

CANOPUS

The Astronomical Society of Southern Africa

Johannesburg Centre

Monthly Newsletter for August 2000

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

Editorial

Here we are again at the start of another Johannesburg Centre Astro-Year. The AGM went off quite smoothly (*and speedily if the truth be told*) and once the admin was taken care of, everyone tucked in at the braai. Subsequent viewing was largely forestalled by the arrival of a (very) cold front with a fair amount of wind chill factor thrown in for good measure. Turnout was sparse, due no doubt to the Wintery conditions forecast for the evening.

You have a new committee and the new office bearers will be allocated their posts at the next monthly committee meeting. Their duties will be announced at the monthly meeting of the 9th of August. The committee members are shown in the table below, which will be updated with duties/contact details in the September issue of Canopus.

Danie has supplied us with our variable of the month - R Centauri - together with a light curve display and a sky chart to locate the star. This is an interesting star with a large variance and most data about it has been supplied by amateurs. You'll need a telescope or good binoculars for this one.

Bill Wheaton has submitted an update on the 2MASS project which has produced an amazing amount of data about Stars in general and "cool" Stars more particularly. The data is available on the web and also on DVD-ROM and is very comprehensive. This project was responsible for the discovery of a new type of star and this was allocated a new letter (L) in the famous "OBAFGKM" spectral sequence. This project has most certainly been worth the time and money invested in it. Brian has supplied us with the Heavenly Happenings for the next 2 months and an article about the eclipse due in 2001 - time to start planning for your observing position for this and the next eclipse nearer home in 2002.

The speaker for August is Professor Ron Buto. He is one of the world's leading experts on galaxies and is currently working with David Block. He will be talking to us about galaxies and this will be a presentation that none of you should miss. He really is a presenter of note!!

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 a budding journalist, and have an article you'd like to submit, send it through. I can almost guarantee you it'll be published as is.

The Editor

chris@aqua.co.za

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Notice of Meeting

The **August** 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 9th of August, 2000 at 20:00.

Topic:

Galaxies

By: **Professor Ron Buto**

Future Meetings

September 13 th	T.B.A.	Tony Hilton
October 11 th	Meteorite Collecting	Trevor Gould
November 8 th	Craters	Prof Uwe Reinhold
December 9 th	Under the Full Moon	Annual Star Party

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.

26 th August	28 th October	Year End Star Party 2000
23 rd September	25 th November	<i>"Under the Full Moon"</i>
		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 was visited, and an article has been promised for the next issue of Canopus.

Boyden has been cancelled due to lack of availability of the 60" but we'll plan a visit again next year.

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 held their AGM at our physical address on 12th July 2000.

This year's AGM and Bring 'n Braai

The Jo'burg Centre's AGM was held on Saturday the 15th July. Turnout was sparse and the meeting proceeded swiftly. A new committee was nominated and duties will be assigned at the first committee meeting which takes place on the 7th of August.

The braai was enjoyed by all, even though the (freezing) wind also ensured a fair distribution of smoke mostly into the eyes and noses of the participants. We really must try to organise warmer evenings for this sort of event.

Committee for the 2000/1 Year

The following nominated members were elected to serve on the committee for the 2000/1 year.

Ed Finlay

Wolf Lange

Constant Volschenk

Frans van Nieuwkerk

Melvyn Hannibal

Evan Dembskey

Chris Penberthy

Chris Stewart

Tom Budge

Other Talks

Tony Voorvelt arranges (and sometimes presents) monthly lectures on the last Friday of each month. These are held in the 26" telescope building and there is a charge of R10 for adults and R5 for children or senior citizens. The talks which start at 19:30, last for approximately 45 minutes and there is always a practical demonstration to backup the lecture.

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.

