

CANOPUS

The Astronomical Society of Southern Africa

Johannesburg Centre

Monthly Newsletter for February 2001

Contents:

Editorial

Notice of Meeting

...and the Winners are...

A New Local Astronomy Website..... Andre Bruton

Eclipse June 2001 Brian Fraser

Beagle 2 Landing site chosen ESA Science News

Variable of the Month Danie Overbeek

Easter 2000 Expedition..... Trevor Gould

The Hunter and the Hare..... Jill Stewart

An Honour for and Honourary Member..... Chris Stewart

2 Weeks to travel to Mars Andrew Yee

In The Sky This Month Brian Fraser

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

Editorial

As February nears, we see Venus approaching it's brightest. Many people have commented on this apparition, including "non-astronomers" who have noticed this very bright "Star" in the Western sky each evening. A moderate sized telescope will show quite good shape and this will become more pronounced as Venus reaches peak brightness. I have never seen it, but many Astronomers have reported that in a very dark area without any light pollution, it is possible to see that Venus can cause a shadow to be cast. Seeing it as it now appears, I am perfectly ready to believe this. Have any of you out there actually witnessed this phenomenon? Write in and tell us if you have, and we'll include your descriptions in a future issue of Canopus.

The first meeting of the year was very well attended, and included the draw for the short tube refracting telescope. The results are published under the notices section of this issue.

Brian has supplied some interesting articles as well as his "State of the Skies" information. He covers the sometimes widespread ignorance regarding Astronomy and what we as Astronomers should do to improve the situation.

Chris Stewart has picked up in interesting snippet of information regarding another of our eminent honorary members - Patrick Moore, as well as supplying useful website addresses for seeing some good images of the Lunar Eclipse which took place early in January. Your editor attempted some Astro-photography during this event with rather uninspiring results. Using a 135mm lens with an old Minolta SR1V camera (totally mechanical - no electronics), I managed images taking up a tiny part of a 35mm frame. Connecting the camera to a 10" Meade LX6 on the other hand, filled the frame with only a small portion of the moon's surface which was also undesirable.

Trevor Gould has supplied a write-up on last Year's Easter Expedition in the wastelands to the North of Verneukpan for the purpose of the recovery and identification of Meteorites, as well as a little piece to make you all chuckle. Eric Brindeau has also decided that we need some light relief and passed on a little Astronomical humour.

Once again a plea for articles - this is Your magazine, and it is preferable that the articles published therein are supplied by the membership of the Johannesburg Center. Any appropriate article submitted will be sure to be published - who knows - it could be the start of a career in writing or journalism!!!

The Editor - *chris@penberthy.co.za*

Committee of the Johannesburg Centre of the ASSA for 2000/1		
Chairman	Tom Budge	484-4740 - farthings@iafrica.com
Vice Chairman	Chris Stewart	763-3301 - cstewart@alcatel.altech.co.za
Secretary & Treasurer	Constant Volschenk	972-6038 - tabbie@icon.co.za
Librarian	Ed Finlay	616-3202 - edwin.finlay@ucb-group.com
Curator of Instruments	Frans van Nieuwkerk	609-8158 - machteld@iafrica.com
P.R. and Media Liaison	Wolf Lange	849-6020 - wlange@mail.sbic.co.za
Viewing Officer	Constant Volschenk	972-6038 - tabbie@icon.co.za
Members	Evan Dembskey	680-9304 - evan@telemessage.co.za
	Melvyn Hannibal	435-6007 - melvynhannibal@metroweb.co.za
Editor of CANOPUS	Chris Penberthy	793-7480 - chris@penberthy.co.za
Our Web Address is www.aqua.co.za/assa_jhb.htm Send e-mail to assa_jhb@aqua.co.za and fax us at (011) 339-2926		

Notice of Meeting

The **February** 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 14th of February, 2001 at 20:00.

Topic:

Sundials

By: **Malcolm Barnfield**

Future Meetings

March 14th

Galaxies

T.B.A.

April 11th

Special Planetarium show for Jo'burg Centre

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.

Ed.

