

CANOPUS

The Astronomical Society of Southern Africa

Johannesburg Centre

Monthly Newsletter for July 2000

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

Editorial

Another Jo'burg Centre year draws to a chilly close with Winter blowing it's frosty breath around us as we go about our observations. Of course, it takes a little more determination to do so at this time of the year, but the results are usually more spectacular as the seeing tends to be much clearer than at other times of the year. Early mornings have the two big planets putting on a good show though this is only available to those of us who are insane enough to leave for work before 06:00.

The Centre's A.G.M. is being held at 19:00 on *Saturday* the 15th July this year and our normal Wednesday evening meeting will be used from 20:00 by the ASSA parent body for their A.G.M. More information on these meetings is available in the Notices.

The big Astronomical news of the moment is of course the announcement of strong evidence of liquid water on or near the surface of Mars. This makes the case for more missions to Mars all the stronger, including some manned missions in the next few years. Just imagine, in a few decades, the younger members of our society might be in a position to consider a holiday on Mars - this is exciting!

Bill Wheaton keeps us abreast on the status of some of NASA's current missions, of both major and moderate importance. There are many missions being planned or in the final throes of implementation and you are sure to find something of personal interest amongst them. Brian, besides his normal "state of the heavens" report, has supplied us with an interesting article on when mid-winter's day actually occurs. This of course changes by a few hours from year to year.

The Planetarium is on the lookout for presenters - if anybody out there is interested in taking on this challenging and rewarding task, please read Claire's short piece on the subject.

Included please find a nomination form for election to the committee as well as a form asking you for your personal interests and things you'd like to see us achieve during the next Jo'burg Centre year.

The Editor

chris@aqua.co.za

Committee of the Johannesburg Centre of the ASSA for 1999/2000		
Chairman	Constant Volschenk	972-6038
Vice Chairman	Evan Dembsky	680-9304
Secretary	Wolf Lange	849-6020
Treasurer	Constant Volschenk	972-6038
Librarian	Ed Finlay	616-3202
Curator of Instruments	Frans van Nieuwkerk	609-8158
Viewing Officer	Constant Volschenk	972-6038
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Notice of Annual General Meeting

The **July** meeting of the Johannesburg Centre of the Astronomical Society will be held in the Sir Herbert Baker Library, 18a Gill Street, Observatory, on **Saturday** the 15th of July, 2000 at **19:00**.

*** Please note the change from our normal Day and Time ***

The A.G.M. will be followed by a Bring 'n Braai and viewing

Future Meetings

August 9 th (<i>provisional</i>)	Ring Galaxies	Prof. Ron Bruto, U of Alabama
September 13 th	A Telescope history	Tony Hilton
October 11 th	Meteorite Collecting	Trevor Gould
November 8 th	Impact Craters	Prof. Uwe Reinhold

Are there any subjects that you would like to hear at one of the monthly meetings? Contact your local friendly committee member and ask her/him to discuss it in committee.

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 viewing time with them.

1 st July	28 th October	Year End Star Party 2000
26 th August	25 th November	<i>"Under the Full Moon"</i>
23 rd September		9 th December

Jo'burg Centre Outings for 2000

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 revived - if you want to join in our perennial jaunt to Swinburne from 7th to 9th July, contact Ed Finlay on (011) 616-3202.

Boyden - now cancelled as we cannot get access to the 60" telescope for the available date.

We will also be looking at the possibility of arranging visits to other ASSA Centres (e.g. the Pretoria Centre) during the year - and also try to see if we can organise some joint ventures.

Haartebeeshoek - Wolf Lange is attempting to organise a visit later in the year, as well as a visit to the Suikerbosrand Nature Reserve.

Tswaing Crater - still trying to set up a day visit under the guidance of Prof. Reinhold

ASSA Annual General Meeting

The ASSA Parent Body would like us to host their AGM. As *our* AGM will be on 15 July (see below) we have agreed to host the ASSA AGM at the Sir Herbert Baker Library on our normal meeting night of Wednesday 12 July. We will publish more information in the next issue of Canopus.