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JPL and NASA News

Bill Wheaton

2000 August

2MASS in the News:

The Two-Micron All Sky Survey (2MASS) has had a good month in the news. I have already talked some about 2MASS on these pages. As the first comprehensive all-sky survey carried out in the near infrared (NIR), somewhat comparable to the two Palomar Sky Surveys done in the optical in the mid-1950's and repeated in the early 1990's, it is an exciting project, of key interest to all astronomers. Last March, 2MASS made its Second Incremental Data Release, with 47% of the sky included. Finally, when NASA issued a major press release about 2MASS last week (on 7/14/00), the web server at the Infrared Processing and Analysis Center (IPAC), where 2MASS data are available, shortly thereafter began running at up to 1.9 million hits per day, over 20 per second -- many times its designed maximum capacity. So perhaps this is a good time to catch up on the subject.

A near-infrared sky survey is important for a number of reasons. It is an interesting fact that in astronomy a change of wavelength or frequency of only a factor of two (2MASS observes at from two to four times the wavelength of visible light) typically results in dramatic changes in the scene which one obtains. For example, because the Galaxy is so heavily obscured by dust, in visible light we really cannot see much or far in the galactic plane, compared to what is really there. In most directions in the plane, dust obscuration limits us to a few thousand light years or less, compared to the 25,000 light-year distance to the center. The Galactic Center itself is obscured by about 30 mag in the visible, a factor of a trillion (10^{12}).

Infrared light, however, can penetrate the dust to a great degree; the longer the wavelength, the better. So it is that to my mind at least, the 2MASS image of the Galactic Center (see the URL below) and its environs -- the central star cluster glowing red, centered on the invisible black hole, surrounded by a vast beach of galactic-bulge red giant stars like grains of sand, with the plane stretching out on both

sides, laced with dark filamentary clouds deep in dust -- ranks with the best of the HST images for impact and astronomical interest.

Because it can see through the dust so well, 2MASS can observe practically all stars in the Galaxy that are bright enough, in particular almost all the cool red giants, which account for most of the NIR light. Hot objects, recall, tend to emit mainly at shorter wavelengths toward the blue or even ultraviolet, and cooler ones at longer wavelengths towards the red and infrared. In addition, although we have been conditioned to think of the Sun as a typical star, in fact it is more massive, and thus hotter and brighter, than all but roughly 5% of the main-sequence stars in the Galaxy. A vast number of stars have masses in the 0.1 to 0.5 solar-mass range, and because the luminosity or absolute magnitude of a main-sequence star is an extremely strong function of its mass, these are typically cool red dwarfs.

While 2MASS does not have the sensitivity or angular resolution to observe them, in their uncounted billions, at very great distances, clearly these truly "typical" dwarf stars are best observed in the NIR, where their emission is strongest. Thus 2MASS is perfect for exploring the near environment of the Sun. In fact, if interstellar travel is ever possible at all, it may well be that the first objects visited will be discovered by 2MASS. Among such local objects are the "brown dwarfs", until about five years ago mythical beasts of theory only. These are "stars" too low in mass, and thus too cool, to ever successfully ignite the nuclear fire of hydrogen burning. Stars with masses below about 8% of the Sun's are fated to shine only for a little while by the heat of their gravitational contraction, and then cool into dark obscurity. Jupiter, with 0.1% the mass of the Sun, is 80x below the 8% limit, yet it still emits (mainly in the far infrared) about twice as much energy, due to its slow cooling contraction, as it receives from the Sun. Thus it is an example, from the extreme low-mass end, of what brown dwarfs might be like. Not one

brown dwarf was known less than ten years ago; as of this writing, 2MASS has identified many hundreds, and thousands are expected when analysis of the survey is complete. In fact, it appears that the number of brown dwarfs exceeds the number of all normal stars combined, although they contribute only a small fraction of the total mass. Thus the nearest object to the Sun may well be a yet-undiscovered brown dwarf.