Dark Sky Viewing

On the Saturday nearest New Moon at Tom Budge's Farm in the Magaliesberg. Remember that this is by arrangement only as most observers will be following specific viewing programmes and if you don't have your own 'scope, you should contact one of the observers (e.g. at the monthly meeting) to arrange some eyepiece time with them.

24th February

21st July

Year End Star Party 2001

24th March

18th August

"T.B.A."

21st April

15th September

8th December (*provisionally*)

19th May

13th October

23rd June

17th November

Public Viewing

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.

2nd March

24th August

30th March

21st September

25th May

19th October

29th June

23rd November

27th July

Jo'burg Centre Outings for 2000/1

Your Committee is making arrangements for several outings during the year. Amongst these are some old favourites as well as a couple of new ones which should prove interesting.

Swinburne or **Nylsvlei** (or both)! **Boyden** - dependant on availability of a suitable weekend.

Other ASSA Centres (e.g. the **Pretoria Centre**) - and try to see if we can organise some joint ventures. **Haartebeeshoek** and possibly a visit to the **Suikerbosrand** Nature Reserve.

Tswaing Crater - still trying to set up a day visit under the guidance of Prof. Reimold. This natural heritage viewsite is starting to deteriorate, and needs our support - visits are a part of this support.

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.

...and The Winner(s) are...

The draw for our "Win a Telescope" Competition was held at our first meeting of the year on Wednesday the 10th of January 2001.

Winner of the Telescope was the holder of ticket number A00383
Mr. G.M. Lazarevic of Bryanston

Two further tickets were drawn with the prize of a one-year membership of the ASSA Johannesburg Centre. These were:-

A00010 - *Mr. R McMennamin*
A00491 - *Mr. Roland Amm*

CONGRATULATIONS to all of you!!

New Local Astronomy Link

Hi

Please add the link www.astronomy.co.za to your links page.

Best regards

Andre F Bruton andre@bruton.co.za

Solar Eclipse June 21st 2001

We have chartered two planes to travel to Lusaka in Zambia on June 21st to observe the eclipse of the sun. Lusaka lies within the path of totality, not at the exact center, but it will enjoy about 3 minutes and 10seconds of totality. If the weather is clear. If the weather is not clear totality could last all day.

The idea is to fly to Lusaka from Johannesburg, leaving at about 10:30 am, watch the eclipse and return to Johannesburg straight afterwards. Flying time to Lusaka is about 2 hours (about 1600kms). Cost will be in the region of R2,000 to R2,500 depending on oil prices, the dollar exchange rate and whether we can convince the airline that they can't use the planes for anything else on that day.

The first plane we chartered was booked out within a couple of weeks. We now have a second plane, seating 75 people and already have about 25 seats taken.

If you would like to come along please let me know URGENTLY.

TO THOSE WHO HAVE PUT THEIR NAMES DOWN

PLEASE contact me to confirm your booking. I will need to get a deposit of R500 per person, very soon, to pay for the planes.

Brian Fraser Tel H 803-8291
 W 871-0370
 email: brian.fraser@macsteel.co.za

Beagle 2 landing site selected

ESA Science News
<http://sci.esa.int>
 20 Dec 2000

The Mars Express lander, Beagle 2, will land on Isidis Planitia, a large flat region that overlies the boundary between the ancient highlands and the northern plains. The choice of site was announced last week at a meeting of the Mars Express science working team in ESTEC, Noordwijk, the Netherlands.

The region appears to be a sedimentary basin where traces of life could have been preserved, if primitive life really did exist at some time on Mars. "This is the best site given the landing constraints and scientific aims of Beagle 2," said John Bridges from the Natural History Museum, London, who has been assessing several sites on behalf of the project.

Isidis Planitia lies between 5 degrees and 20 degrees north. The specific site chosen lies close to 10 degrees north, which is the maximum latitude for a site to be warm enough for Beagle 2 to function properly during early spring, the season at which it is due to land on Mars. The number of rocks on the surface seems to be about right -- not too many to threaten a safe landing, but enough to provide an interesting landscape for the experiments. The site is also at a low enough elevation to allow the parachutes sufficient atmosphere to brake the lander's descent, has few steep slopes down which the tiny probe may have to bounce as it lands, and doesn't seem to be too dusty.