This year's AGM and Bring 'n Braai

Last year we held a bring 'n braai as part of our AGM, and the smallish turnout notwithstanding, it was a quite successful. So going by the feedback we have received in this regard, it has been decided that the A.G.M. will be held at 19:00 on *Saturday* the 15th of July in the Sir Herbert Baker Library.

Please note the earlier starting time of 19:00. The meeting will run between 19:00 and 20:00 and then we will retire to the Braai area to partake of whatever gastronomic delights we can create. The domes will also be opened for whomever is interested in viewing the wonders of the Wintery night sky. With a bit of luck, we may be able to persuade Tony to open the 26" as well.

Nominations for Committee for the 2000/1 Year

The following current committee members have indicated their willingness to serve another term.

Ed Finlay *Wolf Lange* *Constant Volschenk* *Frans van Nieuwkerk*
Melvyn Hannibal *Evan Dembskey* *Chris Penberthy*

In addition, *Chris Stewart* and *Tom Budge* have also indicated that they are willing to serve on the committee for the coming year.

If any of you our readers would like to nominate someone, or serve on the committee yourselves, please contact one of the committee members, and we will add the name(s) to the nomination list. If more than ten names are available, an election will be held to select ten members to serve on next year's committee.

A nomination form is included with this issue including the abovementioned names, and space to add any nominations of your own. *Remember that nominees must agree to their nomination.*

Public viewing nights

We have public viewing once a month, on the Friday following New Moon. This is of course subject to the vagaries of the weather. Members are welcome, but there is a nominal charge of R5.00 for members of the public including any guests you may bring along. Here are the dates through November 2000.

7th July 8th September 3rd November
4th August 6th October

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.

For Sale

Russian Made 4.5" Newtonian telescope
(manufactured in 1995)
15 mm Eyepiece
25 mm Eyepiece
3x Barlow(?)

Reason for selling: No longer being used
Price: R1500.00 or nearest offer
Contact: **Nancy Diuguid**
Telephone: (011) 726 3578

Mid-Winter's Day

So when on the calendar is the shortest day of the year? (For the Southern Hemisphere)

Is it in fact June 21st? Or is it the 22nd now, due to precession or the falling gold price?

This may sound like a simple question but to understand what you are asking is actually quite complicated.

The problem is that the calendar is a man-made invention but the motion of the solar system was set up by a completely different Agency, who did not mind using fractions of a day when He determined the length of the year. In the Gregorian calendar we don't use fractions of a day, so certain feasts and events move around. Like Easter. And Solstices. And Equinoxes.

The shortest day happens around the time when the sun reaches its furthest position north of the equator. In the year 2000 this happens at about 01.48 Universal Time on Wednesday June 21st. Not every year is the same. This date will move one or two days before or after June 21st for the same reason that we have an extra day in leap years. So it could happen from June 19th to June 23rd in any year. When we talk about "what day is it?" we have to take into account the International Date Line and the line on the earth directly opposite the sun, where it is "midnight". The area to the east of "midnight" is a day ahead of the area to the west of "midnight" - except when "midnight" crosses the International Date

Line, when the whole world is on the same "day".

So when we say the solstice is at 01.48 UT on Wednesday 21st June, it is not "Wednesday" in the whole world. In fact in the USA, it is still Tuesday and for them the solstice occurs on Tuesday 20th June this year. In other years it may occur on the same "day" in the USA as it does in South Africa. But because there are always two "days" running at the same time at different places around the world (except when it is "midnight" across the International Date Line, when the whole world is on the same "day") we must be careful about noting a "day" for events that happen out in space.

For instance, Neil Armstrong may have landed on the moon on July 20th, for Americans, but it was July 21st for some other countries around the world. That is why, when you are talking about international events, it is good to define the reference system you are using. When you refer to the time and date of astronomical events you very definitely need to state what your reference system is.

And the international standard is now Universal Time (the old Greenwich Mean Time).

No matter what the gold price is.

Brian Fraser.

