CANOPUS

The Astronomical Society of Southern Africa

Johannesburg Centre

Monthly Newsletter for August 2001

Contents:

The Sir Herbert Baker Library, 18a Gill Street, Observatory, Johannesburg
P.O.Box 93145, Yeoville, 2143

Editorial

A new Johannesburg Centre year starts with some really sad news. One of our most illustrious and long standing members, Danie Overbeek, passed away last week. A most vigorous and esteemed observer of Variable Stars, he was the regular contributor of the Variable of the Month articles until his unfortunate illness earlier in the year. *Our thoughts are with Danie's family at this time.*

You once again have a new committee and the new office bearers will be formally allocated their posts at the next monthly committee meeting and announced our meeting on the 8th of August. The committee members are shown in the table below, with their proposed duties for the year to come. We are all bound to benefit from the new blood in the committee.

Eben van Zyl continues his fascinating exploration of Life in the Universe, with an article which delves into the ages of the stars. I'm enjoying this series and will be sorry when it reaches its conclusion. These articles could quite easily be edited together into a guide to the universe for the new (and even more experienced) astronomer and give them good insight into the whole saga of life in our universe.

Evan Dembskey has supplied us with our variable of the month, Sco X-1 (V818 Sco). Included you will find a table of observations by Berto Monard and Peter Nelson of South Africa and Australia respectively. You're encouraged to observe and report on this interesting x-ray binary.

Dave Gordon has supplied an interesting guideline for, as he puts it, "A Cluster Hop Around The Body of the Scorpion". It makes for interesting reading, and is also very practical it it's approach. If you follow the advice contained therein, you can have a most enjoyable evening exploring Scorpius. **Brian Fraser** has supplied us with the Heavenly Happenings for the next 2 months; and several items about the June 21st eclipse, including pointers to some websites covering the event, are contained in this issue.

The speaker for August is **Trevor Gould** who will be presenting a talk on meteorite recovery in South Africa, especially as regards the last expedition on the subject, and also, no doubt, covering the next one, which is planned for later in the year.

What would you like to read about in Canopus? Please drop your editor a line on any subject(s) you'd like to see, or even better … if you have an article you'd like to submit, send it through. I can *almost* guarantee you it'll be published as is.

The Editor

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Michiel Daniel Overbeek (1920-2001)

Danie Overbeek passed away on July 19th 2001, at his home, after suffering a heart attack.

Born in 1920 and growing up in Ermelo in the Transvaal, Danie went to the University of the Witwatersrand to do a Mining and Metallurgy course in 1939 and 1940. After serving in the South African Air Force during the 2nd World War, and being mentioned in Dispatches in 1943 (Oak leaf on Africa Star), he joined the South African Airways and South African Railways where he spent his entire working life doing maintenance, training, civil engineering research and administration, retiring in 1980.

Danie's astronomical interest started at a very young age. When he was just 5 years old he once went to his parents in terror to report that "the stars are moving" but when, about 3 years later he heard his grandfather identify Mars, he was so intrigued at the fact that heavenly bodies have names that he started to read all the astronomy books he could lay his hands on. When he was about 15 he made his first telescope from a reading glass and a pocket microscope, moving on to spectacle lenses and then in 1937 he bought a commercial telescope for about $4.48! In 1951 he constructed a 6-inch Newtonian and started observing occultations and variable stars. This led in 1953 to the building of a 12.5-inch Dall-Kirkham Cassegrain reflector, which became his main astronomical observing tool for more than 47 years.

He married an old school girlfriend, Jean in 1945 and they brought up 4 children, 2 boys and 2 girls. In 1958 he obtained a B Sc degree in astronomy from UNISA.

Danie received many honours for his astronomical achievements. He served as chairman of the Johannesburg in 1956 and president of ASSA in 1961 and 1999 - a rare feat for someone to be elected president more than once. He was elected an honorary life member of both ASSA and the Johannesburg centre. In 1984 he received the highest honour from the ASSA when he was awarded the Gill medal. In 1986 he received a merit award from the AAVSO and in 1994 received the Director's award and a prolific observer's merit award from AAVSO. The Astronomical Society of the Pacific presented him with their Amateur Achievement Award in 1996. The Minor Planet Centre announced in November 2000 that minor planet 5038 had been named "Overbeek" in his honour.