Sites previously under consideration include the Chryse Planitia, Candor Chasma and the Elysium plains. Further studies, however, showed that the probe would be unable to function properly at these sites because their latitudes make them too cold in early spring. One channel south of Chryse, Simud Valles, would have been warm enough, but it is too narrow to ensure a safe landing.

Another possibility might have been areas of the layered terrain imaged by the camera on NASA's Mars Global Surveyor (MGS) and made public earlier this month. The layering, which is extensive, especially in low-lying areas around the equator, was most likely

formed by sediment deposited at the bottom of long-standing lakes or seas, an ideal environment for preserving traces of life. "Unfortunately, this layered terrain is revealed in steep, narrow canyons which are unsuitable because of the landing ellipse size," Bridges told the meeting.

The landing ellipse is an area up to about 500 km long by 100 km wide in which Beagle 2 will land. The size of the ellipse will depend on the angle at which the probe enters the Martian atmosphere, which has yet to be determined: the steeper the angle, the smaller the ellipse. However, a landing site must be chosen to accommodate the maximum likely ellipse size and that rules out the bottom of many valleys.

When Beagle 2 has landed, its precise position will need to be measured. One way of doing this will be to time the movement of the shadow of Mars's tiny moon, Phobos, as it passes over the lander during a partial eclipse of the Sun. "In February 2004, the Sun will have a partial eclipse by Phobos. By timing the eclipse, we will be able to pinpoint the lander's position quite accurately," said Tom Duxbury from the Jet Propulsion Laboratory, Pasadena, California, USA, who is helping to characterise the landing site using MGS data.

The timing of the landing site decision has been determined by the need of ESA's Mars Express and Starsem's launcher teams to work out a trajectory to enable the spacecraft to deliver Beagle 2 to the desired site. However, further detailed characterisation of the site will continue as new data becomes available from MGS.

USEFUL LINKS FOR THIS STORY

* Mars Lander Beagle 2

http://sci.esa.int/content/doc/cc/19660_.htm

* Beagle 2 homepage

<http://www.beagle2.com/>

* The Mars science articles

<http://sci.esa.int/structure/content/index.cfm?aid=9&cid=2839>

Variable of the Month

Nova Puppis 2000 or V445 Pup

This was a real New Year's present to observers.

On December 30, Kazuyoshi Kanatsu of Japan reported a previously invisible ninth magnitude object in a CCD frame exposed on 2000 December 22. As often happens, the object is right in our own back yard, whereas it was quite low in the sky as observed from Japan. We should have noticed it first!

The discovery highlights the value of visual observing. The announcement came eight days after the exposure, which probably meant that the download was sitting in Kanatsu's computer memory for about a week before he processed it, denying astronomers the opportunity of studying the nova in its early stages. Still, better late than never and we congratulate Kanatsu.

It is easy to find and identify the field without setting circles. The nova lies between the naked eye stars marked m and k Puppi in Norton. The field immediately surrounding it is shaped like the Southern Cross, shrunk by a factor of 90. The star marked 104 corresponds to alpha Crucis, the 99 to delta, the 87 to gamma and the star with no magnitude to beta. The nova corresponds more or less to the Jewel Box. What could be easier? Have a look and let Brian, Jan Hers or myself have your estimates. It was mag 10.0 this morning but fluctuates in brightness.

Good observing!

Danie Overbeek

2001 01 22.

Cloning

Scientists in China have recently performed the first successful cloning of a human being.

Unfortunately, the DNA donor for the cloning had Turrets Syndrome. As a result, the clone exhibited the same characteristic swearing tendencies as the donor.

The lead scientist for the project recently admitted taking the clone to the roof of the science facility and pushing him to his death. This, due to the incessant profanity which the new clone used.

The scientist has been charged with making an obscene clone fall.

Submitted by **Trevor Gould**.

Sherlock and Watson

Sherlock Holmes and Mr. Watson went on a camping trip. After a good meal and a bottle of wine they lay down in their tent for the night and went to sleep. Some hours later, Holmes awoke and nudged his faithful friend awake.

"Watson, look up at the sky and tell me what you see."

Watson replied, "I see millions and millions of stars."

