Advertisements

Do you have anything for sale, or do you want anything (preferably, but not necessarily astronomical)? Advertise here - no charge.

Observatory Day jobs

The following is a list of some of the jobs which could be attempted on Observatory Day (Saturday, 22 July). Can you help with any of them?

Inside main building
- Clean
- Paint
- File papers
- Re-shelve books and magazines

Outside
- Replace door facing with plywood
- Fit door handle and lock
- Paint
- Cut grass and weeds
- Trim hedges and remove branches
- Repair surface of car park
- Replace gutter
- Replace car park light

C14 building
- Fix roof track
- Screw down trapdoor
- Check for possible leak in roof
- Paint part of outer walls

Toilet
- Fit new door latch
- Clean
- Fix plumbing

Shed
- Reorganise

Equipment
- Install solar telescope
- Fix fast and slow motion drives on C14
- Build large celestial sphere framework

Astronomy Section Officers

Section Secretary:	Geoff Falla	724101
Honorary Treasurer:	Peter Langford	720649
Light Pollution Officer:	Ken Staples	54759

The next newsletter will be published early in September. The deadline for publication materials is 15th August.

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Sagittarius

The Newsletter of the Astronomy Section of La Société Guernesiaise

July/August 1995

Forthcoming events

Observatory Day
Saturday, 22nd July
From 9.00 am
at the Observatory

Sundials
by Richard Mallet
Tuesday, 25th July
8.00 pm at the Observatory

Barbecue (7.30 pm) and Perseid Meteor Shower Count (10.00 pm)
Friday, 11th August
at the Observatory
(Rain date 12th August)

In this issue

The Anthropic Principle

Photographs of the Moon

Liberation Day

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Centre insert

July/August star chart

Observatory Day

Saturday, the 22nd July is Observatory Day. This is the day when the Observatory comes first. Starting at 9.00 am, members will have the opportunity to pick out one or two tasks from a long list, and contribute to the appearance and effectiveness of the Observatory.

The list of jobs appears on the back page. You may come at any time during the day, and stay as long as you like. Some basic tools, brushes, paint, etc will be provided, but additional materials will be welcome.

We need as many hands as possible to maintain and make improvements to the Observatory, and your help is therefore needed. No special skills are necessary. This is your chance to shine!

Sundials

On Tuesday, the 25th July, at 8.00 pm at the Observatory, Richard Mallet will talk about sundials. Please note the changed date for this talk.

Richard has long been a member of the British Sundial Society, and is an avid sundial hunter, having gone on some of the Society's organised trips. He will describe the various types of sundials, something about their design, and will give examples. Sundials can be thought of as an astronomical instrument – indeed one of the earliest astronomical instruments, having been used in ancient Greece and Egypt.

Incidentally, Richard is also a solar eclipse chaser, and has journeyed to the ends of the Earth in pursuit of them. Although a Guernseyman, Richard lives in England, as is therefore a visiting speaker.

Barbecue and Perseid meteor shower count

The annual barbecue will be held at the Observatory on Friday, the 11th August, starting at 7.30 pm. Families and friends are most welcome. As usual, the fire will be provided, and members are asked to bring meat to cook themselves, and something to drink. Any side dishes, etc, are generally shared. Please bring utensils.

The **Perseid meteor shower count** will start after the barbecue, when it gets dark, at about **10.00 pm.** All members and friends are invited to join in for an hour or so. This is not just fun, but it is also a contribution to science, as our observations are submitted to the central national register of meteor records. Even if you cannot come to the barbecue, you are welcome to join the meteor count.

Normally, 50 or 60 meteors an hour can be expected at the peak period of the Perseids. This year, however, the Moon will be bright, so our observations are likely to be limited to the brightest "shooting stars". Nevertheless, given good weather, it should be a pleasant occasion, involving no more effort than relaxing in a garden chair and keeping an eye on the night sky. (If you can bring a garden chair please do.)

The "rain date" for these events is the following day, Saturday, the 12th August. Should it be doubtful, please telephone Geoff Falla (724101) after 6.00 pm, or the Observatory (64252) after 7.00 pm. Sometimes, when it has been cloudy but not raining, we have gone ahead with the barbecue but postponed the meteor count. Since both these nights are at the weekend, anyone who wishes to stay later than, say midnight is welcome to do so. (There are more meteors in the early morning hours.)

A Great Event - some reminiscences of Liberation Day

by Peter Langford

Everyone will have their own memories of Liberation Day; here are some of mine.

It was a bright, sunny morning as my wife and I drove up to the Observatory. We met up with Geoff Falla there at around 9.00 am, and loaded up the 11-inch telescope and other items for the astronomy stand into our cars. We took them down to St Peter Port and a sympathetic policeman let us drive into town despite not having a proper permit. Around the Albert Pier there was a great hubbub of activity, with everyone setting up their stands. The Rotary Club were in position, just below our spot on top of the Pier, with huge nets of balloons and signs right where we had planned to display our own "ASTRONOMY" sign (excellently painted by Lawrence Guilbert). Roger Chandler and Rex Huddle were on hand. We all set to and, with a bit of improvisation, everything was more or less in place by about 10.30.

Straight away there was a flurry of activity as parents and children stopped by. The fibre optic torches sold particularly well, but the sales of balloons (for which we had hired a large helium cylinder) were disappointing. There was plenty of interest from people wanting to look through the telescope. The QE2, anchored off St Martin's Point, gave us a good object to look at in the absence of anything in the sky.

Brian Le Page, who lives in Havelet, had kindly volunteered his 14-inch Meade telescope for the day, and he came down and set it up. With its extra long dew cap fitted it looked suitably impressive. When looking through it at the QE2 most people's first comment was "Oh, it's upside down", and we had to explain that astronomers were not usually bothered by that. Ken Staples suggested they stand on their heads for a better view. Fortunately, David Le Conte acquired an image inverter for the 11-inch telescope to show we could look at things the right way up if we wanted. That telescope was trained on the White House Hotel in Herm, and gave a nice view of the conservatory and the flag flying on the front lawn.