Danie was the first amateur astronomer to detect the effects of a Gamma Ray Burst , with a SID/SES receiver that he had constructed. He also built a seismograph in 1990 and monitored the Earth's activity on a continuous bases.

Danie's contribution to astronomy in South Africa was enormous. He was mentor and friend to all who wanted to do serious astronomical observing and encouraged observers in all corners of the country. He contributed over 250,000 variable star observations to the AAVSO over a period of nearly 50 years and was one of their key observers in the Southern hemisphere when critical data was required for scheduling satellite observing time.

The passing of Danie Overbeek has signaled the end of an era, and he will be missed by all who knew him.

B.F.

Notice of Meeting

The next meeting of the Johannesburg Centre of the Astronomical Society will be held in the Sir Herbert Baker Library, 18a Gill Street, Observatory, on Wednesday the 8th August, 2001 at 20:00.

Topic

Meteorite recovery in Southern Africa

By: Trevor Gould

(We will also be covering June 21st eclipse experiences during this meeting)

Future Meetings

September 12th	**Meteorite Recovery**	**Trevor Gould**
October 10th	**Optical Devices**	**T.B.A.**

If you have any ideas for topics or subjects that you feel should be presented at future meetings of the Johannesburg Centre, please contact one of the Committee members, or email us with the details thereof. The Editor.

Year End Star Party 2001
"T.B.A."
8th December (*provisionally*)

Public Viewing *(weather permitting)*

Public viewing nights are on the Friday nearest First Quarter, and are held at the Old Republic Observatory, 18a Gill Street, Observatory, Johannesburg. Starting time around 19:30.

Please note that the Public viewing nights are held subject to suitable weather conditions.

27th July	19th October
24th August	23rd November
21st September	

Annual General Meeting.

The A.G.M. of the Johannesburg Centre of the ASSA was held on Saturday 14th July at our meeting place in the grounds of the Old Republic Observatory in Gill Street Observatory on an evening when Mars stood out amongst the stars that could be seen through the haze surrounding Johannesburg.

The main business of the evening was handled fairly quickly, including the election of a new committee and then the members moved outside to set up telescopes and braai their supper (in no particular order of course) and generally enjoy the evening. Amongst the 'scopes in use were Mary's home-made Dob, Ed's refractor and Peter's Meade LX200. All had eyes glued to eyepieces and were used to track a variety of popular objects including Mars (of course), Omega Cen, Alpha Centauri and the Jewel box. All of these were nicely overhead and easy to see, though objects nearer the horizon were less easy to observe and track due to the muck and haziness surrounding us that evening. (A few minutes of eyepiece time at Peter's big Meade has convinced me that maybe a 12" light bucket is the way to go - unless of course I win the Lotto and can spring for the 16" instead).

Please advise your committee of any subjects or topics you would like covered by the society diring the monthly meetings. This will help us to set-up meetings that will be enjoyable for all of you .

Jo'burg Centre Outings for 2001

Nylsvlei - we have a booking for the weekend of the 14th - 16th September for 30 people.

You may contact Ed Finlay on 083-449-1103 if you wish to book a place on this outing.
(as Ed has stood down from the committee, an alternate member will be allocated for this task).

Boyden - We are busy attempting to negotiate a suitable weekend with Martie Hoffman. There does not seem to be much chance at present, but we continue with our efforts in this regard.

The **Suikerbosrand Nature Reserve**. Wolf Lange has organised several enjoyable visits to this site near Heidelberg an says it is an ideal spot for clear viewing.

Tswaing Crater - we're still trying to set up a day visit under the guidance of Prof. Reimold. This will probably be done on a Saturday but we'll have to wait an see what can be set up.

Other ASSA Centres (e.g. the Pretoria Centre) - and try to see if we can organise some joint ventures.

If any of our members have places they would like to society to visit, approach one of your committee members with the request and we'll discuss it in committee. Alternately, just send an email to the editor and I'll make sure it is brought up in committee.