"What does that tell you?" Holmes questioned.

Watson pondered for a minute.

"Astronomically, it tells me that there are millions of galaxies and potentially billions of planets. Logically, I deduce that the time is approximately a quarter past three. Astrologically, I observe Saturn is in Leo. Theologically, I can see that God is all-powerful and that we are small and insignificant. Meteorologically, I suspect that we will have a beautiful day tomorrow".

"Is that all?", Holmes asked.

"Yes." Watson replied. "Why, am I missing something?".

Holmes was quiet for a moment, then spoke:

"Watson, someone has stolen the #@\$!?!?...tent."

Submitted by **Eric Brindeau**

Sky Chart for the Variable of the Month

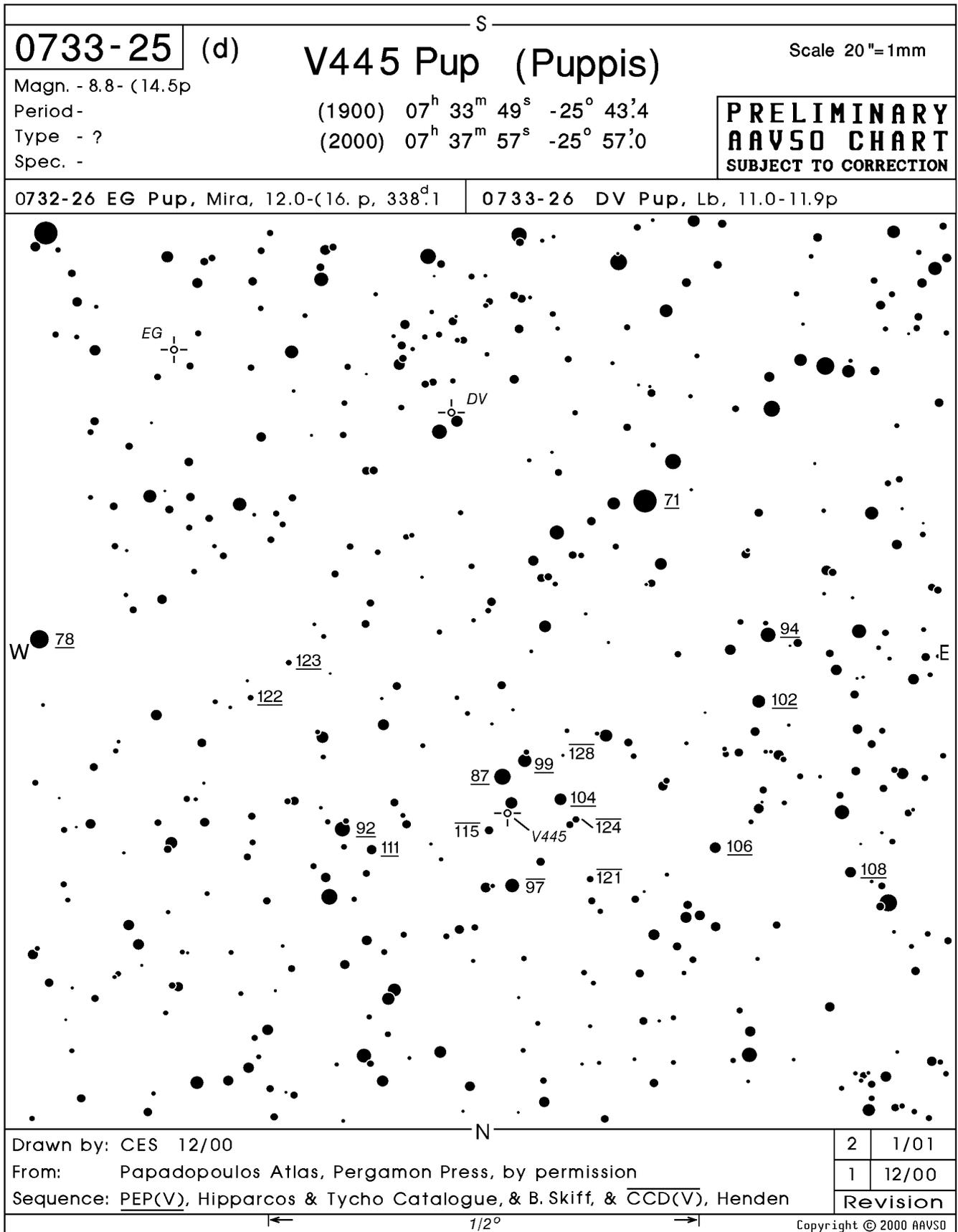


Chart downloaded from the AAVSO Website:

