

# CANOPUS

**The Astronomical Society of Southern Africa**

**Johannesburg Centre**

**Monthly Newsletter for December 2002**

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

## Editorial

Eclipse fever is starting to affect the un-initiated. Work colleagues who have never before shown the slightest inclination toward anything Astronomical ( more usually things of an Astrological bent ) are now finding excuses to visit those of us with more of a leaning in that direction. And of course, the topic usually starts something like this....."So tell me, where do I get a pair of these glasses to look at the Sun?" which shows that in general that the Eclipse advertising appears to be working fairly well! This in turn usually leads to a quick lesson on how eclipses work complete with rough diagrams and scribbles. I think we may see another small surge in membership during this period of eclipse excitement.

Venus has quietly done her little jump from the one side of the sky to the other, and now transformed into the "Morning star" where she joins most of the other major Planets in an extended display in the Eastern Morning sky. It really can be enjoyable following the dance of the Planets.

**Eben van Zyl** continues his series with one entitled "How did Einstein do it?" which gives some insight into the famous  $E = mc^2$  formula, and our **Chairman Dave Gordon** takes a retrospective look at the year just past. Some pictures from the pre-eclipse meeting of the 16<sup>th</sup> November are also included to show the sort of interest which has been generated for 4<sup>th</sup> December.

**Brian Fraser** has once again supplied us with the monthly tables of all the astronomical events of interest - for the whole of 2003. Included on the back page are the tables for December 2002 and January 2003.

For those members with a few bucks to spare, **Dennis Du Plooy** of **Photoweb** has a bargain for you - have a look at the half-page advert on the inside back cover and see if you can resist the offer!!!

ECLIPSE chasers - Once again remember we have a solar eclipse on 4<sup>th</sup> December. If you would like to be there, contact a committee member, or Brian Fraser for further details on how to get to the area of interest. Time and accommodation has just about run out - so don't delay or you will miss this big event.

*The Editor*

*chris@penberthy.co.za*

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## Notice of Monthly Meeting

The Monthly Meeting of the Johannesburg Centre of the Astronomical Society will be held in the Sir Herbert Baker Library, 18a Gill Street, Observatory, on Wednesday, 11<sup>th</sup> of December, 2002 at 20:00.

### Informal get together and Eclipse Feedback and Visitors from the Netherlands

## Public Viewing ( *weather permitting* )

Public viewing nights are held *subject to suitable weather conditions* on the Friday nearest First Quarter, and are held at the Old Republic Observatory, 18a Gill Street, Observatory, Johannesburg. Starting time around 19:30. *See the ASSA event calendar for the proposed viewing dates.*

## Web Between the Worlds

It's almost time to compile a Christmas gimme list. Here is a decent telescope buyers' FAQ (Frequently Asked Questions) list to help you with yours. I recommend it to all first-time buyers.

<http://home.earthlink.net/~hakaida/index.html>

Even if you don't use Mathematica, Wolfram Research's website is a useful resource. Take a look at the following pages.

<http://integrals.wolfram.com/>

<http://scienceworld.wolfram.com/>

<http://mathworld.wolfram.com/>

<http://functions.wolfram.com/>

NASA's Planetary Photo-journal offers a staggering amount of really great pictures of the Solar System.

<http://photojournal.jpl.nasa.gov/>

Cartes du Ciel is a nice free sky charting programs. It supports a decent variety of catalogues. Version 2.75 is available at:

<http://www.stargazing.net/astropc/>

Richard Fleet has written a sky chart program to show when the best time to view objects in the sky at any time of the year, and from any location in the world.

GraphDark allows you to work out when an astronomical object will be visible from your location and when moonlight, twilight or low haze will affect its visibility. An additional option displays the moon's phases as a lunar calendar. Typical uses might be planning a series of observing sessions for deep sky objects so that moonlight can be avoided, working out when a comet will be visible from your location at a reasonable altitude, or when a variable star will be visible.