Telescope Making Classes

Would you like to make your own telescope?…or finish off a partially finished one? Well your opportunity has arrived (once again). Join the Telescope Making Class being held under the guidance of Brian, Evan and Chris. Contact Brian on 803-8291 if you are interested. Some really great telescopes have emerged from the hands of members like Mary McKinnon and Gerhard Koekemoer and Gerhard is in the final throes of motorising his Dobsonian to allow for "equatorial" tracking.

Interesting items

courtesy of Tony

Some things you may not know

1. In Shakespeare's time, mattresses were secured on bed frames by ropes. When you pulled on the ropes the mattress tightened, making the bed firmer to sleep on. That's where the phrase, "goodnight, sleep tight" came from.
2. The Main Library at Indiana University sinks over an inch every year because when it was built, engineers failed to take into account the weight of all the books that would occupy the building.
3. It was the accepted practice in Babylon 4,000 years ago that for a month after the wedding, the bride's father would supply his son-in-law with all the mead he could drink. Mead is a honey beer, and because their calendar was lunar based, this period was called the "honey month" or what we know today as the "honeymoon."

Tony Golding

Eclipse Snipperts

Pop along to the following Website and look at the photos of the June 21st Eclipse.

http://www.icon.co.za/~nevyoung/photos.htm

emailed to the editor by **Brian Fraser**

I popped along - great photos - Ed.

Variable of the Month

Sco X-1 (V818 Sco)

(The X-Ray Binary Sco X-1 (V818 Sco) is Extremely Active)

Sco X-1 (V818 Sco) is the brightest (persistent) low-mass X-ray binary in the sky. The object is a close binary containing a neutron star, which accretes matter from the companion star, and emits X-rays. Low-mass X-ray binaries are often very faint in the visual light, and Sco X-1 (V818 Sco) is a rare example which amateur telescope can easily reach.

Berto Monard (South Africa) and Peter Nelson (Australia) report that the object, usually at around mag 12.7, has brightening significantly, and looks to be still brightening.

Observers are strongly encourage to observe this "monster" in the northern Scorpius.

V818 Sco is located at 16h 19m 55s.0 -15^{o} 38' 24" (J2000.0).

Recent observations reported to VSNET:

YYYYMMDD(UT)	mag	observer	YYYYMMDD(UT)	mag	observer
20010510.758	127	(B. Monard)	20010612.766	127	(B. Monard)
20010511.767	127	(B. Monard)	20010613.785	130	(B. Monard)
20010512.788	127	(B. Monard)	20010615.737	128	(B. Monard)
20010513.816	126	(B. Monard)	20010616.764	127	(B. Monard)
20010514.772	127	(B. Monard)	20010618.756	128	(B. Monard)
20010515.774	127	(B. Monard)	20010619.716	128	(B. Monard)
20010517.767	127	(B. Monard)	20010620.688	128	(B. Monard)
20010518.794	127	(B. Monard)	20010621.725	134	(B. Monard)
20010519.769	127	(B. Monard)	20010622.760	134	(B. Monard)
20010520.753	128	(B. Monard)	20010623.741	133	(B. Monard)
20010521.738	128	(B. Monard)	20010625.694	134	(B. Monard)
20010523.783	127	(B. Monard)	20010628.006	127	(B. Monard)
20010525.769	129	(B. Monard)	20010628.722	127	(B. Monard)
20010526.732	128	(B. Monard)	20010630.694	127	(B. Monard)
20010527.756	126	(B. Monard)	20010703.467	<114	(P. Nelson)
20010529.791	127	(B. Monard)	20010704.419	120	(P. Nelson)
20010530.951	122	(B. Monard)	20010708.739	123	(B. Monard)
20010608.732	127	(B. Monard)	20010711.812	120	(B. Monard)
20010609.740	135	(B. Monard)	20010712.544	116	(P. Nelson)
20010610.728	126	(B. Monard)			

submitted by **Evan Dembskey**

More Eclipse Snipperts

This is a nice collection of eclipse pictures.

