sky and Telescope)

Jodrell Bank MTRLI Project

The Science Research Council has given a grant of £3.1m to Jodrell Bank for the construction of two new 25-metre radio dishes, to complete a facility called the Multi-Telescope Radio-Linked Interferometer. The MTRLI will consist of a total of seven radio dishes, all linked to a central computer, to be used in various combinations to create a radio 'zoom lens' for looking at distant objects (in particular, quasars) with various magnifications. (New Scientist)

THE VOYAGER PROJECT Part 6 - The Spacecraft (ii)

The spacecraft can transmit to Earth on two frequencies. During the long cruises between the planets, the lower frequency, known as S-band, is used to send data to Earth at a relatively slow rate. This is adequate for interplanetary science information, which can be received on the 26-metre antennae, releasing the larger antennae of the Deep Space Network for other uses. For the encounters with planets when a very large amount of data has to be transmitted, a higher frequency is used - X-band. The X-band transmitter power outputs are 21 or 12 watts, whereas those of the S-band are 28, 20 or 10 watts. Both transmitters have a double on board just in case the primary one fails.

The new Voyagers, like the earlier Mariners, are built around the electronics, this package being surrounded by the antennae, with a small propellant tank in the centre of the electronics compartments. Unlike earlier spacecraft, the Voyagers do not use one big engine for propulsion. Instead they use hydrazine fuel (which doesn't have to be ignited) to control their attitude, through 16 small thrusters situated all around the space vehicle. Messages are sent to the thrusters by two guidance systems. The first is the familiar Canopus Star Tracker method, which uses a 'fix' on the Sun and the bright star Canopus for its positioning. The second is a complicated system of internal gyroscopes, called an Internal Reference Unit. For some of the larger manouvres in space, the little thrusters must be 'switched on' for as much as an hour.

To add to the final velocity required at launch to escape Earth and to attain a trajectory to Jupiter, each Voyager has a solid rocket system weighing 1 210 kg, giving a thrust of 71 000 newtons. The rocket system is, however, dropped from the spacecraft after it has been fired.

The main body of the spacecraft, termed the Mission Module, weighs 810 kg, of which the scientific instruments make up only 105 kg. As with the transmitters, much of the electronics aboard the spacecraft is duplicated in case of damage by interplanetary high energy particles, and causes due solely to the long duration of the spaceflight. The spacecraft has, of course, been designed so that the instruments will be affected as little as possible by the magnetic field that they themselves create.

S.G. Harvey.

NOW, BACK TO EARTH WITH A JOLT!

With all those millions (billions?!) of dollars and other currencies going into the space program, in the widest sense, Barney and others, who have a relatively very limited amount of currency for necessary decorating and similar work at the Orwell Park

Observatory, have to rely on the help of volunteers to physically assist them. As our use of the telescope depends on such spadework being done, by no means as tedious and comprehensive as some of the sterilizing (and more?!) of spaceprobes, to achieve the pleasurable situation of comfortably looking through the ten-inch, which also needs usually to be far less exacting than directing spacecraft, yet we can see a lot further, PLEASE can we 'twist some of your counterweights' in this direction on Tuesday nights?

JOURNAL PHOTOCOPYING from the Producer's table.

Many favourable comments have reached me concerning the change of Journal format, and (so far - binoculars crossed) no adverse ones. May I hereby thank those people who have kindly said they liked the Journal recently (including 'Patrick the Great') and simply explain that the Journal is now typed directly in microtype with a typewriter with small characters, for straight photocopying. After the first test issue, it was decided to keep the new fashion in the hope that facilities of appropriate reproductive quality (such as those incorporating the use of a new Canon NP-77 photocopier) that had been virtually guaranteed us by a local office equipment firm, would continue at something approaching realistic commercial cost.

Unfortunately, after waiting several days with the completed master sheets for a replacement machine to arrive at this firm, we felt we could wait no longer and had to 'fall back' on an original source but with a slight difference of resource (that is, a photocopier instead of a duplicator). This will not be possible with this issue, as holidays are concurrent, unless, indeed, we fail to find a reasonable commercial photocopying source for this issue, meaning that it may be also in such instance, rather late.