<http://www.naas.btinternet.co.uk/>

Clear skies!  
Evan Dembskey

## ASSA Jo'burg Centre - Calendar of Events

Month	Day/ Date	Event	Details
Dec	Tue 3	<i>Possible</i> Star Party at Tshipese before	
	Wed 4	<b>Solar Eclipse 2002</b>	
	Mon 9	Committee meeting	
	Wed 11	<b>Year End Monthly Meeting</b> and Eclipse 2002 feedback	Informal get together and viewing
Jan 2003	Mon 6	Committee meeting	
	Wed 8	<b>Monthly Meeting</b>	A visit to Birr Observatory <b>Tony Hilton</b>
Feb	Mon 10	Committee meeting	
	Wed 12	<b>Monthly Meeting</b>	T.B.A.
Mar	Mon 10	Committee meeting	
	Wed 12	<b>Monthly Meeting</b>	T.B.A.

### Reminders

2002	ASSA Symposium / hosted by Pretoria Centre/ At Aloe Ridge Hotel and Conference Centre LEONIDS Nov 19 <b>December 4, Solar Eclipse</b>
2003	Centenary of Flight <b>August: Mars opposition</b> <b>Mercury Transit</b>
2004	Centenary Sir Herbert Baker Library Building Johannesburg Centre to host 2004 ASSA Symposium <b>June 8, Venus Transit</b>

*We received the following email during the month.*

### SN 2002hy in NGC

Dear friends,

I did hesitate initially, but I am here again with the news of another SN discovery. I think most of you like to be informed on this, and some of you already know.

It concerns SN 2002hy in NGC 3464. This is the sixth SN discovery with the CCD at the Bronberg Observatory, the seventh in total.

Thanks for your support.

Kind regards,

Berto

PS and now the Leonids.

*Regarding Berto Monard's latest Supernova discovery*      *Ed.*

## The Year in Retrospect

*Hello fellow members*

I'll start by extending a warm and friendly welcome to our 30 new members who have joined the society since 1 July 2002, the start of our financial year. You now belong to a clan of 143 astronomy enthusiasts who love to meet and share experiences of all things astronomical.

There are 60 new enthusiasts who joined the society between 1 January and 30 June 2002. In total, a 170% increase in membership over 2000/2001! Credit due to our past Chairperson, Trevor Gould, for starting the wonderful momentum.

So, who are we?

We are a group of like-minded amateur astronomers who enjoy sharing a common interest as regularly as possible. We are non-critical, unassuming and completely tolerant of all levels of astronomical understanding. Remember, we all started by asking the questions: "what is a planet", and "what is a star". The opportunity to popularise and teach a little of what we are passionate about is part of the delight of astronomy.

It's a debatable point: Can we force an appreciation and fascination for the stars? In most cases I doubt it. More likely, we can be a catalyst, a spark that ignites a life-long affair with astronomy that is an irrepressible hunger for knowledge, the supply of which is inexhaustible in a single lifetime.

So, I guess in my own rambling way, I'm trying to say that you can't force people to attend the monthly Astronomical Society meetings. Our monthly meetings are an opportunity to network, plan, dream and implement with fellow enthusiasts who range from the arm-chair enthusiast to the active expert. Our member's interests are diverse and fascinating. They include deep sky, variable stars, double stars, minor-planet occultations, astrophotography, planets & moon sketching, cosmology ... the list is extensive.

I'm in heaven when we're talking galaxies, big bang theory, the size of the universe and advice

on a 30-minute guided exposure of The Great Orion Nebula.

Sadly, I don't believe I have met all the new members. Many have joined but are yet to attend one of our monthly meetings. What's the benefit of being at the meetings? Well, our topics thus far have included:

- Video on John Dobson & telescope making  
- 10 July 2002
- Finding the Elusive SCP - Dave Gordon  
- 14 August 2002
- Quantum Computing - Evan Dembskey  
- 11 September 2002
- Eyepieces – Chris Stewart  
- 9 October 2002
- Consciousness Mapping - Marilyn Lucas  
- 13 November 2002
- Backwards Spiral NGC 4622 - Ron Buta  
- 13 November 2002
- Eclipse Special - Eben van Zyl, Brian Fraser and Kurt Buchmann - 16 November 2002

Plus a monthly "What's Up", expertly presented by Ed Findlay using The Sky astronomy software and the occasional book review of worthwhile reading material.