Hale-Bopp May Have Formed Near Neptune

From the Stardust List at NASA's JPL

Comet Hale-Bopp, which paraded across evening skies during the winter and early spring of 1997, may have formed in our solar system somewhere near Neptune, a team of astronomers announced today. If correct, this would be the first time scientists have been able to pin down the homeland of one of the solar system's icy wayfarers.

The conclusion was based on the first-ever measurement of a noble gas in a comet, which revealed the comet has an abundance of argon, said Alan Stern, leader of a team of researchers that announced the finding today at the American Astronomical Society's meeting in Rochester, NY. Stern directs the Southwest Research Institute's Space Studies Department, and is principal investigator of the team that analyzed Hale-Bopp.

Try:- http://www.space.com/scienceastronomy/comet_hale_000605.html for the full story

JPL and NASA News

Bill Wheaton IPAC - July 2000

Astronomy for the Next Decade:

The "Decadal Report" of the Astronomy and Astrophysics Survey Committee (AASC) of the US National Research Council has been released in draft form. It has become customary in the USA to prepare such reports every ten years, and they are extremely important in setting NASA's astronomical priorities for the coming ten years. Other, non-space agencies supporting astronomy are included as well, such as e.g., the National Science Foundation (NSF) for most ground-based programs. Planetary exploration and Earth observation missions, however, are not included in the committee's purview.

The AASC includes 13 astronomers and astrophysicists under co-chairs Chris McKee and Joe Taylor. It established nine sub-panels to report on wavelength subdisciplines and other major areas, including over 100 members in all. These panels then made a great effort to collect wide community inputs.

Although program details (and of course acronyms) may change, still, the list of top priorities is likely to organize NASA and US efforts in astronomy for years to come. Besides new initiatives, the committee particularly calls for completion of recommendations of the 1991 AASC (the Bahcall Committee):

SIRTF, the Space Infrared Telescope Facility (on schedule for launch in December 2001), at:

<http://sirtf.caltech.edu/sirtf.html>;

ALMA, the Atacama Large Millimeter Array (previously known as the MilliMeter Array, MMA) is an international project to build a VLA-style array of at least 64 movable 12-m antennas at nearly 5000 m altitude in Chile; the URL is:

<http://www.alma.nrao.edu/info>.

SOFIA, the Stratospheric Observatory For Infrared Astronomy, is a 2.5-m airborne IR telescope expected to begin flying in 2002. The URL is:

<http://sofia.arc.nasa.gov>;

SIM, the Space Interferometry Mission, currently scheduled for launch in June, 2006, URL is:

<http://sim.jpl.nasa.gov/index.html> and

MAP, the Microwave Anisotropy Probe, to continue the pioneering work of COBE, the Cosmic Background Explorer. Planned launch is April, 2001, and the URL is

<http://map.gsfc.nasa.gov> .

Evidently I cannot hope to recite more than a few superficial buzz phrases about each of the missions and plans mentioned in such a large-scale roadmap, laying out a decade of effort. Thus for now I will only be able to give minimal information and URLs so you can, I hope, take advantage of the huge resources of the World-Wide Web.

Major Initiatives:

1. The committee confirmed the Next Generation Space Telescope (NGST), as its top recommendation. NGST is to be an 8-m space infrared telescope, working from the visible out to at least 10μ , with 100 times the sensitivity and ten times the angular resolution of the HST in the infrared. It is intended to detect the light from the first stars and observe the formation of the first galaxies, as well as revolutionize our understanding of the current formation of stars and planets in our own galaxy, the Milky Way. The URL is *<http://ngst.gsfc.nasa.gov>.*
2. The Giant Segmented Mirror Telescope (GSMT) is the committee's second priority, and top ground-based recommendation. It would have approximately 30 m aperture, and use adaptive optics to achieve diffraction-limited imaging in the atmospheric windows between 1 and 25μ . The committee advised that the US seek approximately 50% cost sharing with private or international partners, and that construction begin within the decade. Being a ground-based project (like the EVLA and LSST, below) the US agency involved would presumably be the NSF. So far I have found no URL for this exciting project.
3. The Constellation-X Observatory is an array of large X-ray telescopes, designed to acquire high-quality spectra with grating spectrometers working in the 0.2-2 keV

band, of sources as faint as the weakest sources observed in the ROSAT deep surveys. This will require a throughput 20 to 100 times higher than Chandra or XMM. In addition, it would include focusing hard X-ray telescopes operating to an energy of 40 keV, about three times higher than focusing optics in space astronomy so far. URL: <http://constellation.gsfc.nasa.gov>.