Trade was brisk during the morning. Christopher Le Conte and two of his friends manned the stand for a time and used some aggressive sales tactics to shift some of the balloons. There was some good demand for the *Channel Islands from Space* posters, and steady interest in the two quizzes: *Where did Apollo 11 Land?* (stick in a pin), and *How Many Miles to Mars?* While other volunteers manned the tables I spent a lot of the day demonstrating the telescopes, and it was a great pleasure to see people's reactions, particularly the children's, on seeing the images.

There was a good crowd in town after lunchtime and we got a view of the back of Prince Charles's head, upside down through the telescope, when he unveiled the monument. Later there was the air display and then things quietened down for us as attention focused on the cavalcade. For a while after that the Albert Pier went pretty dead. Most of the other attractions around us had closed down. The sky clouded over and the weather turned »»

chilly. Heather Froome brought a welcome cup of coffee. The moon had risen by this time and one lucky passer-by got a sight of it through the telescope, but soon it was obscured. The cloud was thickening and the weather did not look promising for the evening. It seemed like a good time to take a break and I left the stand in the capable hands of the other volunteers.

I returned as it was getting dark and the torchlight procession was making its way through town. At the astronomy stand the scene was transformed. The sky had cleared, apart from some fast moving high cloud, and the Moon was visible. A long queue of people stood waiting to see through the telescopes, and the sales were doing a roaring trade. Most people wanted to look at the Moon through the more impressive-looking Meade, but for those who didn't mind sitting on the floor to get to the eyepiece the 11-inch was equally as good, although we kept losing the image quite quickly as there was no power for the drive. Again, it was a real pleasure to hear people's reactions. For most of them it was the first time they had seen the Moon's craters through a powerful telescope.

We had a short interlude at around 10 o'clock for the fireworks. The air was very still by now, so we had ideal conditions and were in just the right place opposite Castle Cornet for the spectacular display. After the fireworks had finished there was still a queue of people for another hour wanting to see through the telescopes, even while the rest of the stand was being cleared away. Eventually everyone was satisfied, and Geoff and I dismantled our telescope and Brian Le Page dismantled his. We were able to store most of the items from our stand in the storage room under the Albert Pier that David Le Conte had discovered. However, we did not want to leave the telescope there, so Geoff and I had a trip back to the Observatory. It was well after midnight by the time I got home. It had been a long day but a memorable one and, who knows, maybe we ignited someone's interest in astronomy. ¤

Peter Langford

Total sales at the Astronomy Section's Liberation Day Event were £381, and the profit to Section funds was £204.

Our thanks go to the following who helped with the Event (I hope no one has been left out!):-

Roger Chandler
Jeremy Ellis
Geoff Falla
Heather Froome
Rex Huddle
Peter Langford
Christopher Le Conte
David Le Conte
Brian Le Page
Debbie Quertier
Ken Staples
Siân Wilén

DLC

"My favourite part of the Liberation Celebrations was the opening of the monument. Because I have never seen Prince Charles in my life. We went to see it yesterday it was high and it was pointed."

- Pupil at St Sampson's Infants School

(However, believe it or not, most of the pupils enjoyed the fireworks best!)

Famous Lives - 9 Percival Lowell (1855 - 1916)

In my last Famous Life, that of William Herschel, I highlighted the fact that he belonged to a most remarkable family. Imagine my surprise and delight to discover that the subject of this article, Percival Lowell, came from an equally remarkable family, who between them contributed much to American life.

The Lowells were a well-known Massachusetts family, whose family seat was to be found in Boston. From within their number the Lowells produced writers, poets, politicians, diplomats, academics and industrialists. The 20th century poet Robert Lowell is also a Boston Lowell.

Percival Lowell was born on 13 March 1855 at the family home in Boston. As with previous members of his family, he attended Harvard University. One of his relations, Abbott Lawrence Lowell was to become President of the University, from 1907 to 1933.

The young Lowell did not devote his early life to astronomy or mathematics, as from 1883 to 1893 he dedicated his life to travel, writing and literature. He travelled extensively in the Far East, and published several works based on his experiences: *The Soul of the Far East* (1888), *Noto* (1891), and *Occult Japan* (1895). The success of these books helped to augment his already considerable family wealth.

During his travels he also held the position of Counsellor and Foreign Secretary to the Korean Special Mission to the United States.

However, by the mid-1890s Lowell had tired of his travels, and, inspired by the ideas and works of the Italian astronomer, Giovanni Virginio Schiaparelli, he decided to concentrate his energies and use his wealth in the pursuit of astronomy.

Schiaparelli's theory was quite fascinating, namely that intelligent life on Mars had been responsible for the construction of a vast canal system. It was this idea that was to capture and consume Lowell for the remainder of his days. In writing this I do not forget his work in connection with the discovery of the planet Pluto - more of that later.

Lowell now set about finding a suitable site for his own private observatory. After considerable searching he opted for the clear skies of Arizona, and so built his famous observatory at Flagstaff. It bears his name to this day. He paid for the building, development and staffing of the centre out of his own fortune.

He was possessed by the work of Schiaparelli, who had published the first ever detailed map of the Martian surface in 1877. Lowell was convinced from his own observations and subsequent drawings that the features visible on the planet's surface were not naturally occurring, but constructed by intelligent beings. In all he identified 500 canal systems. His fellow astronomers, however, were never able to concur with these observations.

Whatever Lowell saw, or thought he saw, he did not see with the trained eyes of the professional scientist. Instead he viewed with the eyes of the artist. Such eyes are able to abstract and view reality from afar, as only an artist can. It is important, I believe, to remember his family heritage, one of poets and writers. And do not »»

forget his own literary skills, and the magical hold the Red Planet has had upon humanity throughout the ages.