- You also choose to be involved in:
- Meteorite hunts in the Kalahari and Namibia with Trevor Gould
  - Star parties and social get-togethers in Blue Hills
  - Telescope making classes with Brian Fraser and Chris Stewart
  - Telescope driving courses with Constant Volschenk
  - Telescope and astronomy basics for beginners courses with Dave Gordon
  - CCD Photography with Bruce Dickson in the Papadopolous Dome

We have been faced with certain challenges this year. Firstly, the Sir Herbert Baker Library was burgled in July and then again in August. Thankfully, our losses were not too extensive, although we sorely miss the head of our old faithful overhead projector. Secondly, the uncertainty regarding tenure and our Landlord's identity, brought on by the long-winded hand-over of the property from AS&TS to FEST, has delayed our plans to improve the society's

facilities. This period of uncertainty is now over and we can look forward to a future of exciting developments, improvements and upgrades at the Society.

At last, FEST has granted ASSA Johannesburg Centre unrestricted access to the 26½ inch refractor in the Innes Dome. In the past, we were considered in a similar light as other corporate bodies and were required to pay for the use of the facilities. This is a major coup for us and a privilege. If nothing else, we will become stronger and healthier for exercising on a 26 ton dead-weight!.

I was paging through a Summer 1991 edition of Canopus and noticed that it was a sizable 42 pages. In those days, Canopus was a quarterly newsletter; our current Canopus is monthly (12 pages). What impressed me most was the local content contributed by the membership. I'm sure I'm not the only member who would like to read more local content in our Canopus. Why not put fingers to keyboard and type a small piece about what you are currently doing - astronomically speaking? Submit an article about your impressions of a new eyepiece you purchased (or made yourself!), your attempt at some astrophotography, an evening of double stars or globular clusters, a sketch you made of a crater on the moon ...

If your very first experience at the telescope was anything like mine, it would make for some very entertaining reading. Why not share a challenge or disappointment you may have experienced at

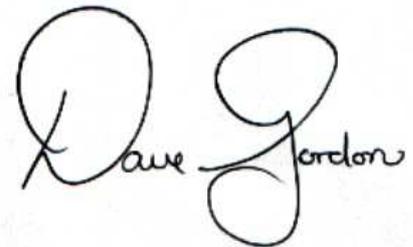
the telescope. You may even wish to address it as a letter to the *Editor*. Here is a good start: "Dear Uncle Chris. I have an astronomical problem ..."

I encourage all our members to contribute to Canopus in future.

You've probably heard it before but it's worth reminding you: Your committee is there for you. We are enthusiasts just like you, steering the society in a direction we THINK you would like it to go. We are always delighted to hear new suggestions which we try to implement wherever and whenever possible. So, keep the suggestions flowing (there is a suggestion book that is circulated at the monthly meetings – please feel free to use it).

There is great excitement and anticipation for the 4<sup>th</sup> December solar eclipse. Revel in the Moon's complete shadow for those 73 seconds. That short moment in time will burn a strong lasting memory that you will access again and again for the rest of your life.

Good health and Clear Skies  
Your Chairman



## HOW DID EINSTEIN DO IT?

Everybody knows Einstein's equation  $E = mc^2$ , in which  $E$  stands for energy in ergs. The erg is the energy or work done when a force of 1 dyne moves a mass of 1 gram through 1 centimetre, in 1 second.  $m$  is the amount of mass in grams and  $c$  is the speed of light in centimetres per second. The speed of light is 300 000 kilometres per second. In 1 km there are 100 000 centimetres. Therefore the speed of light in centimetres per second works out to 300 000 00 000 or  $3 \times 10^{10}$ , a truly colossal figure.

But how did Einstein derive the formula? That is the question.

