

# Event Horizon

Summer 1996

Volume 3 Issue 9

## Tales From the Dark Side -

### The Discovery of a Population II Cepheid in an Eclipsing Binary System in the LMC

**O**ur story begins in Paris (France - not Ontario) where a meeting entitled "Variable Stars and the Astrophysical Returns of Microlensing Surveys" is being held at the Institut d'Astrophysique de Paris. For the first time, workers associated with all the different microlensing

along the line-of-sight. Since about one star in a thousand is variable, the harvest of variable stars is far greater than the harvest of MACHO's! Moreover, the near-continuous coverage in time results in what is frequently the best datasets ever collected for many types of variables.

I will call astrophysically-interesting systems. These typically involve relatively rare variable stars in relatively favourable systems. Cases in point: there were no known Pop II or classical Cepheids in eclipsing binary systems, there are no convincing cases of RR Lyrae in binary systems, there were no R CrB stars in clusters in our Milky Way. Such systems provide key information in understanding the physical properties such as mass, radius, and luminosity.

During the Paris meeting, one of our MACHO Project affiliates, Dr. Karen Pollard from the South African Astronomical Observatory, was

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*Since about one star in a thousand is variable, the harvest of variable stars is far greater than the harvest of*

survey teams have gathered to discuss the *non-microlensing* spin-offs of their surveys. Many projects are represented including:

**AGAPE** = Andromeda Galaxy and Amplified Pixels Experiment

**DUO** = Disk Unseen Objects

**EROS** = Experience de Recherche d'Objets Sombres

**MACHO** = Massive Astrophysical Compact Halo Objects

**MOA** = MACHO Observations in Astrophysics (note 2nd-order acronym!)

**OGLE** = Optical Gravitational Lensing Experiment

**PLANET** = Probing Lensing Anomalies NETWORK

The nature of microlensing searches is that many (i.e. millions) of stars are monitored for the rare occasions when the light of one is amplified by an intermediate mass

We have found variable stars. At last count, well over 100,000 - several times the number in the General Catalogue of Variable Stars! But you might well ask: so? If you've seen one LPV, you've seen 'em all? There certainly is an element of overkill in these statistics - they can't all be equally interesting! Such numbers do provide the *first* real opportunity to locate what

## Things are Heating Up

**W**e tend to think of our Sun as a paragon of stability. While other stars pulsate, go nova, collapse, or bubble and churn like overheated pots of oatmeal, Sol provides us with steady, dependable radiance. Of course there are variations, such as the 11 year sunspot cycle, but these are predictable and benign.

Recent evidence, however, suggests that we don't know all there is to know about the nearest star. Dr. David Gray of the University of Western Ontario has been studying the

Sun's temperature with a technique that compares the strength of absorption lines in the solar spectrum. Gray finds that in addition to a cyclic change of 1.5 degrees Kelvin, the temperature of the photosphere is steadily increasing by 0.014 degree/yr.

Of course, this doesn't mean that the sun will just continue to heat up. The observed change may just be part of a much longer cycle. During the 17th to mid-18th centuries, astronomers noticed a complete absence of sunspots

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## Editorial

**L**ife on Mars! Well... they didn't quite say that, but what they did have to say is really exciting. The evidence that was presented at a news conference just today (August 7, 1996) has stirred up a lot of excitement. Even though they were careful to say that the evidence is not conclusive that life existed on Mars 3.5 Billion years ago, it looks like that is the best explanation for the features found in the meteorite. From my point of view it doesn't really matter if this evidence of extraterrestrial life remains inconclusive. What is important is that this will get many more people thinking that life is possible "elsewhere" and will hopefully lead to more funding for SETI and an increase in the efforts to get to Mars. First extrasolar planets, now microbes on Mars, what's next?

Starting on page 7 is a reprint of the first 80 entries in the "Caldwell Catalogue". The full catalogue actually includes 109 objects arranged in order of declination but I only included those

objects that could be seen from Southern Ontario. (You could probably accuse me of being overly optimistic in going as high as 80.) If you would like to have the complete list please contact me via one of the means listed in the Calendar of Events under "Event Horizon Deadline".

In the coming months we will have reprints of articles by Todd Gross on "Panoptic Eyepieces", "Nagler Eyepieces" and "Cameras for Astrophotography".

Tomorrow is the start of Starfest and here I am sitting in front of a computer writing an editorial instead of getting ready. What's wrong with this picture?

Stewart Attlesey  
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## Chair's Report

**S**ummer is a time to reflect on the past year and plan for the next.

In a few short months, we will begin our fourth year with our membership fast approaching 160. That's an amazing feat for a club that's less than 3 years old!

Even as our membership grows, so do our coffers. The primary goal in establishing the HAA was to offer the benefits of a premier astronomy club at the lowest membership fees possible. We do this by keeping our costs down and by fund-raising. A steady cash flow is maintained throughout the year by hosting planetarium shows or astronomy workshops for various organizations. Recently, with the money raised through these activities, we purchased a second \$1000 savings

bond. This financial cushion will help ensure the future of the HAA.