www.aavso.org

Southern African Meteorite Recovery Program

P.O. Box 2552
Cramerview
2060

Amateurs in the Service of Science

Phone +27 11 886 5602
Mobile +27 83 212 8945
South Africa

Deo Gloria

2001.01.05

Easter 2000 Expedition

Members

Trevor Gould
Evan Dembskey
Clint Lahoud
Jethro
Lynithe du Preez and partner

The overlap of membership between the two expeditions is a cause for concern. So far, only Lynithe and the writer have attended both. The cumulative experience we should be building is therefore limited, and the program needs to attract individuals with a desire to build experience over a long period of time. The alternative is to attract participants who already have collected meteorites in the field and can share their experience.

It is noted with regret that no professional geologists, or representatives of SAHRA have been able to attend either of the expeditions conducted to date.

Although the intention is for amateurs to contribute to science, it would be helpful for those with knowledge to assist on site. I am sure that we will be fortunate to have the pleasure of knowledgeable company on future expeditions.

The role of the Geology Department of Wits U in analysing sample returns.

Expedition members would like to thank the Geology Department, and especially Prof Uwe Reimold, for help both prior to, and after, expeditions conducted in 2000. Additionally, I would like to thank Prof Reimold for taking us seriously and for the handling the additional burden of our 'meteor-wrong' samples on his workload so graciously.

Acknowledgements

The members of the two expeditions conducted in 2000 would like to thank the SAHRA, and especially Mary Leslie, for granting a permit for the collection of meteorites to people who have no experience and are not professionals in that field.

Should the SAHRA see fit to issue a further permit, we would be extremely grateful.

Forms: Status

Originals of the forms have been returned to SAHRA with a letter dated 5 June 2000.

Expedition Area

The expedition area was to the North of Verneukpan [S29d52m / E21d9m30s]. The farm name is Vaderlandspan. The 1:50 000 map number is 2921cc. The geology map states rock type = PPr [Pietermaritzburg Series shales

Dates

Monday 24 April 2000	Travel Johannesburg – Upington district – Augrabies Falls - camp on Vaderlanspan
Tuesday 25 April 2000	Searched for meteorites
Wednesday 26 April 2000	Searched for meteorites
Thursday 27 April 2000	Searched for meteorites
Friday 28 April 2000	Broke camp and returned to Johannesburg

Comment

The intended search area was Verneukpan where Donald Campbell made a Land Speed Record attempt in 1929. Unfortunately this proved to be under water. [It was still partially muddy and under water during the Spring Expedition].

Subsequent thinking has led us to believe that dry pan surfaces would prove to good for RECENT falls. Older falls would become covered in mud and could sink.

We therefore moved North of Verneukpan to a desert pavement surface on the farm Vaderlanspan.

The expedition intention was to concentrate on any area likely to have soaked up meteorite falls over a long period of time and to leave them exposed.

The underlying shale geology looked likely as a reasonably good contrast area. [Contrast shales with dark rocks with possible fusion crusts].

The geology map proved to be too generic, and one with sufficient detail was not available. In fact, the shales were interspersed with banded iron formations [BIFs] which proved to be a problem.

We were sidetracked by the discovery of small stones that were heavy, were attracted by a magnet, and had a shiny black [fusion?] crust. They proved to be BIFs, rich in iron and covered with desert patina. It was hoped that at least one would prove to a meteorite, and while Wits Geology sawed all sample returns open for study, this group proved all to be BIFs.

As an aside, the conventional wisdom of hunting for meteorites with a metal detector would have suffered the same fate.