Lowell will also be remembered, not only for the Martian canals, but also for the background work he undertook which eventually resulted in the discovery of the planet Pluto. He was an accomplished mathematician, and one mathematical problem that had fascinated him was the erratic orbit of the planet Uranus. He, along with others, was convinced that an undiscovered planet lay beyond the orbit of the planet Neptune.

In 1905 Lowell began a systematic search for the undiscovered planet named Planet X, and it was to be the main feature of his remaining life. In 1915 he published his famous work *Memoir on a Trans-Neptunian Planet*. He was convinced of the presence of Planet X, but sadly, after ten years searching, he and his staff had not found anything. Their ten years had not been without some success, as their experiences led them to realise that a fast, wide-field telescope was needed to complete the search properly.

The newly designed and built wide-field telescope was installed in 1929, 13 years after Lowell's death on 12 November 1916 at the age of 61. It will not surprise you to learn that he died at Flagstaff.

Lowell's work was continued by his leading assistant Clyde Tombaugh, and eventually, using the new telescope, Tombaugh made the discovery which vindicated 25 years of research and faith in Lowell's work.

The announcement of the discovery was delayed until 13 March 1930, the 75th anniversary of Lowell's birth, and 14 years after his death. The delay allowed other astronomers to check their findings, and it also gave them time to decide upon a name for Planet X. The actual discovery had been made during January 1930, and confirmed in February. It was decided to name Planet X *Pluto*, and, as you will know, the planetary symbol for Pluto is ♇, the initials of the man who more than anyone else believed in its existence, Percival Lowell.

You may well feel that Lowell does not rank as one of the great astronomers of his or any age, and that his work does not compare with the other great astronomers in my series. Well, I believe he was a romantic – he possessed qualities and gifts, probably inherited from and nurtured by his extraordinary family, that allow some people to view the present and the future in a way not afforded to the rest of us. (That he was an accomplished scientist as well should not be forgotten.)

There is a place within human society and science for such people – thank God we have them for they enrich our lives and open our eyes to the wonders of the universe in all its glories, which surely is the hope and joy of all scientists, great and small – professional and amateur. ¤

David Williams

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Editor's note: I used a quotation from the 19th century poet James Russell Lowell (who was, I assume of the same family) as a frontispiece to my report on the Liberation Monument:-

Till now you dreamed not what could be done
With a bit of rock and a ray of sun.

Footnote

James Russell Lowell, poet, literary critic and diplomat, lived from 22 February 1819 to 12 August 1891. He served as US Ambassador to Great Britain from 1880 to 1885, and while living in England served a term as President of the Wordsworth Society in succession to Matthew Arnold.

DW

The Anthropic Universe

At the meeting held on Tuesday, the 13th June Peter Langford described the Anthropic Universe. He started by saying that "anthropic" means "human", and that this is a branch of cosmology dealing with the connection between man and the universe at large. This leads to contrasts with the prevalent view of man's home, the Earth as a minor planet orbiting around an average star, in an ordinary galaxy.

Peter explained that the "weak anthropic principle" states that our existence affects the universe which we observe, while the "strong anthropic principle" states that the universe exists so that we can exist.

He pointed out that as there are astronomers the universe must be BIG. He explained this statement by describing the recipe for making an astronomer: a Big Bang, leading to hydrogen clouds, then the formation of stars, the production of carbon and other elements, supernovae, the dispersion of elements, a second generation of stars and planets, and, in due course, the astronomer.

The "cooking time" for this recipe is long – 15 billion years! This great age means that the universe must be big, its size being directly related to the travel time of light.

Peter then pointed out that the universe must have three dimensions. With less than three dimensions complex connections cannot be achieved, while stable orbits are not possible with more than three dimensions.

The universe must also have structure, because there astronomers. Peter showed diagrammatically that, on logarithmic scales, humans fall about half way between the smallest objects known (protons) and the largest (galaxy clusters).

Quantum theory and relativity are the ground rules by which the four universal forces (strong and weak nuclear forces, electromagnetism and gravity), operate. The properties of all atomic and molecular systems are controlled by only two parameters: the fine structure constant (α = 1/137) and the mass ratio of the electron to the proton (β = 1/1836).

Electromagnetism is 10^{37} times stronger than gravity, and Peter demonstrated that this was just the right level for us to exist. Holding up an apple by its stalk he explained that the electromagnetic bonds in the stalk exactly balance the force of gravity pulling the apple down.

In turn, the value of the gravitational constant affects the sizes, types and lifetimes of stars, and the sizes of planets and creatures. Modifying the value of any one of the fundamental physical constants results in something going wrong, and leads to a universe which is incompatible with life.

Peter finally touched on alternative theories, such as many universes, bouncing universes, baby universes born from black holes, and parallel universes. The lecture stimulated considerable discussion and thought, making a very interesting evening. ¤

DLC

The Anthropic Principle by Daniel Cave

As we look about, we see a universe of initially surprising coincidences. The Earth is at just the correct distance from the Sun for life to exist, the Sun is in a friendly spiral galaxy suitable for life, inhabitants of Earth are protected from the harsh interplanetary environment by a highly convenient magnetic field and an atmosphere, etc. In an attempt to explain these coincidences, some resort to the intervention of supreme beings to account for the observed situation.

This, however, is not really necessary; had the environment been greatly different from the one we inhabit then we would not be able to observe it as the conditions would be unsuitable for our existence. This statement is known as the *weak anthropic principle* and was first proposed by the physicist Brandon Carter. While at first it seems like a perfectly simple statement, further examination leads to a whole range of possible interpretations which are anything but simple. Brief definitions of the different versions are given below.

The *strong anthropic principle* declares that "the universe must have those properties which allow life to develop within it at some stage in its history".[1]

The participatory anthropic principle (which is really an aspect of the strong anthropic principle) states that observers are necessary to bring the Universe into existence.