Try also click on some of the other sites listed at the bottom especially "Neville Young's site"

http://www.hartrao.ac.za/news/010621eclipse/lusaka/lusaka.html

emailed to the editor by **Brian Fraser**

THE AGES OF THE STARS

Many of the stars in the globular clusters are red giants, stars that have pushed off their upper layers and left their positions in the main sequence of the Hertzsprung-Russell diagram. These stars must have ages in excess of that of the Sun. While in the main sequence a star converts hydrogen in its nucleus into heavier atoms: helium, carbon, oxygen, etc. The energy set free by the fusion reactions, is given by Einstein's equation $E = mc^2$, where m is the mass converted in grams; c is the speed of light in centimetres per second and E is in ergs.

If a star consumes a fraction f, of its total mass while it is in the main sequence, the total amount of energy liberated will be given by $E = f \times mc^2$, f is, of course less than 1. The total energy E, is equal to the product of luminosity L, and the total time T, that the star has spent in the main sequence, so that $E = L \times T$. Therefore $LT = f\ m\ c^2$, so that $T = \frac{fc^2}{} \times \frac{m}{L}$. Now, f is approximately the same for all stars and since c is constant, we have $T \propto \frac{m}{L}$, i,e. T is proportional to $\frac{m}{L}$. According to the mass-luminosity law, first developed by A S Eddington in 1924, the luminosity L of a star is proportional to the (3,5)th power of the mass m, of the star. Therefore we can write $m^{3,5}$ for L so that the lifetime of a star T is proportional to $\frac{m}{{}_m 3.5}$, i.e. proportional to $\frac{1}{{}_m 2{,}5}$. This means that the lifetime of a star in the main sequence is $\frac{1}{{}_m 2{,}5}$. times the life of the Sun. The oldest Lunar rocks have dated the Moon as being at least 4,6 x 10^9 years and since the Moon and the planets were formed at the same time, or just after the Sun, the Sun must, in round figures, have spent at least 5 x 10^9 years in the main sequence. It is estimated that the Sun will spend at least another 5 x 10^9 years before it becomes a red giant and leaves the main sequence. The total time that the Sun will spend in the main sequence, will therefore be 10 x 10^9 years, i.e. ten thousand million years.

From the relationship $T \propto \left(1 \div m^{2.5}\right)$ we see that the greater the mass of a star, the shorter is its lifetime in the main sequence because 1 divided by a quantity more than 1 is less than 1.

A star of 2 times the mass of the Sun will consume its available hydrogen $2^{2,5}$ times faster than the Sun, i.e. 5,657 times faster so that it will reside in the main sequence $\frac{1}{5{,}657}$ times the time the Sun will reside there. 10 x 10^9 ÷ 5,657 = 1,768 x 10^9, i.e. a star of 2 times the mass of the Sun will reside on the main sequence for only 1,768 times 10 to the power 9 years - 1/6 of that of the Sun.

In the case of a star of 5 times the mass of the Sun, its hydrogen will be consumed in $5^{2,5}$ times less than in the case of the Sun. This is 55,9 times faster and its lifetime in the main sequence will be 10 x 10^9 ÷ 55,9 = 179 x 10^6 years - only 179 million.

A star of 10 times the mass of the Sun (eg Sanduleak -69°202 in the Large Magellanic Cloud which ended its life in a supernova explosion in 1987) consumes its hydrogen fuel $10^{2.5}$ times or 316 times faster than the Sun. Its lifetime will thus be 10 x 10^9 ÷ 316 = 31,2 x 10^6 years. This explosion actually took place 166 000 years ago because the Large Magellanic Cloud is 166 000 light years distant from Earth.

So we see that the most massive stars have lifetimes of less than one three-hundredth of that of the Sun.

By contrast a star of one half (0,5) times the mass of the Sun will consume its hydrogen $(0{,}5)^{2.5}$ times, or 0,17678 times as leisurely as does the Sun. Its lifetime on the main sequence is therefore 10 x 10^9 + 0,17678 = 56 x 10^9 years - more than 5 times as long as the Sun!

Mass of Star (solar masses) m	*Speed of fuel Consumption (x the Sun)* $m^{2,5}$	*Lifetime in the main sequence (years)*
1	1	10 x 10^9
2	5,657	1,768 x 10^9
5	55,9	179 x 10^9
10	316	31.2 x 10^9
0.5	0,17678	56 x 10^9

Jan Eben van Zyl

A Cluster Hop Around The Body of the Scorpion

As the scorpion proudly guards our view of the centre of the Milky Way Galaxy, and crawls serenely over our winter sky zenith, spend a leisurely half-hour globular and cluster-hopping around its heart, body and sting territory.