Fortunately, the energy and enthusiasm that founded the HAA continues to be replenished as new people step forward with ideas, suggestions and offers of help. How about you? Have you an idea for a newsletter article? Some slides or new equipment to show at a meeting? If you own a telescope or a pair of binoculars, have you done any observing? If so, we'd all love to hear from you. Don't be shy! The more you put into the HAA, the more enjoyment you'll get from it.

I hope you're all having a great summer. See you in September!

Ann Tekatch

**HAMILTON  
AMATEUR  
ASTRONOMERS** ✨

**E**vent Horizon is a publication of the Hamilton Amateur Astronomers (HAA).

The HAA is an amateur astronomy club dedicated to the promotion and enjoyment of astronomy for people of all ages and experience levels

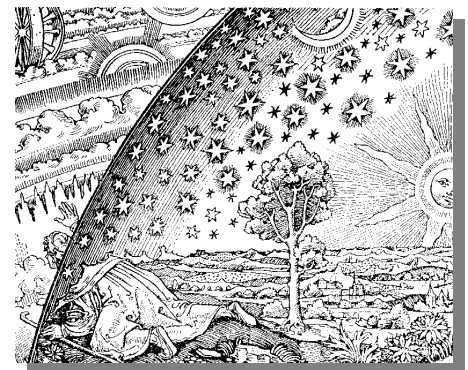
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## Things are Heating up ...

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and geological records show that the Earth's temperature dropped by 1 to 2 degrees during that time. This may not seem like much, but it was enough to freeze the Thames river and shorten Europe's growing season, causing famine in many countries.

Gray notes that other stars also show this behaviour. In fact, two thirds of measured stars have variations an order of magnitude larger than those of

the Sun - 15 degrees over cycle instead of 1.5. Other stars, such as Tau Ceti and Eta Cephei, show no detectable temperature changes.

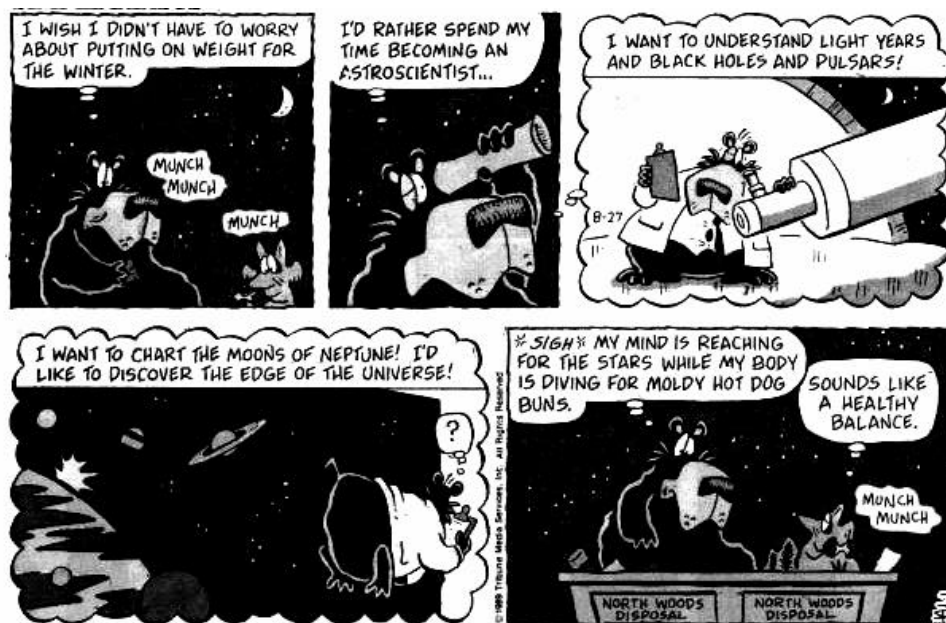
What is unique about our Sun is that temperature, luminosity, and magnetic activity are all linked: a drop in one means an immediate drop in the other two. In other stars, such as Beta Comae, the temperature begins to rise 3 years after we see the magnetic activity pick up. Cooler

Epsilon Eradini (K0) has a gap of only 0.3 years. By this scheme, the Sun should have a lag of about 2 years. But the changes are simultaneous. No one knows why this occurs.

Gray believes that fluctuations of this type are almost certainly due to the activity of dynamos which power the magnetic fields of cool stars. Researchers are currently trying to build a database to understand why stellar dynamos sputter and cough in this way.

What does this kind of variability mean for the Earth's climate? It is possible that the current trend is partly responsible for the global warming - although this doesn't mean we can keep polluting the atmosphere. However, more research is necessary before we can say whether this small rise in the temperature of the Sun will continue, or will have any effect on us.