Finally, the *final anthropic principle*. This variant says that "Intelligent information-processing (life) must come into existence in the universe, and, once it has come into existence, it will never die out".[2]

A fuller discussion of the various forms follows.

The Weak Anthropic Principle

One use of the weak anthropic principle is to 'account' for why the universe is the age it is – it takes about 10 billion years [3] for the evolution of intelligent life forms. First the early generation of stars has to form and convert the plentiful hydrogen and helium into more complex atoms such as carbon and oxygen. These new materials are scattered throughout interstellar space by the explosions of supernovae. New stars and planets, such as the Earth, form from this enriched material – except this time, the ingredients for life are present.

Five billion years after the formation of the second generation stars, and ten billion years after the creation of the universe, intelligent life is able to exist on planets such as the Earth. Its inhabitants are then able to ask the question "why is the universe the age it is?"

The weak anthropic principle can also be used to eradicate some of the more radical strains of cosmology (even before observations rule them out). One good example is that of the steady-state cosmology popularised by F Hoyle (amongst others). As it is put by Rees [4], "the fact that there is an epoch when [the Hubble time, tH, which is essentially equal to the age of the Universe] is of the order of the age of a typical star . . . is not surprising in any 'Big Bang' cosmology. Nor is it surprising that we should ourselves be observing the Universe at this particular epoch. In a steady-state »»

cosmology, however, there would seem no *a priori* reason why the time scale for stellar evolution should be either [much less than] tH (in which case nearly all the matter would be in dead stars or 'burnt out' galaxies) or [much greater than] tH (in which case only a very exceptionally old galaxy would look like our own). Such considerations could have provided suggestive arguments in favour of 'Big Bang' cosmologies . . ."

Since the 1950's, when steady-state theory was first proposed, the observation of the cosmic microwave background radiation is seen by most as sufficient evidence to kill the steady-state theory.

The Strong Anthropic Principle

The statement of the strong anthropic principle, that the universe must have the properties which allow life to develop at some stage during its history, can lead to some intriguing understandings. A few of these are outlined here.

"The constants of the universe must be such that life can exist", is a statement which inevitably leads to the claim by some that the universe was 'designed' with the exclusive goal of generating and sustaining observers. This is a belief that is commonly found in many religions around the world. The claim is also unable to be proven or disproven, which is probably why the idea has been around for such a long time.

Another consequence of the strong anthropic principle that is not commonly found in religion is that there should be more than one universe, or regions of one universe, each with the possibility of different physical laws. Some go even further and say that many other universes are needed for our universe to exist.

There are several objections that have been raised against the strong anthropic principle. Many of its conclusions seem to go against sound reasoning. Throughout the history of science humans have constantly had to demote themselves from a place of importance. Initially there was Ptolemy's conception that the Earth was the all important centre of the universe. Today, after several interim steps, we now have a very different version of events: the Earth is nothing more than an average sized planet, orbiting a typical star, situated in a medium sized spiral galaxy, belonging to a moderately sized cluster of galaxies in an altogether unremarkable part of the universe.

The strong anthropic principle would have us believe that everything we see in the universe has been constructed for our sake. You can certainly argue that the solar system and even the Milky Way is vital for our existence. However, is it really necessary for a small asteroid orbiting the star belonging to a galaxy in a far flung region of space to exist for us also to exist? Possibly not.

The Participatory Anthropic Principle

Observers are needed to bring the universe into being is how some people choose to interpret the strong anthropic principle. In this form it has become known as the participatory anthropic principle and many of its roots are based in quantum mechanics.

The argument to support this principle is based on a similar line as the Schrödinger's Cat Paradox. A cat is placed in a box for a given length of time which contains a device with a 50% chance of killing the cat during that period. At the end of the given time you may ask yourself if the cat is »»

alive or dead. Without observing the cat some say it is in a 'state of limbo', being an amalgamation of both an alive and dead cat at the same time. It is at the time of observation that the actual fate of the cat is sealed.

With the Schrödinger's Cat Paradox the observation of the cat determines if it is alive or dead. With this interpretation of the strong anthropic principle the observation of the universe determines its existence.

The Final Anthropic Principle

The final anthropic principle (another interpretation of the strong anthropic principle), that life must come into existence and once it has it will never die out, has some very interesting consequences. If we are to follow this principle then it states that humans will eventually colonise places off the Earth; "if the foreseeable destruction of its solar system does not motivate a species to develop interstellar travel, it is hard to imagine what would"[5,6]. Once this colonisation of other portions of the universe has begun, there is no reason to assume it will stop for any reason. Taking this to its extremes we may now state that intelligent life could inhabit a substantial portion, if not all, of the visible universe in the distant future.

We now have a very interesting scenario. Throughout the development of life on Earth, the environment in which it developed had an absolute influence on the evolution of that life. In a situation where intelligent beings inhabit a large proportion of the universe it is not unreasonable to say that the operations of this life could begin to affect the evolution of the universe. The significance of intelligent life would become highly conspicuous towards the 'final state' of the universe, with the possibility of intelligent life actually being in control.

This also implies that what is carried out by us today, because of its effect on future life, is also of significance to the ultimate fate of the universe. That is, of course, only if the final anthropic principle holds true!

As it turns out (if you do the sums), the final anthropic principle requires that the universe and the elementary particles have several definite properties. These properties can be tested, and so provide an observational test for the validity of the final anthropic principle (which we are at present unable to carry out).

If the final anthropic principle is found to be true then one of its implications is that there is almost certainly no other intelligent life in the galaxy[7]. If there were other intelligent life, then following the rules laid down by the principle, it would have spread throughout much of the galaxy and would be apparent to us today. The only exception to this would be if we were the most advanced species in our galaxy. Statistically this is highly unlikely and would only be the case if we were living in a very special time in the development of intelligence in the Milky Way.