First stop ? Antares, slip due west 1.5 degrees to the bright globular cluster M4 (NGC 6121). A loosely packed cluster with a central bar-like concentration of stars running approximately north-south along the cluster. Mag 5.9 at 6800 light years.

M80 (NGC 6093) is a rather faint, very compact globular cluster approximately half-way between Antares and beta Scorpii (4 degrees NNW of Antares). Mag 7.2 at 27000 light years.

M62 (NGC 6266) is usually listed in Ophiuchus but its close proximity to the stinging constellation makes the scorpion?s influence on it irresistible. At Mag 6.6, it is small (14 arc seconds), compact and quite luminous. To find it, form an east-facing equilateral triangle with Tao and Epsilon Scorpii.

Move to Zeta Scorpii and change to your lowest magnification eyepiece. Notice the wide double of Zeta Scorpii at mag 3.6 and 4.7. A nudge half a degree north lies the open cluster of NGC 6234 and the loose grouping of Trumpler 24. I have dubbed this the guitar cluster as the entire grouping forms the outline of an acoustic guitar. You can even notice the strings and tiny fret markings on the guitar. A stunning cluster in low magnification or even binoculars.

Moving on to the scorpion?s tail area, M6 (NGC 6405) is also known as the Butterfly Cluster. This is a beautiful open cluster, with BM Scorpii as the brightest member - a sixth magnitude yellow giant. Look for the 7-star ?kappetjie? formation punctuating BM Scorpii. This forms the antennae of the butterfly. Trace the open wings of the butterfly as the brightest members glisten like twinkling diamonds. The cluster comprises about 80 stars in the vicinity of 1900 light years.

A slight nudge south-east of M6 exposes the magnificent open cluster of M7 (NGC 6475). Best in low magnification, this cluster lies about four degrees NNE of Lambda Scorpii at 782 light years (collectively at Mag 3.3). It is extremely large at nearly two full moon diameters. The cluster also numbers about 80 stars, the brightest of which range from mag 5.6 to 9.0. I could also resolve several close visual binaries in the cluster.

And now for the stunner! There is a star designated as G Scorpii, which forms an east-facing equilateral triangle with Lambda Scorpii and Iota 1 & 2 Scorpii as the base. Globular Cluster NGC 6441 nestles a mere 90 arc seconds east of G Scorpii. It is small, very dense and extremely compact. Mag 7.2 at 33500 light years.

Finally, globular cluster NGC 6388 lies about 2 degrees south of Theta Scorpii. At Mag 6.8, I found it remarkably similar in size, structure and concentration to NGC 6093.

Shortly after that final catch, the scorpion burrowed itself in dusty cloud and disappeared from sight. A joyous half-hour of manual search and recovery!

All observations with a 10? SCT, 25mm super Plössel, 32mm super wide from 20:30 to 21:00 SAST on 15 July 2001.

Dave Gordon

CHANDRA DETECTS HALO OF HOT GAS AROUND

MILKY WAY-LIKE GALAXY

NASANews@hq.nasa.gov

RELEASE: 01-146

The first unambiguous evidence for a giant halo of hot gas around a nearby, spiral galaxy much like our own Milky Way was found by astronomers using NASA's Chandra X-ray Observatory. This discovery may lead to a better understanding of our own Galaxy, as well the structure and evolution of galaxies in general.

A team of astronomers, led by Professor Daniel Wang of the University of Massachusetts, Amherst, observed NGC 4631, a spiral galaxy approximately 25 million light years from Earth with both Chandra and NASA's Hubble Space Telescope.

While previous X-ray satellites have detected extended X-ray emission from this and other spiral galaxies, this is the first time that astronomers were able to separate the individual X-ray sources from the diffuse halo, thanks to Chandra's exceptional resolution. Chandra found the diffuse halo of X-ray gas to be radiating at a temperature of almost 3 million degrees.

"Scientists have debated for over 40 years whether the Milky Way has an extended corona, or halo, of hot gas," said Wang, lead author of the paper which appeared this month in The Astrophysical Journal Letters. "Of course since we are within the Milky Way, we can't get outside and take a picture. However, by studying similar galaxies like NGC 4631, we can get an idea of what's going on within our own Galaxy."