Other rock types proved to be lavas. If anything, these samples got my hopes up that one would be meteoritic. One contained visible olivine, had an apparent fusion crust with deep cracks [as mentioned by Dr Mike Zolensky / Johnson Space Centre]. On analysis, one of these also contained nickel, but Wits identified all samples as terrestrial.

Karl Sagan stated that “extraordinary claims require extraordinary evidence” and it is right to be quite skeptical in declaring an object to have originated in space.

It is suggested that we locate concentration mechanisms close to old surfaces for the next Expedition. It can be assumed that 500 year rains and greater could conceivably move meteorites and other rock from old surfaces and concentrate them in runoff areas. This option has yet to be explored. In conjunction with a move westwards, this could prove to be rewarding.

Summary

While South Africa's 50th meteorite remains elusive, the experience gained will pay dividends in future and further explorations.

It is felt that any experience gained can be beneficially used in future and therefore the expedition was not wasted, despite the high fuel cost.

The lack of success in returning a valid meteorite is probably a function of lack of experience in identifying one in the field. Once the first is found, I predict a spate of finds!

Easter 2001, a meteoritical odyssey

The next expedition should be conducted to the west of the current permit area [thus necessitating a new permit].

A permit application for an area bounded by Upington, Vredendal, the West coast, and the Namibian border will be made. Should a permit be issued, we should invest in 1:50 000 topographical maps to speed identification of likely sites.

This will allow freedom 'on the ground' to move to better spots.

Therefore a provisional set of dates is proposed here:

Friday 13 April 2001	Travel to permit area. Full day travelling via Upington. Camp overnight on farmland.
Saturday 14 April 2001	Reconnoitre likely are as. Decide on one to be investigated in depth. Begin search.
Sunday 15 April Easter Sunday	Search. Those who wish to attend church will do so.
Monday 16 April	Search.
Tuesday 17 April	Search
Wednesday 18 April	Search
Thursday 19 April 2000	Tourist site visits. [1]
Friday 20 April 2000	Tourist site visits
Saturday 21 April 2000	Make your own way back to Johannesburg

The expedition is designed to maximise use of public holidays [non-revenue earning days!] at a point where the temperatures are neither too hot nor too cold. Please pencil in your diaries now!

Some members of the Spring Expedition 2001 would like to extend a visit to the Richtersveld [for those with 4X4s]. I suspect that no permit will be issued to recover meteorites in National Parks, though.

[1] There are a number of 'geological tourist attractions' to the West including Black Rock, the O'Kiep copper mines, the Steinkopf Reserve area, Gamsberg etc.

Trevor Gould

The Hunter and the Hare

A Word-search for 11 star names

E U L A K A T N I M
 S M T A N L T A X A
 U E D M H N U I F L
 E I L E G I R R O I
 G S V L O T N A D N
 L S F K A A V L E L
 E A A L P K I S B A
 T B L J H P I A S H
 E E H I Q S X I A I
 B E N R A R T F Z G

Submit your 11 star names before 20th February and win the tremendous honour of having your name published in the hallowed pages of this esteemed magazine.

An Honour for an Honourary Member

PATRICK MOORE TO BE KNIGHTED

Patrick Moore has been England's premier Amateur Astronomer for many decades - in fact, more than 40 years at last count. At the end of last month, it was announced by Buckingham Palace that he will receive the country's highest royal recognition when Queen Elizabeth II bestows a knighthood upon him for "services to the popularisation of science and to broadcasting."

The 77 year old Moore, who has written and starred in the BBC television series "The Sky at Night" for some 44 years, which has placed him (and the show of course) into the record books. He has written in excess of 90 books and is a regular contributor to many Science and Astronomy magazines and periodicals, and has been active in Astronomy long before reaching his teens. He has also been a long time member of the British Astronomical Society.

Sadly, he has recently been severely affected by a deterioration of his spine which has had a serious impact on his observing and writing, but he hopes to continue his work on "the Sky at Night" for some time to come.