Conclusion

Some of the ideas thrown up by the anthropic principle are extremely interesting and can be discussed at great length. Other interpretations do, however, stretch the boundaries of plain old common sense.

While few would raise objection to the weak version, the anthropic principle as a whole, and the strong anthropic »»

principle in particular, do seem to go against everything humans have learnt about their place in the universe since the dawn of time. The promotion of the importance of humans on a galactic and universal scale could be seen to be a bit of a backward step. This is brought to an extreme by the final anthropic principle.

Yet there is the possibility that some aspects of the principle can be tested, and so we may eventually have a better idea of our importance in the universe as a whole. Much of the principle is, unfortunately, scientifically untestable with current theories. The areas that are outside the realms of science may be better off left to the philosophers and in some cases the theologists to discuss. ¤

Daniel Cave

References

1. J D Barrow and F J Tipler, page 21.
2. J D Barrow and F J Tipler, page 23.
3. Throughout, one billion is defined as 1,000,000,000.
4. As quoted by J D Barrow and F J Tipler. page 17.
5. J D Barrow and F J Tipler, page 589.
6. An argument based on the 'Brandon inequality' actually gives the terrestrial biosphere a very short time left to exist (approximately 4 x 10^4 years!). This would greatly accelerate the immigration.
7. A fuller discussion of this argument is discussed by J D Barrow and F J Tipler, Chapter 9.

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Did you know? - The Pulsar in the Crab Nebula

The supernova which formed the Crab Nebula was recorded in Chinese celestial observations for the year 1054. The resulting pulsar, or spinning neutron star in the centre of the nebula, has a spin or pulse rate of thirty times a second. Every five minutes there is also a giant pulse of energy around one thousand times more powerful. This is one of the strongest radio signals yet found, and it is claimed that the energy pulse is so powerful that it can show up as interference on a blank television screen.

I had a little spaceship

I had a little spaceship,
All trim in cruiser black;
I hired it to a trader
To haul to Mars and back.
He knocked it, he pocked it
in meteoric hail;
I would not let it out again –
In fact it's up for sale.

K V Bailey

Landmarks in Space Research - Part 3 by Geoff Falla

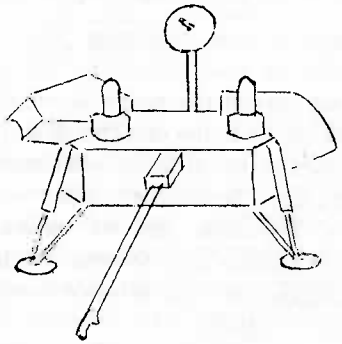
With the completion of the Apollo programme of Moon flights, the attention of the United States space researchers turned in particular towards a closer investigation of the planet Mars and space probes to the outer planets.

Pioneer 10, launched in March 1972 on a mission to Jupiter and beyond, became the first man-made object to escape the Solar System. Designed to operate for a period of less than two years, the space probe is still operative, relaying back to Earth data on the solar wind.

In July 1972 the first Earth Resources Technology satellite was launched, later renamed *Landsat*. The satellite was placed into a near polar orbit for maximum image coverage of the Earth's surface. 14 orbits a day were completed, and each ground track covered could be repeated at intervals of 18 days. A scanning device was used to provide valuable information in such areas as crop production, geology, water resources, coastal erosion, and pollution of the environment.

In May 1973 *Skylab* became the first US manned space station, some two years after the Soviet *Salyut* station was launched into orbit.

Mars probe *Viking 1* was launched by the USA in August 1975. It soft landed on the planet on the 20 July 1976, transmitting pictures of the Martian surface, and taking soil samples. *Viking 2* followed about a year later. Soil sampling and analysis was regarded as an important test for the possible existence of bacteriological life in the Martian soil. Although a very positive answer appeared to be produced from one of the tests, scientists decided that this must have been the result of some sort of chemical reaction.



Viking Mars Lander

The Soviet Union succeeded in October 1975 in placing the *Venera 9* spacecraft into orbit around Venus, releasing a capsule to land on the surface. The capsule survived on the planet's surface for 53 minutes, taking television pictures, and confirming the extreme conditions, with a pressure measured at 90 atmospheres and a temperature of around 500°C.

In 1979 *Voyager 1* and *Voyager 2* were launched on multi-planet, gravity assisted flights to the outer planets. The Voyager 1 flyby of Jupiter in March 1979 discovered a thin ring of material around the planet, together with the major discovery of active volcanoes on Jupiter's inner moon Io, with some of the volcanic plumes extending to a height of 175 miles. Voyager 2 completed a Grand Tour of all the large outer planets, discovering also a ring system around Uranus together with 14 additional moons, and passing within 3,000 miles of Neptune in August 1989.

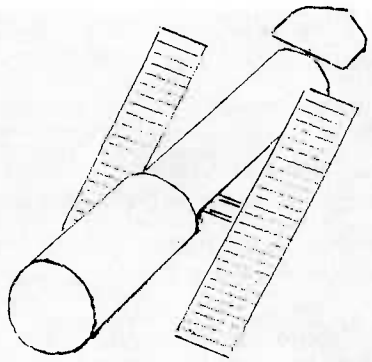
The concept of the Grand Tour by gravity assisted flight involved the Voyager craft being directed close to a planet and accelerated around it by the planet's gravity, onto a new trajectory and the next target planet. The complex flight patterns required were developed, surprisingly not by NASA, but from computer calculations by a student.

The Space Shuttle was launched on its first orbital test flight in April 1981, and, with its large cargo bay, has become the mainstay of the US Space Programme for the launch of satellites and astronauts into orbit.

Two important satellites were launched in 1983. In January of that year *IRAS*, the Infra-Red Astronomical Satellite, made possible the first complete survey of the infra-red sky, locating the exact positions and densities of about 200,000 sources, and discovering a ring of solid material around the star Vega, one of the brightest stars in the sky. In May of the same year the European Space Agency launched *EXOSAT*, the first observatory satellite for the detection of X-Ray sources.