Denise Kaisler [kaislerd@impatiens.physics.McMaster.CA](mailto:kaislerd@impatiens.physics.McMaster.CA)



## 3rd Annual HAA Summer Star Party .... not!

Unfortunately, our Summer Star Party had to be cancelled in June even though the skies were clear on the Saturday night.

Heavy spring run-off with torrential early summer rains followed by several downpours on the Friday night turned the York Soaring Association's property into a mud wrestler's paradise. In spite of being warned by Ev Butterworth and Doug Black that the fields were soggy, Bill and I stubbornly refused to accept the cancellation of HAASP'96 and travelled

up to the glider field on Saturday morning. We pulled into the camping area and promptly sank into the mud! After having first the minivan, then the trailer, dragged out of the field by the Soaring Club's tractor, we decided not to risk parking vehicles and expensive telescopes in the swamp that used to be the glider runway. With great disappointment, we cancelled the star party.

We'll try again next year!

Ann Tekatch 575-5433

P.S. There has been some talk of

trying again during the first or second weekend in September (Sept.6-8 or 14-15). If you're interested in a camping weekend at the York Soaring Club during either of these weekends, give me a call and I'll let you know if we decide to go ahead.



## Tales From the Dark Side ...

(Continued from page 1)

reporting on her work on the Pop II Cepheids and RV Tauri stars in the LMC from the MACHO data. For the first time, she was able to conclusively show that they are related to each other. Not only that, she was able to show the onset of what is almost certainly chaotic behaviour in these stars as you go to longer period systems. Such defining moments in variable star astronomy are rare.

Karen had defined her own sample of such stars, but we discussed the need to cross-check against the relatively short list of such stars which had been discovered during the Harvard College Observatory variable star survey - they listed only 17 such stars. This had not been seen as a priority to date because many of these objects were likely outside the 22 MACHO fields that had been analysed so far. Still, it seemed like a good idea to tidy up loose ends. Since I was familiar with

## Cosmology Corner

**T**he next cosmology discussion group meeting is tentatively set for 8:00 PM Saturday September 28, 1996 in room B148 (the room beside the planetarium,) Burke Science Building, McMaster University. The topic is to be announced. Topic suggestions to date include galaxy formation, time, life, alien worlds, creation, the big crunch, the future of astronomy, and Delphi versus Visual Basic (yes, it takes all kinds.) Well who knows what we will end up discussing? The only way to be sure is to come out and join us. See you there.

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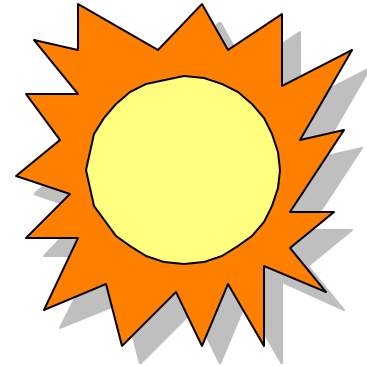
the list - I had actually published one of the few modern studies of these stars - and knew the intricate paths to locate objects in the MACHO database, I undertook to pull out such stars.

The meeting ended on Friday - our hosts managed to swing a conference banquet *in* the Eiffel Tower! Since I flew home Sunday and was

*“Time was of the essence. The organization of follow-up observations would have to start immediately”*

seriously short of cash, I decided to work most of Saturday at the Institut. The InterNet connection was good and so I was logged in on my computer at McMaster and interrogating the databases in Australia and Seattle. Most of the objects in the Harvard list were either already found by Karen or outside our fields. However, there were one or two lightcurves with a lot of points that could be extracted and I did so. It was doubly important to do this immediately because both the survey telescope in Australia and the database were about to become unavailable for over a week due to system upgrades.

The moment the lightcurve of HV 5756 appeared on the screen I knew we had a *really* interesting star. Not only did it show the regular pulsation lightcurve, but it also showed three equally-spaced dips in brightness in *both* the red and blue lightcurves. Could this be the first example of an eclipsing Cepheid after all these years? I had only an hour or two to be decide since my arrangement of visiting hours with the Director of the Institut was about to expire. Quickly I noted the times of faintest magnitude and found the differences between them. Excellent - they were equally spaced and it was therefore very probably an eclipsing binary. But it looked like there should be another one right about now. I added the orbital period to the time of the last eclipse and the time was - five days



from that instant! The eclipse was already in progress!

Time was of the essence. The organization of follow-up observations would have to start immediately. I sent news around to the rest of the team. Karen could not be reached because she was on holiday in Europe for two weeks. Reluctantly, I logged off and returned to my hotel room to wait for the trip home the next day. On the plane, I sketched out the outline of a paper and planned strategy for the days ahead.

Once I arrived back in Hamilton, I had the approval of the other MACHO team members to send out an IAU Circular. (This appeared as number 6434 on 1996 July 15). We also arranged observations at SAAO, CTIO and UTSO. The first frames back indicated that the eclipse was indeed in progress!