Deep in the cold dark of dense molecular clouds new stars are forming, usually invisible to optical telescopes, but often apparent in the NIR. Thus the details of star formation and star-forming regions is another subject of great interest available for investigation with 2MASS data. Lastly, the optical obscuration of the Milky Way blocks not only the Galaxy itself, but everything beyond. A century ago the "spiral nebula" were known not to be found in the "zone of avoidance", near the galactic plane -- almost half the sky. At the time, before the extent of dust obscuration in the galactic plane was appreciated, some argued that this proved that they must be local objects, somehow associated with the Milky Way. Now it is clear that if we wish to observe galaxies at low galactic latitude, observation in the NIR is one of the best ways to do it. 2MASS has already discovered one large nearby spiral galaxy, and two previously-unknown galactic globular clusters. Thousands of fainter galaxies will be discovered in the Extended Source Catalog being prepared.

2MASS data are being obtained by by two identical, dedicated 1.3 m telescopes, one in Arizona and one in Chile. The survey differs from the photographic Palomar surveys in that the data are collected directly in digital form by 256 x 256 pixel infrared arrays, one for each of three near IR color bands: J (1.25 μ m), H (1.58 μ m) and K_s (2.17 μ m). The pixel size is 2" x 2", but the image is stepped by 1/6th frame, with small offsets, so each pixel is sampled six times, allowing images to be reconstructed with 1" pixels. Despite the small field of view, which is tiny compared to that of the 6° FOV Palomar Schmidt survey telescope, the detectors are so sensitive that instead of hours, each frame is exposed for only about 1.35 sec, giving a total of about 8 sec on every star. The total mapping rate is then about 70 sq.

degrees per night, not very different than for the Palomar surveys, done almost completely automatically under computer control. This exposure gives a point-source sensitivity of about 15.8 mag in J, 15.0 in H, and 14.3 in K_s at a signal-to-noise ratio (SNR) of 10:1. The data are recorded on magnetic tape, and shipped to IPAC for processing; well over 10 TeraBytes (1 TB = 10¹² bytes) of raw data have been collected so far. Technical details of telescopes, cameras, and observations may be found at:-

<http://pegasus.phast.umass.edu:80/2mass/pub/overview.html>.

2MASS is a joint project of IPAC and the University of Massachusetts at Amherst, under the direction of Principal Investigator Dr. Mike Skrutskie of U.Mass. U.Mass is responsible for the project as a whole, built the telescopes and cameras, and operates the observatories.

Because of the amount of data involved, equivalent to about 6,000 CDROMs in the second release, the World Wide Web is the only practical method of distributing the survey. Because of the all-digital collection, processing, and archiving, it is also natural and convenient. IPAC is responsible for the processing, archiving, and distribution of the data, under direction of Project Scientist Dr. Roc Cutri. A "Sampler" release of just one night's data was issued at the beginning of 1999; it alone was larger than the complete data set from the entire year (1982-1983) of operation of IPAC's first project (IRAS, the InfraRed Astronomy Satellite). Then in May 1999, 6% of the sky was issued in the First Incremental Data Release; a reprocessing of these data is included in the 47% of the second release. The project has made enormous progress in the past year, with about 95% of the sky already observed under good conditions. The 4-year data collection for 2MASS will be complete early next year. All the data will be reprocessed to a uniform standard and re-issued about a year thereafter.

The data available at IPAC (world wide web URL:- <http://www.ipac.caltech.edu/2mass/>)

include four main components:

- An Image Archive, with 8' x 16' images in each of the three bands, covering the released region;

- A Point Source Catalog, with positions, J, H, and K_s magnitudes, colors, optical identifications, and associated information for 162 million stars and other point-like sources with SNR > 7 in at least one band.
- An Extended Source Catalog, with corresponding data for each of 585,000 extended sources, most of which are galaxies; and
- An Explanatory Supplement, giving details about the data and the processing.