In July 1985 the European Space Agency also successfully launched the *Giotto* space probe by Ariane rocket from French Guiana, with the purpose of achieving a rendezvous with Halley's Comet as it made its periodic return to the inner regions of the Solar System for the first time since 1910. The probe passed within around 300 miles of the Comet's nucleus in March 1986, taking photographs of its dark core.

The *Magellan* Venus probe was launched in May 1989, orbiting the planet in August 1990, and mapping the cloud covered surface by radar.



The Hubble Space Telescope

The Hubble Space Telescope, with its 2.4 metre mirror, was launched in April 1990, but after having been placed successfully in orbit, was found to have a fault in the manufacture of the mirror, resulting in a less than ideal performance. In December 1993 astronauts on a Space Shuttle mission were able to fit corrective optics, enabling the telescope to produce images of a quality never attained previously, and providing new knowledge of distant objects.

Geoff Falla

References

The Illustrated Encylopædia of Space Technology, by Kenneth Gatland, Salamander Books, 1981.

Space Diary, by Kenneth Gatland, Salamander Books, 1989.

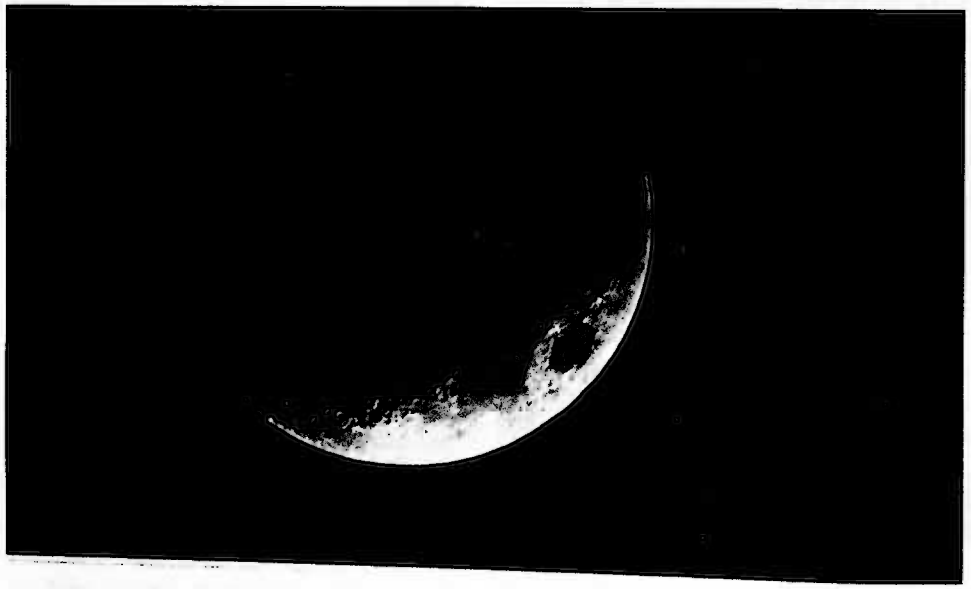
Members can find a lot of information about Space Research in the Observatory Library, including many NASA and ESA publications, and the Hubble Space Telescope newsletters. - Ed.

Photographs of the Moon by Roger Chandler

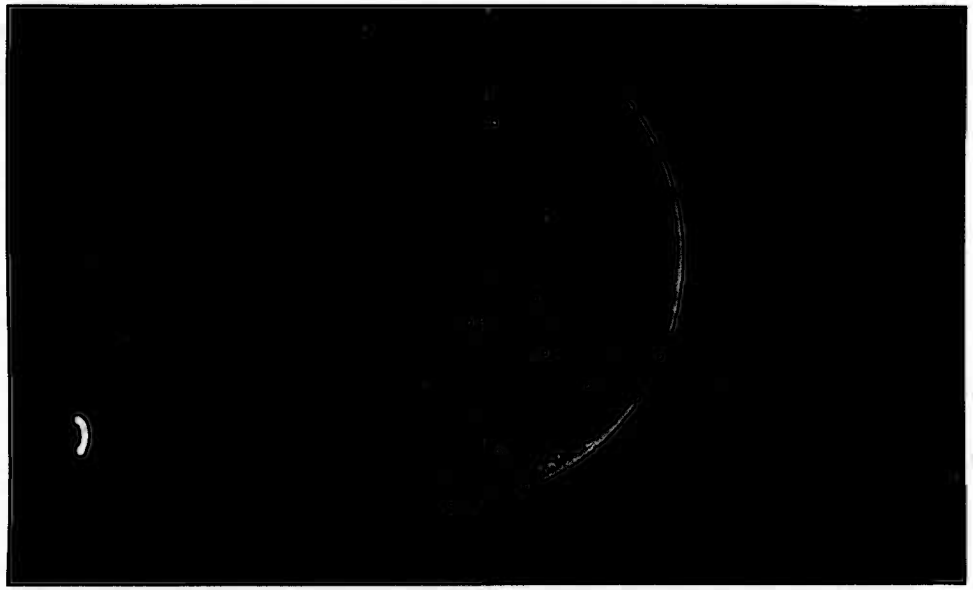
On the next four pages are seven photographs of the Moon taken over the past few months by Roger Chandler. He has been running a programme of photographing the Moon at all of its phases. Although the series is not yet complete, these pictures do show most of the lunar phases, and all of the lunar features.

The photographs show the Moon at different phases, and the approximate "age" of the Moon is given below each photograph. The Moon's phases repeat in a cycle of about 29½ days. This is called a *lunation* or *synodic month*. Thus New Moon has an age of 0 days, First Quarter occurs when the Moon's age is about 7½ days, Full Moon when it is just less then 15 days, and Last Quarter at 22 days.