Why all the excitement? One reason is that this is the first opportunity to directly determine the mass of a Cepheid. Some classical Cepheids are members of spectroscopic binaries, but none are in eclipsing binaries so that the mass estimated is always a lower limit because the inclination of the orbit is unknown. Once a radial velocity curve can be obtained, the masses of the two components can be found.

But wait - there's more! The HV stands for "Harvard Variable" and

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# Haphazard Reporting Leads To Confusion

**B**ake any planet at 82 degrees Celsius and you'll get a spacefaring civilization.

While the above statement may not appear in any science textbook or grace the front page of any respectable magazine, the sentiment may be close to what many Canadians believe.

Take last week's planetarium show. I have given these presentations to people of many ages and

backgrounds, but children are the most enjoyable audience, due to their enthusiasm and unabashed curiosity. In the post-show question period, I asked who had heard about the two new planets circling other stars. About half the group raised their hands. When prompted to relate what they knew, the hands began to wave about eagerly.

"I heard one planet is nine times the size of Jupiter!" chirped one grade 3 student.

"Actually, the planet around 70 Virginis is nine times as heavy as Jupiter, But that doesn't mean it's nine times bigger."

"One of the planets has liquid water," another child volunteered.

"Well, that might be true, but we don't know for sure. The people who discovered it only said that the planet was warm enough that water could exist in liquid form. That planet is a gas giant, so it wouldn't have oceans like we have on Earth."

A third child spoke up: "I heard there's oxygen on one of the planets. And that means there could be life."

I was truly taken aback at that one. Molecular oxygen is a rarity in the

***"These comments might be the product of simple misunderstanding, but a glance at recent media treatment of the discovery says otherwise"***

cosmos and, to my knowledge, Marcy and Butler have said nothing about it being present in quantity. Since the new satellites have not been viewed directly, detailed spectroscopy does not even exist. What's more, the idea that oxygen is necessary for life is not even true for all terrestrial organisms.

These comments might be the product of simple misunderstanding, but a glance at recent media treatment of the discovery says otherwise. For the most part, newspapers and magazines have been accurate in their summaries of Marcy and Butler's findings, but a few glaring errors are evident. The Toronto Star informs us these gas giants "...are thought to have surfaces that would allow the formation of water..." and that the planet circling 47 UMa has

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## Tales From the Dark Side ...

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that means that its lightcurve was one of those thousands that the good folks in Hamilton have been typing in. That Monday, Ev and I determined that it was one of the ones that hadn't yet been typed in and Ev proceeded to do so. With luck, some evidence of an eclipse several decades ago will allow us to really pin down the orbital period! That, of course, will result in a paper by itself!!

There was also a dose of reality that crept in - Pop II Cepheids are less regular than classical Cepheids - their periods are only stable at the 0.5% level and their lightcurves at the 2-5% level. Also, modelling the lightcurve in such a system is no simple matter. The lightcurve of the Cepheid outside of eclipse is always contaminated by the other star, but to find the depth of the eclipse you need to know that lightcurve without the contamination. Also the Cepheid changes its diameter by about 30% during its cycle which lasts a similar length of time to the eclipse, giving rise to the possibility of additional "contact times" and lightcurve features not seen in eclipsing binary made up from constant stars.

Still, these difficulties can be overcome with enough attention and working hard to get important results is

part and parcel of doing interesting science. So for now, the adrenaline level is still high and I can hardly wait until we find an eclipsing classical Cepheid or RR Lyrae star!!

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Microlensing URL's:

MACHO

<http://www.macho.mcmaster.ca/>

AGAPE

<http://cdfinfo.in2p3.fr/Experiences/Astrop/AGAPE/agape.html>

EROS

<http://www.lal.in2p3.fr/EROS/presa.html>

MOA

<http://www.phys.vuw.ac.nz/dept/projects/moa/index.html>

OGLE

<http://www.astro.princeton.edu/~staneck/ogle/>

PLANET

<http://www.astro.rug.nl/~planet/>

# Comet C/1995 01 (Hale-Bopp)

## EPHEMERIDES

DATE (00:00 UT)	R.A. (2000)	DEC	El.	Sky	Mag
08-05	18h05.5m	08o32'	136o	E	5.7
08-10	17h59.4m	08o07'	130o	E	5.6
08-15	17h53.8m	07o44'	124o	E	5.5
08-20	17h48.7m	07o21'	118o	E	5.5
08-25	17h44.2m	07o01'	113o	E	5.4
08-30	17h40.3m	06o41'	107o	E	5.4
09-04	17h37.0m	06o23'	102o	E	5.3
09-09	17h34.4m	06o06'	96o	E	5.3

## ORBITAL ELEMENTS

<b>Perihelion Date</b>	<b>1997 04 01.14561</b>
<b>Perihelion Distance (AU):</b>	<b>0.9140971 AU</b>
<b>Argument/Perihelion (2000):</b>	<b>130.59227 deg.</b>
<b>Ascending Node (2000):</b>	<b>282.47087 deg.</b>
<b>Inclination (2000):</b>	<b>089.42807 deg.</b>
<b>Eccentricity:</b>	<b>0.9950784</b>
<b>Orbital Period:</b>	<b>3000 yrs.</b>