The Chandra image reveals a halo of hot gas that extends for approximately 25,000 light years above the disk of the galaxy. One important feature of the X-ray emission from NGC 4631 is that it closely resembles the overall size and shape seen in the radio emission from the galaxy. This indicates that there may be a close connection between the outflows of hot gas, seen in X-rays, and the galaxy's magnetic field, revealed by radio emission.

The Hubble image of NGC 4631 shows filamentary, loop-like structures enclosing enhanced X-ray-emitting gas and emanating from regions of recent star formation in the galaxy's disk. These data clearly show the hot gas is heated by clusters of massive stars and is now expanding into the halo of the galaxy.

"What we see in NGC 4631 can be thought of as the bursting flames of a gigantic cosmic camp fire," said Wang. "Using Chandra and Hubble together, we really get a complete story of what is happening in this galaxy."

NGC 4631 is a galaxy that has high amounts of star formation, possibly triggered by interaction with neighboring galaxies. Such star formation might have created the conditions necessary to heat the gas seen by Chandra, as vast amounts of energy are released from supernovae and massive stars in star-forming regions - enough to lift the gas out of the plane of the galaxy.

These new results provide important clues about the cycling of energy and mass in a galaxy like our own Milky Way and about the evolutionary history of galaxies, which are thought to be more active in star formation in the past than at the present.

Other members of the research team include: Stefan Immler, University of Massachusetts; Rene Walterbos, New Mexico State University; James Lauroesch, Northwestern University, Evanston, IL, and Dieter Breitschwerdt, Max Plank Institute, Germany.

Chandra observed NGC 4631 with its Advanced CCD Imaging Spectrometer instrument, developed for NASA by Pennsylvania State University, University Park, and Massachusetts Institute of Technology, Cambridge. NASA's Marshall Space Flight Center in Huntsville, AL, manages the Chandra program, and TRW, Inc., Redondo Beach, CA, is the prime contractor for the spacecraft. The Smithsonian's Chandra X-ray Center controls science and flight operations from Cambridge, MA.

Images associated with this release are available on the Internet at:

http://chandra.harvard.edu

http://chandra.nasa.gov

Happy Anniversary, Viking Lander

NASA Science news

On July 20, 1976, NASA's Viking 1 lander parachuted safely to the surface of Mars, revealing an alien world that continues to puzzle scientists and tempt explorers.

July 20, 2001: Twenty-five years ago NASA's Viking 1 lander made history by parachuting from orbit to the surface of Mars. It was the first probe from Earth to land intact on the Red Planet, and the first American spacecraft to land on any world since the Apollo program.

Before Viking 1 touched down many people thought Mars might harbor abundant plant life and microbes living among the rust-colored rocks. Scientists guessed the skies might be tinged deep purple like Earth's stratosphere, which is about as tenuous as the Martian atmosphere. But Viking 1 and its sister ship Viking 2, which arrived on Mars a few months later, quickly dispelled those notions. The landers revealed an alien world with sterile soil and eerie salmon-pink skies. No plants swayed in the breeze. No animals scurried from rock to rock.

On the bright side, there were no hostile aliens either. If there was to be a "War of the Worlds" -- like the one popularized by Orsen Well's famous 1938 radio broadcast -- it wouldn't likely begin on Mars!

The Viking 1 lander set down on Chryse Planitia, a flood plain at 23 degrees north latitude.

"Chryse Planitia is an interesting place," says Jim Garvin, Mars program scientist at NASA Headquarters. "Long ago -- perhaps billions of years -- it was the dumping ground for five wide outflow channels apparently carved by flowing water." Scientists were attracted to it because of its watery history. Viking mission planners liked it because it was flat and seemed to offer a safe landing spot.

"[Before Viking], Mars had been examined from orbit by the Mariner spacecraft ... but the images were on the scale of a football field," explains former Viking project manager James Martin of NASA's Langley Research Center. "That was the smallest thing we could see and that's not very distinct when you consider the landers are only six or eight feet across. We didn't have the slightest idea what was on the surface [at such small scales]." Landing anywhere was risky!