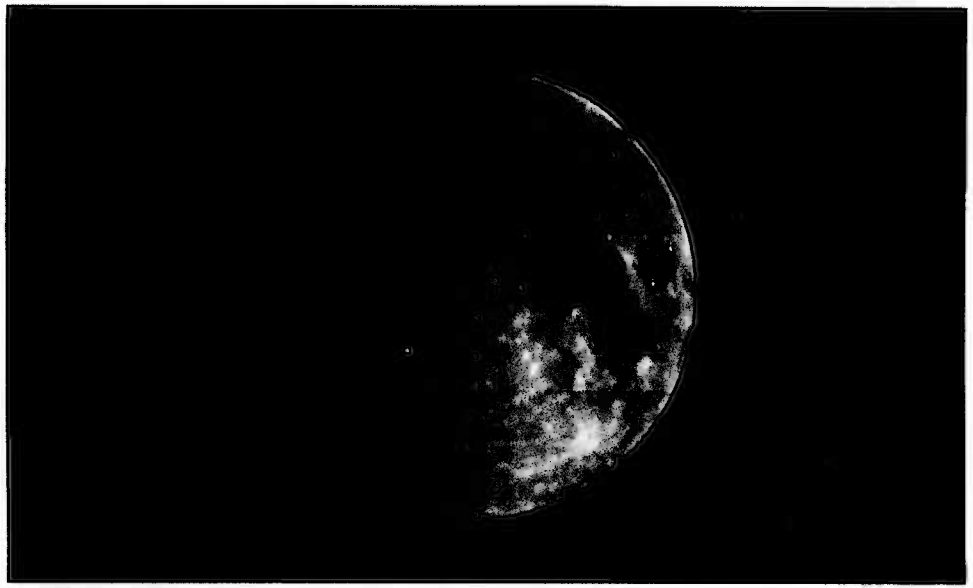
The photographs clearly show the lunar "seas": the small *Mare Crisium* 280 by 350 miles, the large *Mare Tranquillitatis*, the *Mare Serenitatis*, and the huge structures of the *Mare Imbrium*, *Mare Nubium*, and *Oceanus Procellarium*. Bright craters are also visible, including: *Hipparchus*, *Copernicus*, and the dominant *Tycho*, with its bright and extensive ray structure.