## Haphazard Reporting ...

(Continued from page 5)

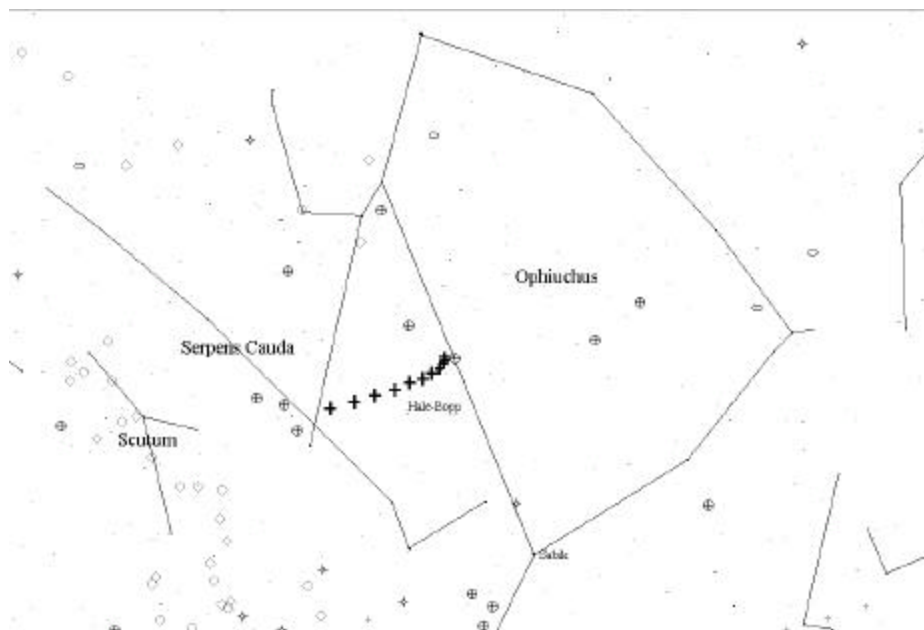
an orbital radius "comparable to that of the Earth from its sun". According to the press release from UC Berkeley, this value is actually twice the distance of the Earth from the sun.

The Globe and mail notifies us that "[47 UMa's companion], too, may have water, but 'Mr.' Marcy said it probably would be frozen." Yet they neglect to mention the researchers' statement that "the planet probably has a region in its atmosphere where the temperature would allow liquid water [ t o e x i s t ] . "

Similarly, The Globe reports: " 'Mr.' Marcy said the planet orbiting 70 Virginis is about 9 times as large as Jupiter". Obviously this was where one student had gotten his news. Yet both Marcy and Butler's unpublished paper and the Berkeley press release (<http://pio06.urel.berkeley.edu/documentation/Marcy2.html>) put the estimate at no greater than 6.5 Jupiter masses. It came as a shock to realize that the factor 9 had somehow gotten lodged in my memory as well.

One might expect less well-informed, or less scrupulous periodicals to be guilty of inaccurate reporting, but such mistakes in two of Canada's major newspapers are unacceptable. Educating people about science isn't the easiest thing in the world. The task becomes more difficult if the popular media fails to draw the line between research and speculation, or understands astronomical concepts inadequately enough to make a proper s u m m a r y .

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Hale-Bopp Finder Chart

Note: The left mark indicates the comet's position on August 8, 1996. Subsequent marks are 5 days apart.