Suppose we have a space shuttle in orbit around the Earth. It is in "free fall" and there are no forces acting inside the shuttle. Suppose we introduce a wooden or metal cylinder (Einstein used a book) having a mass  $M$ . Since there are no forces acting inside the shuttle the cylinder will float freely (Fig 1) and it will be at rest with reference to the frame of reference, the shuttle. If we place a flashlight a short distance from the cylinder, on each side of the cylinder, we could send horizontally moving flashes of light to the cylinder. The speed of the horizontal flashes of light will be equal to  $c$ , shown by the arrows. Each flash of light could then supply an amount

of energy to the cylinder equal to  $\frac{1}{2} \times \frac{E}{c}$  so that the total energy received by the cylinder would be  $\frac{E}{c}$ .

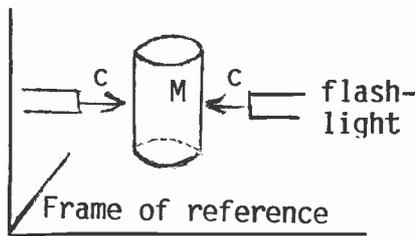


Fig 1

Now let us assume that the frame of reference moves down with velocity  $v$  (Fig 2).

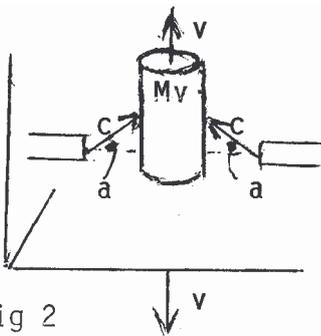


Fig 2

The cylinder will then seem to be moving upwards with velocity  $v$  and its momentum will be equal to  $Mv$ . The horizontal flashes of light will then seem to move with an upward slant (angle  $a$ ), with velocity  $c$  because the velocity of light in all directions is the same. Because of the slanting rays the actual velocity will be equal to  $v \div c$  and the energy received by the cylinder will be  $\frac{E}{c} \times \frac{v}{c}$  namely  $\frac{Ev}{c^2}$ . This energy gets added

to the momentum  $Mv$  of the cylinder, which then has an energy of  $Mv + \frac{Ev}{c^2}$ .

Let this equal  $M'v$

$$\text{Thus } M'v = Mv + \frac{Ev}{c^2}$$

Now divide throughout by  $v$ .

$$\text{Therefore } M' = M + \frac{E}{c^2} \text{ or } M' - M = \frac{E}{c^2}.$$

$M' - M$  is the amount of increase of mass of the cylinder due to the light flashes which it has received. Call this  $m$ .

$$\text{Therefore } m = \frac{E}{c^2} \text{ or } E = mc^2.$$

This is the equivalence between mass and energy and it shows that matter and energy are interchangeable -- the one can be converted into the other. This derivation appeared in Einstein's theory of relativity in 1915, long before physicists had unravelled the structure of the atom. The first atomic bomb (July 1945) showed that the amount of energy set free from the matter which was annihilated in the bomb is exactly equal to the result of Einstein's equation. When protons are fused in the nucleus of the Sun into helium atoms only 1/140, or 0,07% of the matter is annihilated. If all the matter could be annihilated 140 times as much energy would be set free. By the conversion of hydrogen into helium the Sun loses 4 million tons of mass per second. It has been doing this for at least 5 milliard years and will be able to go on doing so for another 5 milliard years before any change can be noticed.

Jan Eben van Zyl

## NEVER BEFORE SEEN: TWO SUPERMASSIVE BLACK HOLES IN SAME GALAXY

From: NASAnews@hq.nasa.gov  
RELEASE: 02-222

For the first time, scientists have proof two supermassive black holes exist together in the same galaxy, thanks to data from NASA's Chandra X-ray Observatory. These black holes are orbiting each other and will merge several hundred million years from now, to create an even larger black hole resulting in a catastrophic

event that will unleash intense radiation and gravitational waves.

The Chandra image reveals that the nucleus of an extraordinarily bright galaxy, known as NGC 6240, contains not one, but two giant black holes, actively accreting material from their surroundings. This discovery shows that massive

black holes can grow through mergers in the centers of galaxies, and that these enigmatic events will be detectable with future space-borne gravitational wave observatories.