In addition, the Image Gallery has a large number of beautiful color composite images, laboriously built up from the small 8' x 16' images in the Archive, of many well-known astronomical objects. The color mapping is

generally J = blue, H = green, and K_s = red, so that the usual intuitive relationship between obscuration and reddening, and color and temperature, is roughly preserved. Thus the dust that prevents us from seeing the Galactic Center at all in visible light can still be discerned along the galactic plane in the 2MASS image, by the reddening of the stars there. Each of these many images may be down-loaded for display, printing, or other use. Some 32 GB of data, mostly color composite images, were delivered by the server over the Net on the peak day after the NASA press release.

Bill Wheaton

Fortunate Fingers

Date: Tue, 18 Jul 2000 07:44:19 -0700 (PDT)
From: The Near Earth Object email List at NASA's JPL

Teacher's typo points him to an asteroid

**By David L. Chandler
Boston Globe
July 15, 2000**

Talk about a lucky mistake.

Earlier this month, as Fitchburg schoolteacher Leonard Amburgey was using his backyard observatory, controlled from a computer in his house, he was carrying on a conversation with friends outside through an open window. The distraction caused him to mistype one of the numbers to aim his telescope at a specific point in the sky.

Because of that error, what he saw through the scope was not what he expected. The streak of light that appeared in that patch of sky turned out to be an asteroid on a path that sometimes takes it across the Earth's orbit, making Amburgey the first person in Massachusetts to discover a near-Earth asteroid.

If you have access to the World Wide Web, you will find the full story here:

http://www.boston.com/dailyglobe2/197/metro/Astronomical_findP.shtml

Eclipse June 21st 2001

The first solar eclipse of the new millennium will occur on June 21st next year, almost in our backyard, with the path crossing Angola, Zambia, Zimbabwe, Mozambique and Madagascar.

If you want to observe this impressive event then you have a choice of a number of places to go to, each with its advantages and disadvantages.

The event occurs between roughly 1.00 pm and 5.30pm local time in the afternoon, beginning in the Atlantic ocean off the west coast of Africa. The shadow path then crosses Angola, south of Luanda, and then Zambia, with Lusaka being in the path of totality. Although it is about 40km from the centerline, Lusaka will get nearly 3 1/2 minutes of eclipse. The shadow track then moves eastward and crosses the north eastern corner of Zimbabwe and then on across Mozambique. Madagascar will catch the shadow track, although it will be late afternoon, and people there will see the sun set with a chunk missing due to the moon.

The further west you go the more favourable the eclipse elements, with totality lasting 4min 56 sec in Angola and only 2min 19 sec in Madagascar. Also the sun will be at an altitude of 55 deg in Angola and only 11 deg in Madagascar when the eclipse occurs.

So where are YOU going to go to see the eclipse? Here is the bad news - every single bed in Zambia and Zimbabwe is fully booked and has been for more than a year. The only alternative is to camp out or to find accommodation privately.

Here is a brief summary of options :-

- On a ship off the **west coast of Africa**. This will give you the best possible view of the eclipse, if the weather is clear. Duration is 4min 56 sec altitude 55deg.
- **Angola**. Although on paper the best land vantage point, the security situation in Angola will prevent a lot of people from going there. It is also impossible to contact the Angolan embassy for any assistance and getting tourist information is more difficult than

catching a falling star. Weatherwise Angola offers the best prospects. The shadow track runs between Luanda and Lobito.

- **Western Zambia**. There is a national park in this area, Kafue, which is fully booked, but you may get a cancellation at a game lodge (for R3000 pppn). Otherwise you will need to find a place to camp out. Weather prospects are good in this area. Some of the roads may be category 16 (4x4). The centerline is about 100km north of the gate to the park. From Lusaka to the park is 279km and some of the roads are constantly under repair.
- **Central Zambia**. Lusaka lies in the eclipse track and would be a good base if you could find a place to camp out. A group from Austria and Germany will be flying to Lusaka, getting off the plane to watch the eclipse at the airport and then jump back on the plane and fly home. No need for visas or inoculations, or even luggage. This is certainly an option. Every bus and coach in the city has been booked for the day, so it probably won't even be possible to hire a car. Lusaka will get an eclipse lasting 3 min and 35 sec although it is about 40km south of the centerline.
- **Eastern Zambia**. In the Zambesi river area. You could stay near Kariba and travel to the eclipse line. Again you will need to find a place to camp. The Zambesi valley does experience some cloudy weather from the Indian ocean at this time of the year but odds favour clear skies. Duration 3min 29sec. Altitude 29 deg.
- **Zimbabwe**. Probably one of the easier options for South Africans, although there is still concern about the security situation there. The Harare centre are making plans to welcome visitors and it may be that working through them will be the most effective way to travel. The centreline only just makes it into Zimbabwe for much of the track and it