Submitted by **Chris Stewart**

Two weeks to travel to Mars

Excerpt from an announcement dated
 Thursday, 04 Jan 2001 10:47:30 -0500

Beer-Sheva, December 28, 2000 -- Scientists at Ben-Gurion University of the Negev have shown that an unusual nuclear fuel could speed space vehicles from Earth to Mars in as little as two weeks. Standard chemical propulsion used in existing spacecraft currently takes from between eight to ten months to make the same trip. Calculations supporting this conclusion were reported in this month's issue of Nuclear Instruments and Methods in Physics Research A (455: 442-451, 2000) by Prof. Yigal Ronen, of BGU's Department of Nuclear Engineering and graduate student Eugene Shwagerous.

In the article, the researchers demonstrate that the fairly rare nuclear material americium-242m (Am-242m) can maintain sustained nuclear fission as an extremely thin metallic film, less than a thousandth of a millimeter thick. In this form, the extremely high-energy, high-temperature fission products can escape the fuel elements and be used for propulsion in space. Obtaining fission-fragments is not possible with the better-known uranium-235 and plutonium-239 nuclear fuels: they require large fuel rods, which absorb fission products.

Ronen became interested in nuclear reactors for space vehicles some 15 years ago at a conference dedicated to this subject.

Speaker-after-speaker stressed that whatever the approach, the mass (weight) of the reactor had to be as light as possible for efficient space travel. At a more recent meeting, Prof. Carlo Rubbia of CERN (Nobel Laureate in Physics, 1984) brought up the novel concept of utilizing the highly energetic fragments produced by nuclear fission to heat a gas; the extremely high temperatures produced would enable faster interplanetary travel.

From: **Andrew Yee**
 ayee@nova.astro.utoronto.ca
 Jet Propulsion Laboratory,
 Pasadena CA

Diary of Astronomical Phenomena:- 2000

February 2001

dd hh	dd hh
1 14 FIRST QUARTER	15 09 Mars 2.9 S of Moon,
2 09 Saturn 2.2 N of Moon	20 19 Moon at apogee,
2 22 Jupiter 3.0 N of Moon	20 23 Neptune 2.1 N of Moon,
3 14 Mercury stationary	21 16 Mercury 5.6 N of Moon,
7 21 Moon at perigee	21 23 Venus greatest brilliancy,
8 07 FULL MOON	22 04 Uranus 2.4 N of Moon,
9 12 Uranus in conj. with Sun	23 08 NEW MOON,
13 01 Mercury in inferior conjn	25 05 Mercury stationary,
14 16 Mercury 4.6 N of Uranus	26 08 Venus 11.4 N of Moon
15 03 LAST QUARTER	

February 2001

dd hh	dd hh
1 18 Saturn 2.1 N of Moon	18 19 Pluto stationary,
2 08 Jupiter 2.9 N of Moon	20 08 Neptune 2.2 N of Moon,
3 02 FIRST QUARTER	20 10 Moon at apogee,
3 20 Mercury greatest brilliancy	20 13 Equinox,
4 15 Mars 5.5 N of Antares	20 20 Mars 10.2 S of Pluto,
7 10 Venus stationary	21 13 Uranus 2.5 N of Moon,
8 06 Moon at perigee	22 18 Mercury 2.1 N of Moon,
9 17 FULL MOON	25 01 NEW MOON,
10 07 Mercury 0.2 N of Uranus	25 05 Venus 14.4 N of Moon,
11 12 Mercury greatest elong. W(27)	29 04 Saturn 1.8 N of Moon,
15 20 Mars 2.0 S of Moon	29 21 Jupiter 2.5 N of Moon,
16 21 LAST QUARTER	30 05 Venus in inferior conjn.

LOCAL TIMES of RISE and SET for the MAJOR PLANETS, 2000

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
Feb 10	05.51	18.53	06.21	19.02	09.11	20.58	23.49	13.09	13.24	00.08	12.49	23.46
Feb 20	05.57	18.46	04.55	17.51	09.02	20.32	23.28	12.54	12.47	23.31	12.11	23.08
Mar 02	06.03	18.37	04.10	17.15	08.42	20.00	23.07	12.38	12.13	22.55	11.34	22.30
Mar 12	06.09	18.27	04.04	17.07	08.07	19.17	22.46	12.20	11.39	22.20	10.58	21.53
Mar 22	06.13	18.16	04.20	17.09	07.13	18.25	22.23	12.01	11.06	21.46	10.23	21.17