"The breakthrough came with Chandra's ability to clearly distinguish the two nuclei, and measure the details of the X- radiation from each nucleus," said Guenther Hasinger, of the Max Planck Institute for Extraterrestrial Physics in Germany, a coauthor of an upcoming *Astrophysical Journal Letters* paper describing the research. "These cosmic fingerprints revealed features characteristic of supermassive black holes -- an excess of high-energy photons from gas swirling around a black hole, and X-rays from fluorescing iron atoms in gas near black holes," he said.

Previous X-ray observatories had shown that the central region produces X-rays, while radio, infrared and optical observations had detected two bright nuclei, but the nature of this region remained a mystery. Astronomers did not know the location of the X-ray source, or the nature of the two bright nuclei.

"With Chandra, we hoped to determine which one, if either, of the nuclei was an active supermassive black hole," said Stefanie Komossa, also of the Max Planck Institute, lead author of the paper on NGC 6240. "Much to our surprise, we found that both were active black holes!"

At a distance of about 400 million light-years, NGC 6240 is a prime example of a massive galaxy in which stars are forming at an exceptionally rapid rate due to a recent collision and subsequent merger of two smaller galaxies. Because of the large amount of dust and gas in such galaxies, it is difficult to peer deep into their central regions with optical telescopes. However, X-rays emanating from the galactic core can penetrate the veil of gas and dust.

"The detection of a binary black hole supports the idea that black holes can grow to enormous masses in the centers of galaxies by merging with other black holes," said Komossa. "This is

important for understanding how galaxies form and evolve," she said.

Over the course of the next few hundred million years, the two black holes in NGC 6240, which are about 3000 light-years apart, will drift toward one another and merge to form an even larger supermassive black hole. Toward the end of this process an enormous burst of gravitational waves will be produced several hundred million years from now.

These gravitational waves will spread through the universe and produce ripples in the fabric of space, which would appear as minute changes in the distance between any two points. NASA's planned space-based detector, LISA (Laser Interferometer Space Antenna), will search for gravitational waves from massive black-hole mergers. These events are estimated to occur several times each year in the observable universe.

"This is the first time we see a binary black hole in action, the smoking gun for something that will become a major gravitational wave burst in the future," said Hasinger.

Chandra observed NGC 6240 for 10.3 hours with the Advanced CCD Imaging Spectrometer (ACIS). Other members of the team are Vadim Burwitz and Peter Predehl of the Max Planck Institute, Jelle Kaastra of the Space Research Organization Netherlands and Yasushi Ikebe of the University of Maryland in Baltimore.

NASA's Marshall Space Flight Center in Huntsville, Ala., manages the Chandra program for the Office of Space Science, Washington, and TRW, Inc., Redondo Beach, Calif., is the prime contractor for the spacecraft. The Smithsonian's Chandra X-ray Center controls science and flight operations from Cambridge, Mass.

Images and additional information about this result are available at:

<http://chandra.harvard.edu>

and

<http://chandra.nasa.gov>

*Dear God:*

*If you watch me in church on Sunday, I'll show  
You my new shoes.*

- Mickey

*Dear God:*

*I bet it is very hard for You to love all of  
everybody in the world. There are only four  
people in our family and I can never do it.*

- Nan



*Our Chairman Dave Gordon opens the meeting and welcomes everyone.*



*Part of the crowd that attended the pre-eclipse meeting*



*Brian passes on some pertinent information...*



*...and Eben calls back to past regarding Eclipse 1940*

PhotoWeb SA

## Meade 10" LX200GPS

With standard options

**R46,500-00**

*If you are an ASSA member*

The telescope has been assembled and checked and then dis-assembled and replaced in packing box.

We have received this excellent offer from **Dennis Du Plooy** of **PhotoWeb SA**

If you are an ASSA member and wish to purchase this telescope,  
contact **Dennis** on **(011) 888-8858** during office hours

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## For Sale

### Meade 10-inch LX200

With Tripod and carry case.