Nevertheless, Viking 1 touched down safely and transmitted its first image 25 seconds later. The lander's seismometer failed to uncage, and a sampler arm locking pin was stuck and took 5 days to shake out. Otherwise, all the experiments functioned as planned. The lander went about its business for more than six years, from July 20, 1976 until November 1982, substantially exceeding its design lifetime of 90 days!

On Sept. 3, 1976, Viking 2 set down at Utopia Planitia -- a gently-sloping plain half a world away from the Viking 1 site (6725 km, to be exact). "Viking 2 landed at 48 degrees north latitude near the Mie crater," says Garvin. "It was a very different environment from the flood plains of Chryse." The weather at Utopia Planitia was different -- a result of its more northern latitude, there were curious pedestals that scientists thought might be small volcanoes, and the terrain was littered with the ejecta of the nearby impact crater.

"It was a bold move," says Garvin. Indeed, Viking 2 settled with one leg on a rock tilted at 8 degrees. Nevertheless, the lander performed well for nearly four Earth-years. Mission controllers shut it down on April 11, 1980, after its batteries failed.

Like its sister ship, Viking 2 was powered by long-lasting radioisotope thermoelectric generators, or RTG's for short. RTG's create electricity from heat given off by the natural decay of plutonium. Such a power source allowed long-term science investigations that otherwise would not have been possible. (RTG's also power the distant Pioneer 10 spacecraft, which is still alive after almost 30 years in space.)

Working steadily for years, the two landers accumulated 4,500 up-close images of the Martian surface. They also collected more than three million weather-related measurements -- including the first in situ observations of a global Martian dust storm. Meanwhile, two Viking mission orbiters circling high above the planet snapped 52,000 images covering 97 percent of the Martian globe.

The Viking landers were successful in so many ways, but they may be remembered best as the first space probes to conduct on-the-spot

biological tests for life on another planet. The experiments discovered puzzling chemical activity in scooped-up samples of Martian soil -- but there was no clear evidence of living microorganisms.

Perhaps that's not surprising. Garvin explains: "Mars has a thin atmosphere and no global magnetic field, so its surface is constantly bombarded by cosmic rays, solar flares, and harsh ultraviolet (UV) light from the Sun." UV radiation produces oxygen ions at the Martian surface that destroy organic molecules. "The sampling arm on the Viking landers dug down only about 22 cm," says Garvin. That might not have been deep enough to reach the "safe zone" for tiny Martian life.

Both of the Viking lander sites were extremely dry desert environments. "Other sites on Mars, such as nearer the polar caps or other places where liquid water may be found, are perhaps more likely places to look for signs of present or past life," speculates Garvin. "Our long-term plans call for missions to find liquid water on or under the surface, which will be the best places to begin looking for signs of life."

Since the Viking program, NASA's missions to Mars have included the ill-fated Mars Observer, the successful Mars Pathfinder lander and Sojourner rover, the prolific Mars Global Surveyor (still operating in orbit around Mars), and the Mars Climate Orbiter and Mars Polar Lander -- both of which failed as they neared the Red Planet. The 2001 Mars Odyssey spacecraft is now more than halfway to Mars and is due to arrive there on October 23rd. Operating from orbit, the Odyssey spacecraft will not only search for signs of underground water and interesting surface minerals, but also it will test the radiation environment to learn if Mars is safe for humans.

The next pair of landers to visit Mars are scheduled to leave Earth in mid-2003 and to arrive on Mars early the following year. Unlike the Viking landers, however, the 2003 Mars Exploration Rovers won't be confined to their landing sites. The mobile geology laboratories -- each the size of a desk and capable of traveling up to 110 meters a day -- will roam the Martian terrain analyzing rocks and soil.

Like most Mars missions, the rovers will begin their interplanetary journey when Earth and Mars are close together. Every 26 months the distance between Earth and Mars shrinks as their orbits bring them together. Astronomers call the time around closest approach "opposition." NASA plans to take advantage of as many Mars oppositions as possible to send probes to the Red Planet roughly every two years. Future missions on the drawing board include longer-lasting and more capable rovers, reconnaissance orbiters -- maybe even Mars-exploring airplanes and balloons.