4. The Expanded Very Large Array (EVLA) is a major upgrade and improvement of the original Very Large Array radio telescope, now twenty years old; which revolutionized radio astronomy when it came into operation. The expansion will provide new receivers on all bands with wider bandwidth and lower system noise, continuous frequency coverage from 200 MHz to 50 GHz, fiber optic data transmission, many more spectral channels, and an increase in the number of antennas from 27 to 35, at baselines up to 300 km. The result will be an order-of-magnitude improvement in both sensitivity and angular resolution, and 1000 times better spectroscopic capability. The URL is: http://www.aoc.nrao.edu/vla/html/Upgrade/Upgrade_home.shtml.
5. The Large-aperture Synoptic Survey Telescope (LSST) is an approximately 6.5-m aperture ground-based telescope, designed to survey the visible sky every week, to a much fainter level than that reached by existing surveys. It would extend the ongoing 1-km survey, intended to catalog Near-Earth Asteroids, down a size of about 300 meters, which is still large enough to cause a huge disaster if a populated area were struck. Also, it will observe about 10,000 Kuiper-Belt objects, and thousands of supernovas. No URL is yet known to me, unfortunately.
6. The Terrestrial Planet Finder (TPF), described as NASA's most ambitious space science mission. TPF is a space-based IR interferometer array intended to detect and characterize Earth-like planets at distances out to about 50 light-years. It would have spectroscopic capabilities to detect water, carbon dioxide, ozone, and methane in the atmospheres of such potential abodes for life. The concept is still under development, but an array of four free-flying 3.5-m telescopes, operating from the near IR to perhaps 30μ ,

with interferometric baselines of 75 to 1000 m, is under consideration. Launch could come in 2010. The URL is <http://tpf.jpl.nasa.gov>.

7. The Single-Aperture Far InfraRed (SAFIR) Observatory is an 8-m class telescope in space to work in the far IR, from 30 to 300μ . It would follow-up and extend the work of NGST. The project could start near the end of the decade. As yet no WWW information seems to exist.

Moderate Initiatives:

The highest priority space missions in this category is GLAST, the Gamma-ray Large Area Space Telescope, which is an enlarged and improved follow-up to EGRET, the Energetic Gamma-Ray Experiment on the late, lamented, Compton Observatory. GLAST will have greatly improved angular resolution and sensitivity over its predecessor. The energy range would be from 10 MeV to 300 GeV. A URL for GLAST is <http://glast.gsfc.nasa.gov>.

LISA, the Laser Interferometer Space Antenna, is a very ambitious gravity wave detector, a follow-on to LIGO, the Laser Interferometer Gravitational Wave Observatory now about to come into operation. The prospects for LIGO to detect gravity waves are somewhat controversial, at least in its initial configuration; some good luck may be needed. However, there seems little doubt that LISA should see cosmic signals, unless our understanding of either gravity waves or astronomy is somehow very mistaken. LISA would use phase-locked lasers on three widely separated spacecraft to achieve a large sensitivity gain over LIGO. The committee recommends a co-operative effort with the European Space Agency, to keep the cost reasonable. I understand from Prof. Tom Prince of Caltech, the Project Scientist, that LISA will measure the distance between its three spacecraft with a precision equivalent to measuring the distance to the nearest star to the thickness of a human hair. The URLs are <http://lisa.jpl.nasa.gov> for LISA, and <http://www.ligo.caltech.edu> for LIGO.