4 days old

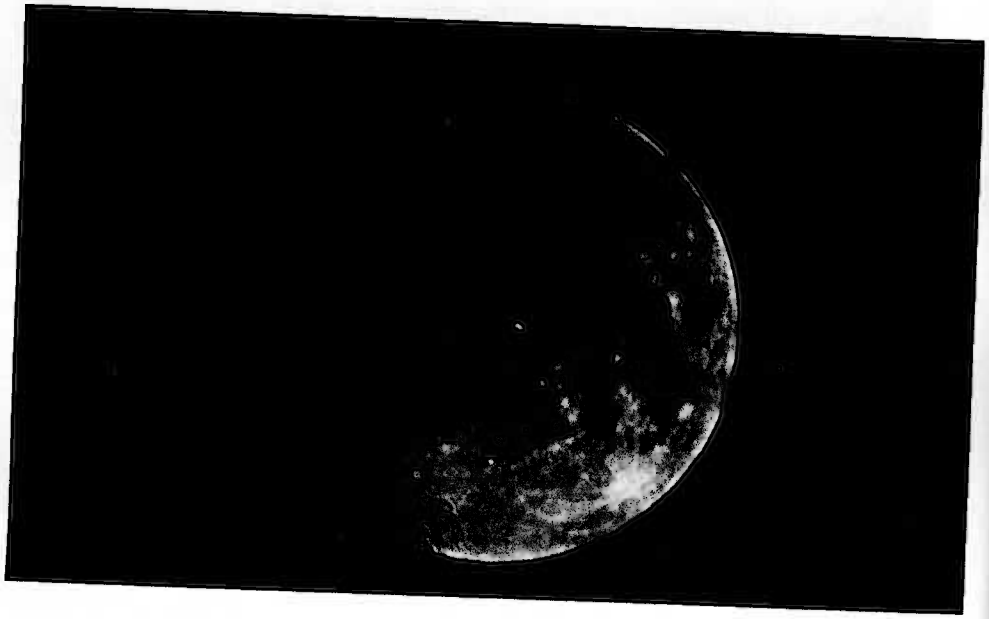


6 days old

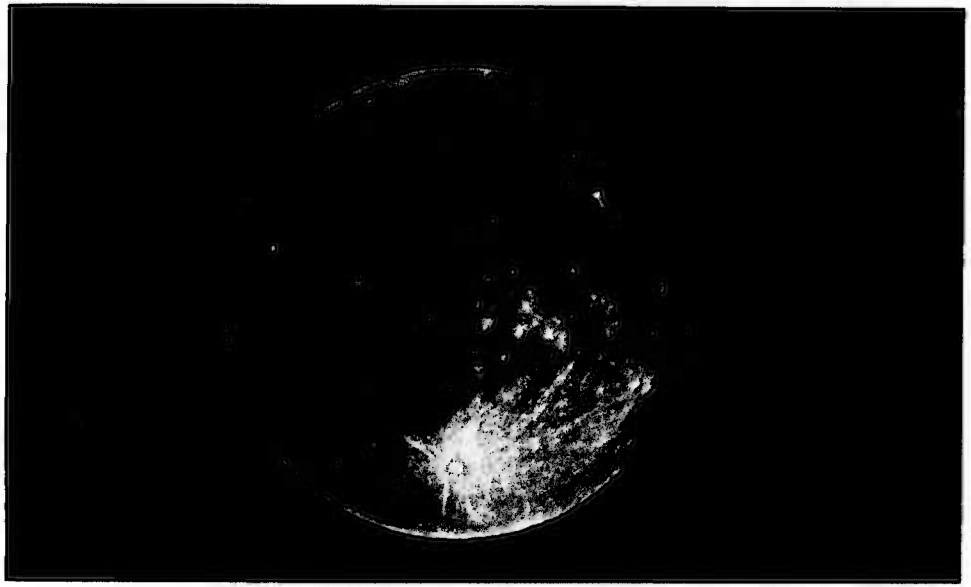


9 days old

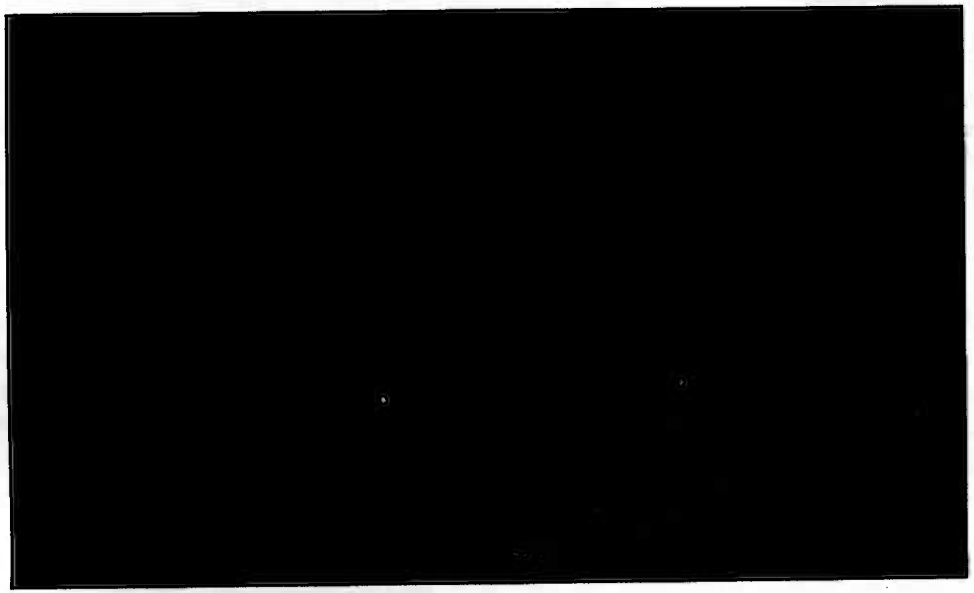
10 days old



11 days old



14 days old



18 days old

The Liberation Monument - the unveiling

Well, what happened on the 9th May? Did the shadow perform as expected?

The answer is *yes*. At about 6.30 am a small group of people, including designer Eric Snell, builders Phil Sebire and Peter Dodson of Le Roy Limited, the States Supervisor and States Architect, Sean Harvey and myself gathered at the Monument to observe the shadow as it reached the paving and seating.

Phil and Peter were giving the Monument a final wash down ready for the unveiling ceremony. The material covering the obelisk was already in place, with its Guernsey flag design. Fortunately, the top few centimetres of the obelisk were left uncovered, so the tip of the shadow could still be seen.

As 6.40 approached, the wet surface made the diffuse shadow even harder to see, and it was not helped by a States Works van which parked on top of it to unload plants! However, the shadow was clearly pointing in the right direction, although its tip did not become visible until it reached the seating at 7.00 am.

The real test came at 7.15 am, the time of the signing of the German surrender, marked by an inscription on the seating. Using a radio controlled clock, a count-down was given, and sure enough, the shadow tip was directly under the inscription at the right time. Not only that, but it was also at the correct height, about 4 cm up on the back of the seat.

Similarly, at 8.00 am, the next time-mark, the shadow was in the right place. And at 10.15 am. The shadow tip tracked accurately along the line of seating.

It was then a matter of waiting for the formal unveiling by HRH The Prince of Wales. This had been timed for 1.30 pm, but it was actually past 1.40 pm when the obelisk was finally completely revealed. At that time there were many thousands of people around the Monument, most catching just a glimpse of the Prince, and hardly anybody able to see the shadow.

I was sitting on the grass close to the obelisk, but being behind the seating, could not see the shadow. However, I was asked by the Bailiff to come and explain the Monument to the Prince, and so was able to see that the shadow was still at the right height, although, because the time was later than planned, it was beyond the letter "S" of the word ISLANDS, rather than under the letter "D".

As soon as the Prince had left, and the public were allowed onto the site, the whole Monument was covered with hundreds of people. It was impossible to see the shadow, or to read the inscriptions!

However, on succeeding days the Monument was in normal use, and it was possible to observe the shadow gradually shortening while people used the seats and read the inscriptions. The Monument was at last doing its job!

David Le Conte explains the Liberation Monument to Prince Charles

Educational activities

Haute Capelles infants

On Thursday, the 11th May, two days after Liberation Day, David Le Conte spoke to the children of Haute Capelles Infants School about the Liberation Monument. The large-scale (1:20) model was on display there, and the children could try the shadow out for themselves with the aid of a torch. They also used graphics computer programs which David had brought along. This talk was followed the next day by one from Phillip Sebire of Le Roy Limited, the company which built the Monument.

German students cancelled

11 students from a school near Munich, together with their teachers and Guernsey hosts, were scheduled to visit the Observatory on Monday, the 19 June. Unfortunately, that was one of the few nights in that period when the weather did not cooperate, and the visit had to be cancelled. We hope to invite them again perhaps next year. ¤

Public visit Observatory

The open evenings being held every Tuesday are proving quite successful. Weather permitting, there have usually been a dozen or so members of the public at the Observatory from 9.30 pm each Tuesday during this summer. Locals and visitors alike have taken advantage of this facility.

We have a poster on display at the Tourist Information Centre, and information also appears in the monthly Diary issued by the Tourist Board. We request £1.00 from each adult and 50p from each child, so the Section's funds are being boosted by these events. Certainly, people are enjoying seeing Jupiter through the telescopes. ¤