looks like access to it is limited to a few specific roads. Mount Darwin is in the path. About 238km from Harare on the Tete road and you're on the centerline. Again you are in the Zambesi valley area which gets its weather from the Indian ocean. Duration 3min 20sec. Altitude 26deg.

- **Mozambique.** The area in Mozambique is in the mid northern section. There is a road from Beira to Quelimane which leads to the shadow path. Weather conditions are less favourable as you get nearer to the Indian ocean. Duration 3min 9 sec. Altitude 23 deg.
- On board ship in the channel **between Africa and Madagascar.** This appears to have the second best probability of clear weather, although the eclipse will be shorter and take place with the sun at a low altitude.
- **Madagascar.** The western part of the island has a greater probability of clear weather than other sites, but the sun will be low and the duration of totality only 2 mins 36 secs. The eastern part of the island has less favourable weather forecasts. Altitude 11 deg.

My advice is to start making arrangements as soon as possible. Africa is Africa and it takes

you 3 or 4 weeks to get a reply to an email seeking details. The Internet may carry messages in a hurry but that does not mean that people do things in a hurry. Don't leave it to the last minute and think you are going to arrange everything in a couple of days. Remember too to allow time to get your passports sorted out, get visas and have the necessary medical jabs. There are going to be plenty of people travelling to the eclipse track and as roads are so few they are probably going to be pretty busy.

If anybody has any ideas for eclipse expeditions then I would very much like to hear from them.

Zambia will be my "destination of choice". I have made contact with the government tourist office in Lusaka and have been informed that camping facilities are available in all 3 areas of interest - the Western part, Lusaka, and the Kariba area. If you would like to travel to Zambia, then please contact me ASAP.

I am also very keen to get information regarding the western part of Zambia, and the Kariba area if anybody has perhaps been there.

Brian Fraser,

July 2000.

Email brian.fraser@macsteel.co.za.

New website for the Total Solar eclipses of 2001 and 2002

Hi there

I have set up a new website for the African eclipses of 2001 and 2002.

This is a South African site and covers the eclipses strongly from a SA point of view. Your members may want to look at it.

Point your browser at: <http://www.eclipse.za.net>

Regards

Peter Tiedt
28 O'Connor Road
Westville
KZN

VARIABLE OF THE MONTH: R Centauri

During the June Johannesburg Centre meeting, Brian Fraser demonstrated this variable at the eyepiece. My observations of it go back to the 1950's. It happens to be a very interesting long period variable and Burnham devotes more than a page to it:

"A long period variable star, discovered by Gould in 1871. At times it has reached naked eye visibility, reaching magnitude 5.3. In the Harvard Second Catalogue of Variable Stars its period is given as 568.2 days but now appears to be about 547 days... A changing period seems to imply a rapid change in the star's internal structure but very little else can be said until the mechanics of the pulsating stars is more thoroughly understood.