A number of other, smaller or lower-priority projects also received the committee's blessing, but those are some of the highlights. We may hope for an exciting decade, with such as these in store.

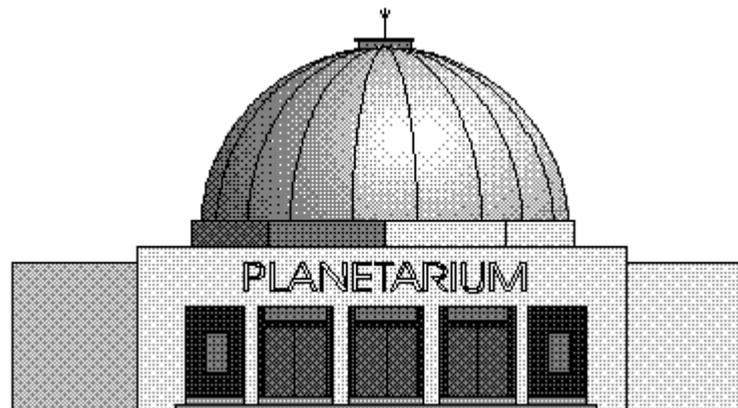
Other News

A problem has disabled NIS, the Near Infrared Spectrometer on NEAR, the Eros-orbiter mission I've written about here a number of times. NIS was an important instrument because its 64-channel, 0.8 - 2.6 μ , spectra with about a 0.5° field-of-view gave the best means of mapping the surface composition of Eros in detail. NIS was turned off on May 13, after it began drawing abnormally heavy current from the spacecraft. The problem recurred during a brief turn-on attempt on June 5, and there are no plans for further attempts. However, about 58,000 spectra have already been obtained. Data from the X-Ray and Gamma-Ray Spectrometer (XGRS) show that asteroid 433 Eros is not of Class S, from a geologically differentiated parent body similar to the stony-iron meteorites, something of a surprise. Type S had been widely expected at the beginning of the mission. Instead, it appears similar to the chondritic asteroids -- which helps to resolve the mystery of the asteroidal sources of the most common class of meteorites, the ordinary chondrites. These consist of a primitive, unmelted mixture of small globules, or chondrules, in a

background matrix. Winter on Eros began on June 25, when the Sun crossed its equator and the asteroidal south pole was illuminated for the first time. On July 7 the spacecraft will descend to 35 km from the 50-km polar orbit which it has been in since late April.

Major news from Mars is rumored to be in store as I write. By the time you read this, it will should be old hat. However, Mars Global Surveyor has indeed been doing an amazing job, working away quietly, despite all the disappointment here over the fate of its later kindred

Bill Wheaton



The Jhb Planetarium needs volunteer presenters for weekend shows.

Presenters should have a good knowledge of basic astronomy and good presentation skills, and be technically competent.

Contact **Claire** at (011) 717-1392 or 111flan@cosmos.wits.ac.za

The Johannesburg Centre of the Astronomical Society of Southern Africa

MINUTES OF THE ANNUAL GENERAL MEETING HELD IN THE SIR HERBERT BAKER BUILDING, 18A GILL STREET, OBSERVATORY, ON WEDNESDAY 14 JULY 1999 AT 19H00.

1. Welcome

The chairman Mr. Constant Volschenk, welcomed all members present.

2. Apologies

Apologies were received from Dr C Flanagan and Mr. G Jacobs

3. Minutes of previous AGM

The minutes of the previous AGM were read and accepted unanimously.

Proposed: C Penberthy

Seconded: Mr. E Finlay

4. Chairman's Report

The outgoing chairman stated that membership of the Centre at the end of the 1997/8 year was 143, the membership for the 1998/9 year stands at 125, at a net loss of 18 members.

Speakers during the year included:

Tom Budge	"Winter Skies" at the Planetarium
Tim Cooper	"Observing Comets and Meteorites"
Eben van Zyl	"Maths of Einstein"
Tony Voorvelt	"The Physics Magic Show" at Wits .
Tony Hilton	"Computers in Astronomy"
Constant Volschenk	"The History- of the Observatory"
Tom Budge	"Leaving Planet Earth"
Gil Jacobs	"The equation of time" at the Planetarium

The meetings attracted an average of 40 persons (members and visitors).