# The Caldwell Catalogue

C	NGC/IC	Const	Type	R.A. (2000.0)	Dec	Mag	Size (')	Notes
1	188	Cep	OC	00h 44.4m	+85° 20'	8.1	14	
2	40	Cep	PN	00h 13.0m	+72° 32'	12.4	0.6	
3	4236	Dra	SG	12h 16.7m	+69° 28'	9.7	19 x 7	
4	7023	Cep	BN	21h 01.8m	+68° 12'	--	18 x 18	Refl. nebula
5	IC 342	Cam	SG	03h 46.8m	+68° 06'	9.2	18 x 17	
6	6543	Dra	PN	17h 58.6m	+66° 38'	8.1	0.3/5.8	Cat's Eye Neb.
7	2403	Cam	SG	07h 36.9m	+65° 36'	8.4	18 x 10	
8	559	Cas	OC	01h 29.5m	+63° 18'	9.5	4	
9	Sh2-155	Cep	BN	22h 56.8m	+62° 37'	--	50 x 10	Cave Nebula
10	663	Cas	OC	01h 46.0m	+61° 15'	7.1	16	
11	7635	Cas	BN	23h 20.7m	+61° 12'	--	15 x 8	Bubble Nebula
12	6946	Cep	SG	20h 34.8m	+60° 09'	8.9	11 x 10	
13	457	Cas	OC	01h 19.1m	+58° 20'	6.4	13	Phi Cas Cluster
14	869/884	Per	OC	02h 20.0m	+57° 08'	4.3	30 and 30	Double Cluster
15	6826	Cyg	PN	19h 44.8m	+50° 31'	8.8	0.5/2.3	Blinking Nebula
16	7243	Lac	OC	22h 15.3m	+49° 53'	6.4	21	
17	147	Cas	EG	00h 33.2m	+48° 30'	9.3	13 x 8	
18	185	Cas	EG	00h 39.0m	+48° 20'	9.2	12 x 10	
19	IC 5146	Cyg	BN	21h 53.5m	+47° 16'	--	12 x 12	Cocoon Nebula
20	7000	Cyg	BN	20h 58.8m	+44° 20'	--	120 x 100	N. America Neb.
21	4449	CVn	IG	12h 28.2m	+44° 06'	9.4	5 x 4	
22	7662	And	PN	23h 25.9m	+42° 33'	8.3	0.3/2.2	
23	891	And	SG	02h 22.6m	+42° 21'	9.9	14 x 3	
24	1275	Per	IG	03h 19.8m	+41° 31'	11.6	2.6 x 2	Perseus A
25	2419	Lyn	GC	07h 38.1m	+38° 53'	10.4	4.1	
26	4244	CVn	SG	12h 17.5m	+37° 49'	10.2	16 x 2.5	
27	6888	Cyg	BN	20h 12.0m	+38° 21'	--	20 x 10	Crescent Nebula
28	752	And	OC	01h 57.8m	+37° 41'	5.7	50	
29	5005	CVn	SG	13h 10.9m	+37° 03'	9.8	5.4 x 2	
30	7331	Peg	SG	22h 37.1m	+34° 25'	9.5	11 x 4	
31	IC 405	Aur	BN	05h 16.2m	+34° 16'	--	30 x 19	Flaming Star
32	4631	CVn	SG	12h 42.1m	+32° 32'	9.3	15 x 3	
33	6992/5	Cyg	SN	20h 56.4m	+31° 43'	--	60 x 8	Eastern Veil
34	6960	Cyg	SN	20h 45.7m	+30° 43'	--	70 x 6	Western Veil
35	4889	Com	EG	13h 00.1m	+27° 59'	11.4	3 x 2	In Coma Cluster
36	4559	Com	SG	12h 36.0m	+27° 58'	9.8	10 x 5	
37	6885	Vul	OC	20h 12.0m	+26° 29'	5.9	7	
38	4565	Com	SG	12h 36.3m	+25° 59'	9.6	16 x 3	
39	2392	Gem	PN	07h 29.2m	+20° 55'	9.2	0.2/0.7	Eskimo Nebula
40	3626	Leo	SG	11h 20.1m	+18° 21'	10.9	3 x 2	
41	--	Tau	OC	04h 27m	+16°	0.5	330	Hyades
42	7006	Del	GC	21h 01.5m	+16° 11'	10.6	2.8	Very distant
43	7814	Peg	SG	00h 03.3m	+16° 09'	10.5	6 x 2	
44	7479	Peg	SG	23h 04.9m	+12° 19'	11	4 x 3	
45	5248	Boo	SG	13h 37.5m	+08° 53'	10.2	6 x 4	