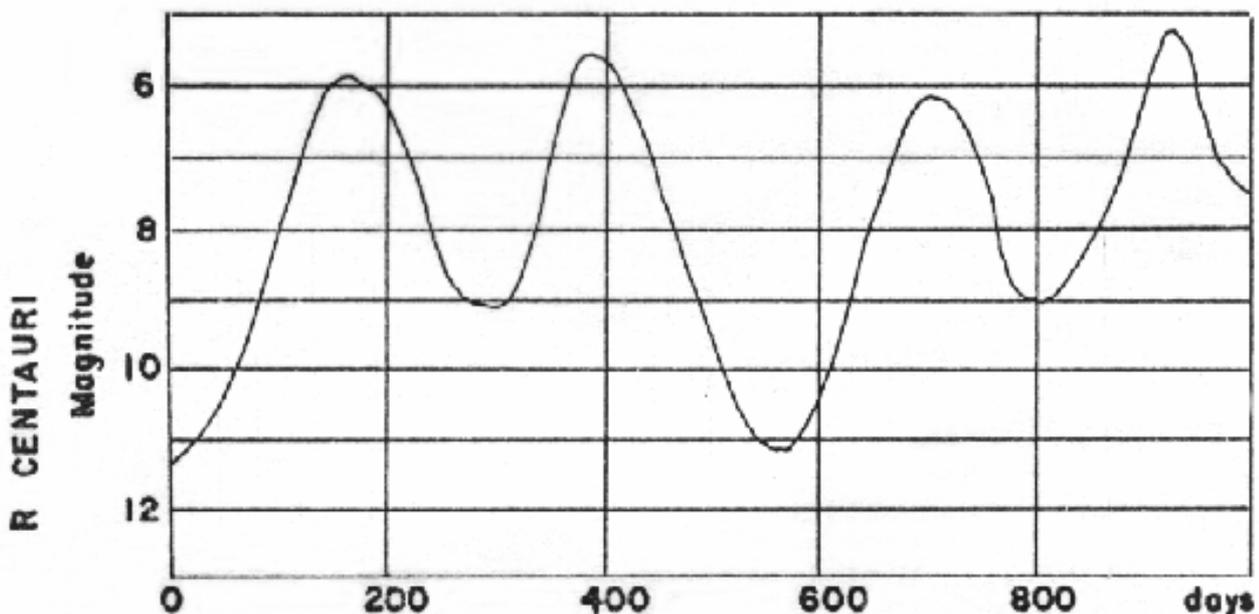
The period, in any case, is unusually long for stars of the Mira class. The really peculiar feature, however, is that the light curve shows double maxima and minima. The minima quite regularly alternate between mag 9 and 11, occasionally sinking to a deep minimum of mag 13. The maxima are nearly equal, but the slightly higher one systematically follows the shallower minimum. . ."

(See diagram)