The Centre conducted two field trips - to the Boyden Observatory in Bloemfontein in July and to Swinburne in August. '

The committee wanted to introduce a beginner's course in Astronomy but since only two members indicated that they were interested it was agreed to shelve it for the meantime.

The Centre was invited and participated in two hobby fairs.

Two telescope driving courses were offered in April and May to members.

Telescope making classes continued under the able supervision of Mr. B Fraser.

In conclusion a number of people and organisations were thanked for their individual contributions to the Centre throughout the year:

The Editors of Canopus, C Penberthy and R & L Barbour, for the stunning newsletter.

John Scott of Parktown Boys High for allowing us to use their facilities for the telescope making class.

Brian Fraser for his time in conducting the telescope making classes.

Ed Finlay for keeping our kitchen facilities in workable clean order and keeping the fridge stocked. .

Chris Penberthy for updating the Centre's Web pages.

The Johannesburg Planetarium for sponsoring the photocopies of the monthly night-sky charts.

Lastly a very big thanks to all the members of the Centre - without you there would be no Johannesburg Centre

Proposed: E van Zyl

Seconded: E Finlay

5. Treasurers Report

A detailed statement of Income and Expenditure was presented, reflecting a closing balance of R13 428.42

Balance in current account	R 135.09
Balance in call account	R14 442.81
Cash float - telescope making	R 134.64
Cash float - Star Bar	R 50.00
Bank error in our favour	R 2 700.00
Canopus and postage May 1998 accrued	R (1 334.12)

Proposed: E Finlay

Seconded: W Lange

6. Librarian's Report

This was rather an uneventful year for the library. The usual letters and newsletters from other Societies as well as the astronomical journals were received during the year. The Library continues to be used by society members but not to a large degree. There should be more interaction between members and the committee/librarian on what books should be purchased. It has been a hectic year and I could not give the deserved attention to the task at hand. The selection of Astronomical books available locally is not amazing and if members come across books in magazines or the Internet that seem of interest, they should mention them to the committee.

On a more positive note, Tony Golding, a committee member has lent a PC to the society. This will be used to catalogue the Library's books and track who has books. It would be best to run ACCESS 97, but this will require more memory. If anyone of the members have spare computer memory to run in a 486 (72pni) it would be most welcome.

Proposed: E Dembsky

Seconded: C Volschenk

7. Curator of Instrument Report

The curator of instruments stated that whilst he has not allocated much time to the maintenance of the

instruments they are generally in reasonable condition,. Some work is still required to the Papadopoulos Telescopes. The Jacobs Observatory has not been used and requires cleaning and attention. He hopes to give more attention to the outstanding tasks in the following year.

Proposed: M Hannibal

Seconded: E Finlay

8. Increase of fees

After some discussions and debating between various members and the committee, it was put to the vote to

- . Increase the fees from R80 to R100 and to
- . Introduce a family fee of R125 for those with a spouse and/or non-earning minors.

The main motivations were the loss of membership and the rising Fees of producing and posting Canopus

The outcome was as follows: 18 for increase, 5 against, no abstention

23 for new family fees. 0 against, no abstention

Proposed: G Corbett

Seconded: W Lange

9. Election of committee

The following members were elected to the committee:

Messrs. C Volschenk, E Dembsky, W Lange, C Penberthy, M Chitters, E Finlay, F van Nieuwkerk, R Barbour. T Golding, M Hannibal and Mrs. M Chitters.

Proposed: E Finlay

Seconded: D Overbeek

10. Other Business

Mr. E Finlay thanked the committee for a job well done and explained that it had been a stressful year in the life of the Centre, in view of the uncertainty of whether the Centre was able to stay on at the premises. This had fortunately been resolved and the accommodation of the Centre looks secure at the Observatory for the foreseeable future. He also made a most welcome donation to the society for which the chairman thanked him wholeheartedly.