# The Caldwell Catalogue ...

C	NGC/IC	Const	Type	R.A. (2000.0)	Dec	Mag	Size (')	Notes
46	2261	Mon	BN	06h 39.2m	+08° 44'	--	2 x 1	Hubble's Var.
47	6934	Del	GC	20h 34.2m	+07° 24'	8.9	5.9	
48	2775	Can	SG	09h 10.3m	+07° 02'	10.3	4.5 x 3	
49	2237-9	Mon	BN	06h 32.3m	+05° 03'	--	80 x 60	Rosette Nebula
50	2244	Mon	OC	06h 32.4m	+04° 52'	4.8	24	
51	IC 1613	Cet	IG	01h 04.8m	+02° 07'	9.3	12 x 11	
52	4697	Vir	EG	12h 48.6m	-05° 48'	9.3	6 x 4	
53	3115	Sex	EG	10h 05.2m	-07° 43'	9.1	8 x 3	Spindle Galaxy
54	2506	Mon	OC	08h 00.2m	-10° 47'	7.6	7	
55	7009	Aqr	PN	21h 04.2m	-11° 22'	8	0.4/1.6	Saturn Nebula
56	246	Cet	PN	00h 47.0m	-11° 53'	10.9	3.8	
57	6822	Sgr	IG	19h 44.9m	-14° 48'	8.8	10 x 9	Barnard's Gal.
58	2360	CMa	OC	07h 17.8m	-15° 37'	7.2	13	
59	3242	Hya	PN	10h 24.8m	-18° 38'	7.8	0.3/21	Ghost of Jup'r.
60	4038	Crv	SG	12h 01.9m	-18° 52'	10.7	2.6 x 2	
61	4039	Crv	SG	12h 01.9m	-18° 53'	10.7	3 x 2	
62	247	Cet	SG	00h 47.1m	-20° 46'	9.1	20 x 7	
63	7293	Aqr	PN	22h 29.6m	-20° 48'	7.3	13	Helix Nebula
64	2362	CMa	OC	07h 18.8m	-24° 57'	4.1	8	Tau CMa Cluster
65	253	Scl	SG	00h 47.6m	-25° 17'	7.1	25 x 7	Sculptor Galaxy
66	5694	Hya	GC	14h 39.6m	-26° 32'	10.2	3.6	
67	1097	For	SG	02h 46.3m	-30° 17'	9.2	9 x 7	
68	6729	CrA	BN	19h 01.9m	-36° 57'	--	1	R CrA Nebula
69	6302	Sco	PN	17h 13.7m	-37° 06'	9.6	0.8	Bug Nebula
70	300	Scl	SG	00h 54.9m	-37° 41'	8.7	20 x 13	
71	2477	Pup	OC	07h 52.3m	-38° 33'	5.8	27	
72	55	Scl	SG	00h 14.9m	-39° 11'	7.9	32 x 6	In Scl Group
73	1851	Col	GC	05h 14.1m	-40° 03'	7.3	11	
74	3132	Vel	PN	10h 07.7m	-40° 26'	9.4	0.8	
75	6124	Sco	OC	16h 25.6m	-40° 40'	5.8	29	
76	6231	Sco	OC	16h 54.0m	-41° 48'	2.6	15	
77	5128	Cen	EG	13h 25.5m	-43° 01'	7	18 x 14	Centaurus A
78	6541	CrA	GC	18h 08.0m	-43° 42'	6.6	13	
79	3201	Vel	GC	10h 17.6m	-46° 25'	6.7	18	
80	5139	Cen	GC	13h 26.8m	-47° 29'	3.6	36	Omega Centauri

### Key to object types

BN = Bright nebula, GC = Globular cluster  
 EG = Elliptical galaxy, DN = Dark nebula  
 OC = Open cluster, IG = Irregular galaxy  
 PN = Planetary nebula, SN = Supernova remnant, SG = Spiral galaxy

For planetaries a size of, e.g., 0.3/2.2 means that the bright nucleus is 0.3' across while the faint outer shell spans 2.2'.

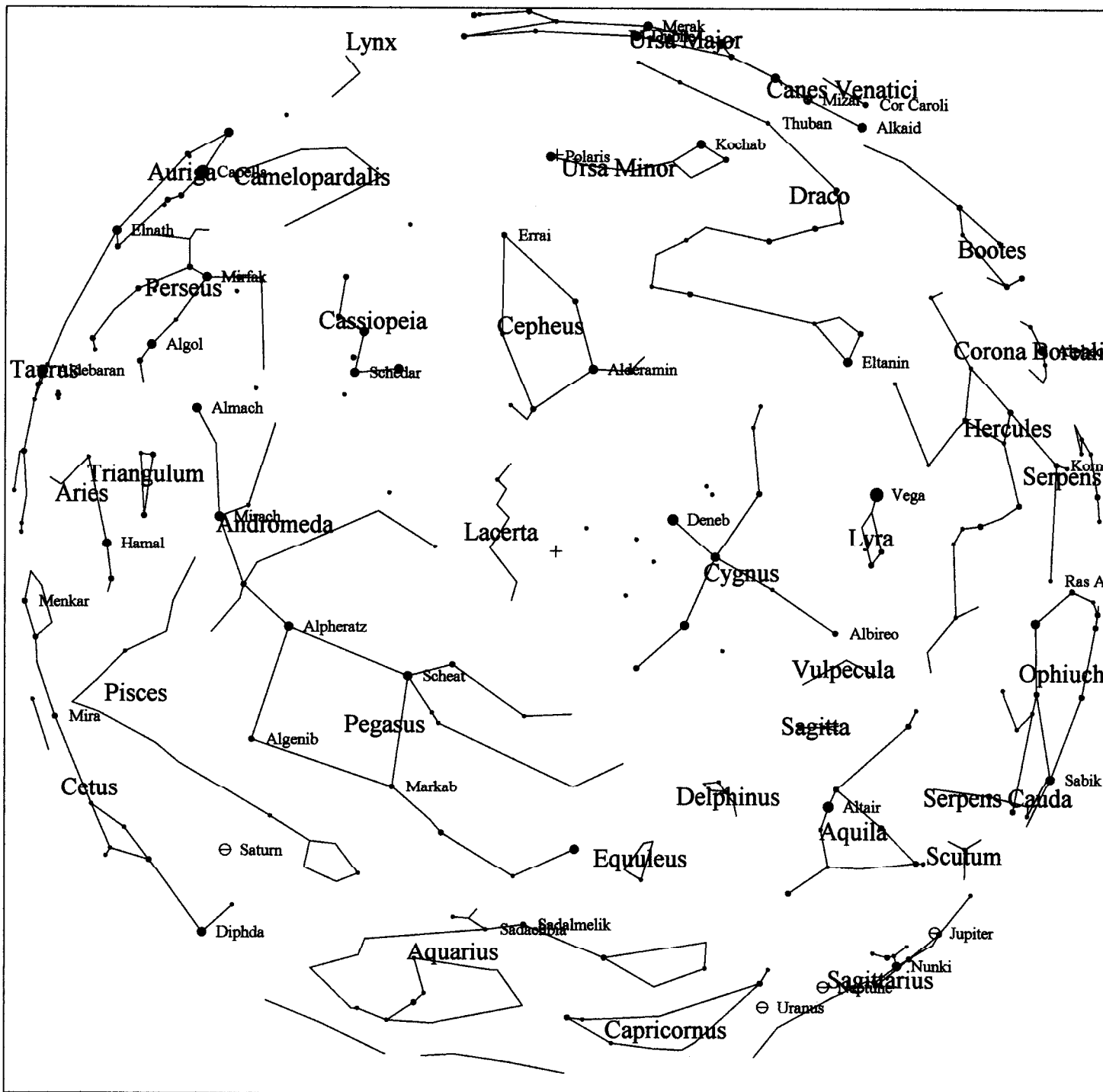
THE CALDWELL CATALOG: 109 Deep-Sky Delights for Backyard Observers By Patrick Moore and the Editors of Sky & Telescope