So, may I ask members if they know of, or can obtain access to, a good photocopying source, preferably at reduced price but not with the expectation so far as to get the paper the Journal might be printed on, free or much reduced, also. Such a facility should preferably be fairly reliable and work completable within a week or so of receipt of masters.

To give a guideline on costs per issue production of present content, we actually had to pay about £10 for the June issue of just under 120 copies. This may seem a lot, but it is, we calculated, just as expensive to ink-duplicate, and though the style may to some be a less important point, we felt the smaller format per content is more professional. What is more, an A4 size copy, of which a total of nearly 500 are required per issue, in the June issue quality, when obtainable, costs at least 7p per copy, commercially, meaning really that we got the June journal at 1/3 normal prices. How we did that was by putting 2 A4s together and calling it an A3 copy, and getting these A3 copies for 5p a time (slightly less with odd extras).

Naturally, we don't really want to pay £10 an issue for our Journal from Society funds if we can help it. We only got the £10 June issue at that price, and understood further issues would come the same way, because the particular firm had the practice of allowing their machines to be used rather than idle while awaiting the fundamental part of their business, office machine sales. Come July issue print time - no machines left, so we feel we should not rely on that source.

The added difficulty is that the copying facility should be able to print on two sides of plain paper. Not every machine will do this, and machines which do cost in the region of £1 500 to £2 300, new. 'Chalky paper' copiers quite frankly are at best, much inferior in repro. quality to the type such as printed our June Journal, and at worst, simply a hopeless nuisance - this from my sincere experience.

After all the foregoing, in summary, I'd like to say we do need a reserve facility if need be to take over from what may expectedly be the usual one from now on. We can [illegible] this way, but we can't ever rely [illegible]

MORE HISTORY OF ORWELL PARK

by Charles Radley

In the July issue of this Journal, I published details of some newly found facts about the history of Orwell Park Observatory, naming its first astronomer, John Isaac Plummer.

Well, I have just heard from Durham University where Plummer worked as a young man. Apparently, Plummer was born in about 1845. He joined Durham University in November 1867, and left for Orwell Park in February 1874. As a leaving present, Durham gave him an Honorary M.A. degree.

Plummer died at Oxshott, Surrey, on 6th February 1925, aged 80. The readings he took as observer at Durham are on record, with a printed Quarterly Journal he issued, commenting on his results. J.T. Fowler's 'History of Durham University' (1904) stated that Plummer was "late" of Hong Kong. Other publications mentioning Plummer include C.E. Whiting's 'The University of Durham' (1932). There is an article by F. Sargent on 'The University Observatory' in the Durham University Journal for 1923. It should be possible to obtain copies of these books through any library.

My thanks to Miss M.S. McCollum, Assistant Keeper at the Department of Palaeography and Diplamatic of Durham University for providing me with the above information.

and more heavy stuff from Wayne Brieske -

THE NEUTRON STAR

A neutron star is a star of about the same mass as the Sun but its diameter would be approximately only 15 km, comparable to the size of Ipswich and environs.

Such mass in small volume means extremely large density - on average 100 million, million times as dense as water, or a thousand million tons per cubic inch. A pinhead made of such dense material would weigh more than the QE2.

The neutron star probably has a solid crust, liquid interior and solid core. The crust is expectedly crystalline - mainly iron, but this would not be atomic iron since there are no electrons present. Within the mantle is a superfluid core - a fluid mostly made up of neutrons. This fluid has zero viscosity (no resistance to flow) and is presumed to be perfectly superconducting (there is no electrical resistance).

Inside the core, physicists don't yet know enough about to tell what it is made of. The gravitational pull around the neutron star is so great that objects on its surface would weigh ten thousand million times what they do on Earth. As well as an ultra-strong gravitational field, there is an immensely strong magnetic field which is believed to be about a million, million gauss.

ORWELL 10-INCH TELESCOPE DRIVE (Part II)

by Roy Adams

Priority information on this was included in the June issue of the O.A.S.I. Journal and it was intended to say more about the choice of drive and pros and cons in the July issue but insufficient space was left after other contributions.