Perhaps one day we humans will go ourselves!

And when we arrive we'll find a pair of dusty pioneers already there -- the long-lasting, prolific, but now-silent Viking landers. They blazed the trail for all who followed.

Eclipse pics

Hello there,

If you are one of those thought I had dropped off the face of the Earth, let me say I'm still alive and kicking (if only feebly). If I was "quiet", it was due to work, and of course more recently... preparation for the Great Lusaka Eclipse Jaunt. To get a taste of that monumental event, take a look at my little web site:

http://home.mweb.co.za/mw/mwgringa/

Unfortunately the service provider has recently been subject to attack by hackers in other countries (who knows why?), which has lead to a few difficulties in access at certain times. So, if you don't get through, well, try again another time.

Some of the thumbnails link to non-existent pictures. That is because I couldn't ftp through our firewall at work, so had to upload the pics from my modem at home. Where the files were too big, I just gave up on them because it would have taken too long. So, if you are looking at this with a fast link, by all means click on the thumbnails for bigger pics. If you are using a modem, just click on the buttons for acceptable download times.

Someday I shall probably get around to building a better, more varied and interesting site, so perhaps you want to bookmark the URL and check up on it on occasion.

In the meanwhile, enjoy!

Cheers,
Chris Stewart

The Sky this Month

August 2001

dd hh	dd hh
3 19 Neptune 2.8 N of Moon	15 20 Jupiter 0.4 S of Moon Occn.
4 06 FULL MOON	16 13 Venus 1.9 S of Moon
5 03 Uranus 3.1 N of Moon	19 03 NEW MOON
5 20 Moon at apogee	19 06 Moon at perigee
5 23 Mercury in superior conjn.	19 23 Mercury 3.6 S of Moon
6 00 Venus 1.3 S of Jupiter	22 13 Venus 7.4 S of Pollux
12 09 LAST QUARTER	24 23 Pluto stationary
13 23 Mercury 1.2 N of Regulus	25 20 FIRST QUARTER
14 03 Saturn 0.2 N of Moon Occn.	27 12 Mars 4.9 S of Moon
15 15 Uranus at opposition	31 00 Neptune 2.9 N of Moon

September 2001

dd hh	dd hh
1 07 Uranus 3.0 N of Moon	20 20 Venus 0.5 N of Regulus
2 02 Moon at apogee	21 00 Mercury 1.0 S of Spica
2 22 FULL MOON	22 23 Equinox
10 13 Saturn 0.2 S of Moon Occn.	24 10 FIRST QUARTER
10 20 LAST QUARTER	25 01 Mars 2.5 S of Moon
12 13 Jupiter 0.0 S of Moon Occn.	26 16 Mercury greatest brilliancy
15 07 Venus 3.3 S of Moon	27 02 Saturn stationary
16 16 Moon at perigee	27 05 Neptune 2.9 N of Moon
17 11 NEW MOON	28 11 Uranus 3.1 N of Moon
18 16 Mercury greatest elong. E(26)	29 08 Moon at apogee
19 03 Mercury 8.1 S of Moon	

LOCAL TIMES of RISE and SET for the MAJOR PLANETS, 2001

Site Location:- Long. **+28.0** deg. Lat. **-26.0** deg. Local Time:- **UT +2.0** hrs.

Date	Sun		Mercury		Venus		Mars		Jupiter		Saturn	
	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set	Rise	Set
Aug 09	06.43	17.44	07.00	17.58	04.17	14.52	13.02	03.03	04.08	14.37	02.24	13.05
Aug 19	06.34	17.49	07.18	18.46	04.27	15.05	12.37	02.38	03.36	14.07	01.48	12.28
Aug 29	06.25	17.53	07.23	19.21	04.33	15.19	12.15	02.16	03.04	13.35	01.11	11.51
Sep 08	06.14	17.57	07.21	19.46	04.38	15.35	11.57	01.58	02.32	13.03	00.34	11.14
Sep 18	06.03	18.01	07.12	20.00	04.39	15.51	11.43	01.41	01.58	12.30	23.55	10.35
Sep 28	05.52	18.05	06.51	19.54	04.39	16.06	11.30	01.26	01.24	11.56	23.16	09.56