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The catalog printed here contains some minor changes/corrections over the one printed in December 1995 Sky & Telescope.



# September Night Sky



ECU V3.0 (Star Atlas Mode) - September Night Skies

UTC: 1996/09/16 at 03:30  
 LMT: 1996/09/15 at 10:30pm

RA=21h52.2m Dec=+43°07'  
 Field=180.0° Azim=346°10' Alt=+90°00'

# Did you know that ...

**C**opernicus said quite openly that he had arrived at his revolutionary heliocentric insights by studying the secret writings of the ancient Egyptians. Likewise, Kepler admitted that in formulating his laws of planetary orbits, he was merely 'stealing the golden vessels of the Egyptians'. Furthermore, Newton had once stated quite explicitly that the law of gravitation expounded in his "Principia" was not new but rather had been known and fully understood in ancient times.

Rob Roy  
a5817394@mcmaster.ca

**D**id you know that the term "surfing" when applied to describe spending time exploring the Internet doesn't derive from anything to do with water? The term was actually coined back in the early days of the Internet (about 1969.) Back then, a person that is now sometimes referred to as one of the founders of the Internet, spent a lot of time working on it. His name is Vinton Cerf. So when you spent a lot of time on the Internet, you were like Vinton Cerf, you were Cerfing. This became the surfing we know today. Now you know.

Bill Tekatch

# Wanted ...

**I** am looking for some firecrackers to simulate craters formed by explosions.

Mike Ricks videotaped a few of our trials and the images are stunning when viewed in the freeze frame mode.

Bob Botts  
bob.botts@ghbbs.com

## CALENDAR OF EVENTS

- ◆ August 16 or 17, 1996, 9:00 PM
- ◆ Tue. August 20, 1996, 7:00 PM
- ◆ Fri. August 23, 1996, 7:30 PM
- ◆ Thu. September 7, 1996, 8:00 PM
- ◆ Fri. September 6, 1996, 11:59 PM
- ◆ Fri. September 13, 1996, 7:30 PM
- ◆ Sat. September 28, 1996, 8:00 PM

**BINBROOK OBSERVING SESSION** - On the first clear date. Contact Charles Baetsen (524-0148 or [charlesb@abelcomputers.com](mailto:charlesb@abelcomputers.com)) for more details.

**HAMILTON AMATEUR JUNIOR ASTRONOMERS** - Mac Burke Science Building, Rm B148 (beside the planetarium) The topic will be "Black Holes: The Monster in the Centre of the Galaxy."  
For more information contact Rosa Assalone at 540-8793

**COUNCIL MEETING** - At the home of Rosa Assalone. Call Ann Tekatch at 575-5433 if you're interested in attending.

**ROYAL ASTRONOMICAL SOCIETY OF CANADA Hamilton Centre** - General Meeting - McMaster University Medical Building Room 1A6

**EVENT HORIZON DEADLINE** - Please submit your articles and pictures to Stewart Attlesey, [stewart@io.org](mailto:stewart@io.org) or modem (905)827-9105 or snail mail to 1317 Mapleridge Cres., Oakville, L6M 2G8

**HAA GENERAL MEETING** - at the Spectator Building auditorium. Guest Speaker will be Ian McGregor of the Royal Ontario Museum speaking on "Mayan astronomy."

**COSMOLOGY DISCUSSION GROUP** - Room B148 (the room beside the planetarium,) Burke Science Building, McMaster University. The topic is to be announced.