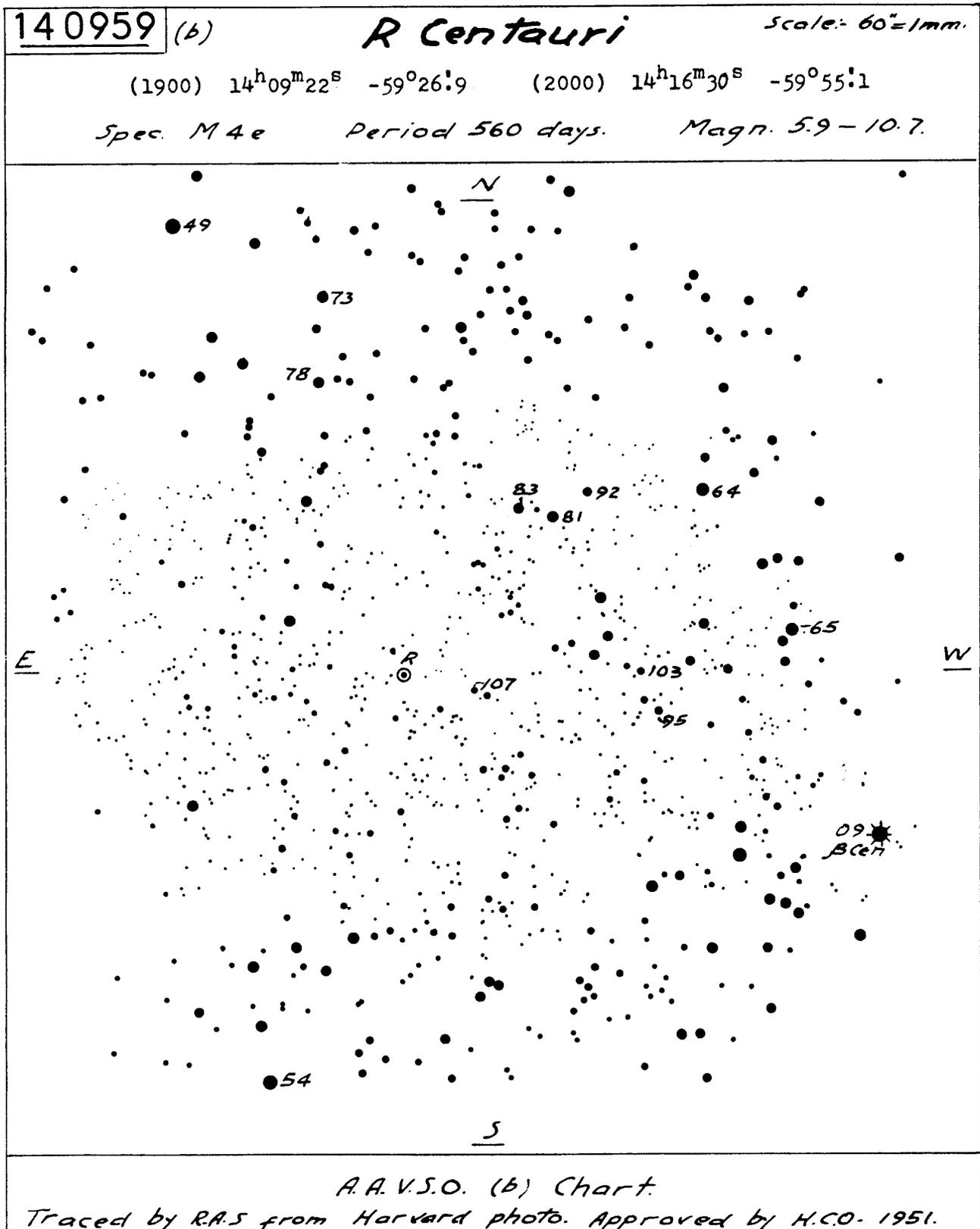
Readers of CANOPUS should bear in mind that Burnham's description is largely based on the observations by amateurs using little telescopes. Makes one think, doesn't it?

Danie Overbeek.

Light Curve for R Centauri



Star Chart for Variable of the Month
R Centauri



The Sky this Month

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

September 2000

dd hh	dd hh
5 17 FIRST QUARTER	19 19 Jupiter 2.6 N of Moon
7 20 Jupiter 4.7 N of Aldebaran	21 02 LAST QUARTER
8 14 Moon at apogee	22 17 Equinox
9 23 Neptune 1.1 N of Moon Occn.	23 16 Mercury 0.7 N of Spica
11 02 Uranus 1.3 N of Moon	24 10 Moon at perigee
12 19 Saturn stationary	25 17 Mars 2.4 S of Moon
13 20 FULL MOON	27 20 NEW MOON
16 07 Mars 0.8 N of Regulus	29 13 Mercury 7.6 S of Moon
18 19 Venus 2.7 N of Spica	29 14 Jupiter stationary
19 02 Saturn 1.9 N of Moon	30 01 Venus 5.2 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
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
Sep 07	06.15	17.57	06.57	18.58	07.27	19.42	05.15	16.21	00.19	10.57	23.34	10.25
Sep 17	06.04	18.01	07.00	19.29	07.23	19.57	04.55	16.11	23.42	10.20	22.54	09.46
Sep 27	05.53	18.05	06.57	19.52	07.19	20.14	04.35	16.00	23.04	09.42	22.14	09.06