26mm eyepiece  
2-inch flat diagonal plus 1 ¼-inch diagonal.  
Transformer for 18v.  
New computer and new handset.

**Price R35,000**

### Meade De-rotator

fits on tripod in Alt-Az mode to give the correct  
field orientation for photography.

Brand new. Cost R6000.  
Will accept **R4,500.**

### 12-inch Newtonian F6.1

with a Meade Sonotube and cell.

5 eyepieces. Konig 32mm, Erfle 20mm, a  
15.5mm, 10mm, Meade 4mm.

Electric focuser.  
Motor drives on both axes.

Solid mount with large driving gears.

**Price R18,000**

Both these telescopes are in excellent condition.  
Telephone Bill Lockhardt 083-299-0124

# The Sky this Month

## December 2002

dd hh	dd hh
1 02 Mercury 11.2 S of Pluto	14 05 Moon at apogee
1 10 Mars 2.6 S of Moon	17 17 Saturn at opposition
1 14 Venus 2.1 S of Moon	19 15 Saturn 2.6 S of Moon
2 09 Moon at perigee	19 19 <b>FULL MOON</b>
4 08 <b>NEW MOON</b> <i>Eclipse</i>	22 01 Solstice
4 21 Jupiter stationary	23 12 Jupiter 4.2 S of Moon
5 04 Mercury 0.7 S of Moon...Occn.	25 16 Mercury greatest elong. E(18)
7 02 Venus greatest brilliancy	27 01 <b>LAST QUARTER</b>
8 08 Neptune 4.6 N of Moon	28 05 Mercury greatest brilliancy
9 14 Uranus 4.6 N of Moon	30 01 Mars 1.1 S of Moon...Occn.
9 16 Pluto in conj. with Sun	30 02 Moon at perigee
11 16 <b>FIRST QUARTER</b>	30 09 Venus 2.2 N of Moon

## January 2003

dd hh	dd hh
2 09 Mercury stationary	18 10 <b>FULL MOON</b>
2 20 <b>NEW MOON</b>	19 14 Jupiter 3.8 S of Moon
3 21 Earth at Perihelion	23 06 Mercury stationary
3 23 Mercury 4.7 N of Moon	23 22 Moon at perigee
4 19 Neptune 4.6 N of Moon	25 09 <b>LAST QUARTER</b>
6 01 Uranus 4.6 N of Moon	26 04 Venus 6.4 S of Pluto
10 13 <b>FIRST QUARTER</b>	27 06 Mercury greatest brilliancy
11 01 Moon at apogee	27 15 Mars 0.3 N of Moon Occn.
11 05 Venus greatest elong. W(47)	28 18 Venus 4.3 N of Moon
11 22 Mercury in inferior conjn.	30 09 Mercury 4.7 N of Moon
15 19 Saturn 2.5 S of Moon	31 00 Neptune in conj. with Sun
15 22 Venus 8.2 N of Antares	31 05 Mars 5.1 N of Antares

### LOCAL TIMES of RISE and SET for the MAJOR PLANETS, 2002/3

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
Dec 07	05.09	18.49	05.56	19.50	02.53	15.42	02.46	15.38	22.58	09.59	19.33	06.08
Dec 17	05.12	18.55	06.24	20.16	02.37	15.31	02.26	15.28	22.18	09.18	18.50	05.25
Dec 27	05.17	19.00	06.45	20.24	02.26	15.28	02.08	15.18	21.37	08.36	18.07	04.42
Jan 01	5.20	19.02	6.43	20.13	2.23	15.29	1.59	15.13	21.16	8.15	17.46	4.20
Jan 11	5.27	19.03	5.41	19.03	2.18	15.34	1.42	15.04	20.33	7.31	17.03	3.38
Jan 21	5.35	19.03	4.19	17.44	2.18	15.42	1.26	14.54	19.50	6.46	16.21	2.56
Jan 31	5.43	18.59	3.50	17.22	2.22	15.52	1.11	14.45	19.06	6.00	15.39	2.14
Feb 10	5.50	18.54	3.56	17.28	2.30	16.02	0.57	14.35	18.22	5.15	14.59	1.33