The original drivegear for the Observatory telescope is a quite magnificent piece of apparatus, but the best choice for a telescope drive in the 1870s is not necessarily the best choice in 1978, for a telescope of this stature, even had the clock gear and transmission not been subject to vandalism and neglect. When I enquired of some other members about the then existing drive's accuracy, a general consensus was that overall, it was currently capable (if brought into action) of working to no closer than +/- 10%.

It seemed to me as I became more interested in using the telescope (or, more correctly, found it easier to find time to use it) that a decent drive was necessary for a better use [illegible] specifically, and that even if the [illegible] centrifugal rising ball and friction-pad governed falling weight drive could be 'tuned-up' painstakingly, its accuracy might not be got closer than about [illegible]% in the long term (here meaning a few hours) and 10% in the short term (over a few seconds' time) because of the age of the unit and particularly hard-to-calculate variables in the bearings of the main part of the telescope mounting which I understood to present a problem. With variations in resistance to movement in the polar axis, a drive with reliance on a weight of non-adjustable mass (while in use, anyway) and with recourse necessary to try to adjust after or as errors become noticeable, the angle of the governor balls allowable by changing the friction pad position could hardly be more accurate than the figures quoted. The complexity of strain gauge systemsin sensing changes in drive load and translating these into friction pad vertical movement, converting the then existing 'clockwork' ball governor system into a servo system would probably be too much to justify it even if it were sanctioned, and even if someone by some experiment on the particular governor mechanism could find indications of somewhat better short-term accuracy. If such tactics were to be employed, it would be better to introduce them in a fully electric system rather than to convert or add to the old, which would expectedly possess more inertia and therefore be still rather more sluggish to control, to say the least, than the new.

It had to be remembered that this is a large telescope, not a smaller or less massive one which is also newer and probably endowed with sealed ball bearings or roller bearings, for which a ball governor drive might well be suitable. Some instruments are driven by such mechanisms, giving suitable output against small changes in equipment weight and necessary contact of the observer's face at higher powers with shorter focal length eyepieces. The frequent rewinding of the drive weight or spring can be irksome, however, as can the limitations of hydraulic cylinder drives, and so, apart from the use of a pendulum or similar clock, weight or spring driven, to be a reference/control for a more powerful drive, this class of drives was eliminated in favour of something more fully electric.

To be continued.

PROGRAMME FOR AUGUST 1978 At ORWELL PARK OBSERVATORY, NACTON, IPSWICH

TUESDAYS from 7 pm: Planetary Section August 8th and 22nd
Directors Mr. J. Deans, [illegible], Capel St. Mary 'Phone Gt. Wenham [illegible]
and Mr. J. Hood, [illegible], Ipswich

Tuesdays from 7 pm: Solar, Lunar and Planetary Section August 1st and 15th and 29th
Directors Mr. J. Hood, [illegible], Ipswich 'WORK PARTY' HELPERS
and Mr. M. Barritt, [illegible], Ipswich MUCH APPRECIATED

THURSDAYS from 8 pm: Double Stars Section August 3rd and 17th and 31st
Director Mr. D. Bearcroft, [illegible], Ipswich 'Phone Ipswich [illegible]

FRIDAYS Variable Stars Section Officially closed until 1st September, but some redecoration or similar work may be found in progress on Friday evenings.
Directors Mr. R.S. Manning, [illegible], Ipswich 'Phone Ipswich [illegible]
and Mr. M. Siggers, [illegible], Ipswich.

SATURDAYS Starting officially at the beginning of September, Mike Barriskill and Roy Adams will be conducting general observation sessions fortnightly (or perhaps with greater frequency) and if the example of Saturday, July 22nd, with members of a caravan club runs true to form, well into Sunday morning - even with UT! The sky cleared well between 2300 and 0130 (Sunday, G.M.T.) compared with what it had been, and much was seen.

John Ranson will also be taking on a regular evening shortly.

PLEASE NOTE that the August 5th Committee meeting is not at the Observatory but that someone should be up there.

FOXHALL HEATH Meteor Section August 12th ALSO August 20th (see METEOR NOTES)
Director Mr. D. Barnard, [illegible], Ipswich 'Phone Ipswich [illegible]

THE GRAND DRAW WILL BE DRAWN on AUGUST 26th at the Observatory when the Suffolk Caravan Club come, (8pm). On 19th another club comes so please if possible, attend on these dates.