11. Closure

The AGM was adjourned at 20h07 and all presented were invited to participate In the "bring 'n braai" organised by the committee.

Chairman (C Volschenk)

Secretary (W Lange)

Date

SPIDER-WEB SENSOR REVEALS A FLAT UNIVERSE

From: JPLNews@jpl.nasa.gov

Inspired by the elegant efficiency of spider webs, researchers at NASA's Jet Propulsion Laboratory (JPL), Pasadena, Calif., have designed a tiny, web-shaped sensor that maps faint structures in the early universe, reinforcing theories that the cosmos is flat in its geometry.

Carried on an internationally sponsored balloon experiment called BOOMERANG (Balloon Observations of Millimetric Extragalactic Radiation and Geophysics), the dime-sized sensor known as a

"micromesh bolometer" is a prime example of NASA's success in developing miniaturized, high-performance technologies for space missions.

In the Sky this Month

July 2000

dd hh	dd hh
1 16 Mars in conj. with Sun	17 06 Mercury stationary
1 20 NEW MOON <i>Eclipse</i>	17 12 Neptune 1.1 N of Moon Occn.
1 20 Mars 2.3 N of Moon	18 16 Uranus 1.5 N of Moon
1 22 Moon at perigee	23 05 Mars 5.8 S of Pollux
2 05 Venus 1.8 N of Moon	24 12 LAST QUARTER
2 06 Mercury 3.2 S of Moon	26 10 Saturn 2.4 N of Moon
2 09 Mercury 4.9 S of Venus	26 20 Jupiter 3.3 N of Moon
4 17 Earth at Aphelion	27 10 Mercury greatest elong. W(20)
6 13 Mercury in inferior conjn.	27 22 Neptune at opposition
7 05 Mercury 5.7 S of Mars	29 18 Mercury 0.8 S of Moon Occn.
8 13 FIRST QUARTER	30 08 Moon at perigee
8 15 Venus 5.8 S of Pollux	30 12 Mars 0.8 N of Moon Occn.
15 17 Moon at apogee	31 03 NEW MOON <i>Eclipse</i>
16 14 FULL MOON <i>Eclipse</i>	

August 2000

dd hh	dd hh
1 02 Venus 1.1 S of Moon Occn.	22 01 Mercury in superior conjn.
3 19 Mercury 7.2 S of Pollux	22 02 Mercury 1.4 N of Regulus
6 07 Venus 1.1 N of Regulus	22 11 Pluto stationary
7 01 FIRST QUARTER	22 19 LAST QUARTER
9 17 Mercury greatest brilliancy	22 20 Saturn 2.1 N of Moon
10 13 Mercury 0.2 S of Mars	23 10 Jupiter 3.0 N of Moon
11 05 Uranus at opposition	27 14 Moon at perigee
12 02 Moon at apogee	28 03 Mars 0.0 S of Moon Occn.
13 17 Neptune 0.0 N of Moon Occn.	29 11 NEW MOON
14 20 Uranus 1.3 N of Moon	29 22 Mercury 2.7 S of Moon
15 05 FULL MOON	30 23 Venus 3.8 S of Moon

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
Jul 09	06.56	17.30	06.28	17.20	07.29	18.03	06.50	17.18	03.36	14.21	3.15	14.09
Jul 19	06.54	17.34	05.40	16.28	07.36	18.21	06.37	17.09	03.05	13.49	2.39	13.33
Jul 29	06.50	17.39	05.31	16.11	07.39	18.38	06.23	17.00	02.34	13.16	2.04	12.56
Aug 08	06.43	17.44	05.55	16.36	07.39	18.55	06.08	16.50	02.02	12.43	1.27	12.19
Aug 18	06.35	17.48	06.27	17.28	07.36	19.11	05.51	16.41	01.29	12.08	0.50	11.42
Aug 28	06.26	17.53	06.48	18.18	07.32	19.27	05.33	16.31	00.54	11.33	0.12	11.04