AMERICAN ASSOCIATION OF VARIABLE STAR OBSERVERS

ABSTRACTS

OF

PAPERS

PRESENTED AT ROCHESTER MEETING

1 MAY 1971

CONTENTS

187 Concord Avenue, Cambridge, Massachusetts 02138

AAVSO ABSTRACTS

Edited by R. Newton Mayall

The 60th Spring meeting of the AAVSO was held in Rochester, New York, on 1 May 1971 at the kind invitation of the Rochester Museum & Science Center and the Rochester Academy of Sciences.

Rochester lies about midway along the south shore of Lake Ontario. Here is the home of the Eastman Kodak Company and the George Eastman House of Photography, which is now an outstanding museum and center for the study of the history and uses of photography. There are five colleges in the vicinity of Rochester. Also the Bausch & Lomb Company and Xerox have extensive plants in Rochester.

STRASENBURGH PLANETARIUM

Many members arrived on Thursday so they could have a day to spend visiting the many points of interest. On Friday afternoon the Council held its meeting in the Library of the Strasenburgh Planetarium. Friday evening we gathered in the television room of the planetarium to hear Terence Dickinson talk about Mars. Profusely illustrated with slides he showed us the history of Mars from the drawings made by early observers to photographs made with our large telescopes, and finally some beautiful slides of Mars sent back to us from the Mariner cameras that passed by Mars.

Saturday morning we held our business session in the auditorium of the Rochester Museum and Science Center. In the afternoon we heard papers by members. The ones on the eclipses of 1972 and 1973 came in for a lot of discussion.

In the evening we held our dinner in the Treadway Inn and at 2100 we again went to the planetarium to see the show which was about Mother Earth. The planetarium is a most comfortable and unique building seating 240 persons in reclining and swivelling chairs. It is run by young people who show a great deal of imagination in what they do. One of the features is the space tunnel which has many exhibits in three dimensions -- one of the best we have seen.

After our demonstration we went back stage to see how things work and attended a reception by the planetarium staff. They provided liquid refreshment and hors d'oeuvres. We left about midnight.

On Sunday we all went our various ways.

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TOTAL SOLAR ECLIPSE 30 JUNE 1973, by Lewis J. Boss

Practically all of Africa except the extreme southern part will see this eclipse as partial, with varying degrees of the sun's disc obscured, as will European countries bordering on the Mediterranean, Saudi Arabia, Iraq and some areas in southern Iran. The maximum duration of totality will occur in the region near the junction point of the borders of Mali, Niger and Algeria. It seems likely that only the most sophisticated and professional eclipse parties will attempt to set up observation sites in this locality.

The moon's shadow first strikes the earth at sunrise near Georgetown, Guiana, on the northeast coast of South America and almost at once swings out over the Atlantic Ocean. It touches land next on the west coast of the African hump, near Nouakchott, Mauretania and moves inland slightly north and east over the area lying between the equator and 20° N. Latitude. This region comprises north central Africa and appears, from the available maps, to be pretty wild and primitive country. The eclipse track leaves the east coast of Africa between the towns of Brava and Chisimai in the Somali Republic and ends out in the Indian Ocean at sunset.

The central line of the shadow path traverses what appears to be quite sparsely inhabited country with no town or even villages very close to the path of totality. Unfortunately the maximum duration of the total phase, amounting to 7 minutes 45 seconds occurs just about in the middle of this area. Parties intending to locate in this region must be prepared for primitive living conditions and long rough travel from more civilized settlements. However, at least one travel bureau in the Boston area announces that it is now taking reservations for a tour to observe the 30 June eclipse!

All of the eclipses in this series occur at the moon's descending node and the first small partial one took place on 13 June 1360. The first central and annular eclipse occurred on 8 September 1504, and the series changed from annular to total on 17 January 1703. The duration of totality has been steadily increasing at each return and will reach a maximum of 7 minutes and 45 seconds with the June 30th event.

At least two eclipses belonging to this series have contributed greatly to the sum total of astronomical knowledge. On 6 May 1883, photographs made on Caroline Island in the mid-Pacific recorded for the first time coronal streamers longer than any before seen visually. Again on 29 May 1919, English astronomers in Brazil and West Africa secured data confirming for the first time Albert Einstein's prediction that light from a distant star passing close to the sun would be deflected from a straight line by the influence of the solar mass.

The eclipse on 30 June will be the sixteenth total eclipse of the series and the length of maximum totality will begin to decrease on the next return which will occur on 11 July 1991, visible in Mexico with the sun near the zenith. The last central and total eclipse will take place on 10 May 2496, and the series will completely run out with a small partial eclipse on 28 July 2622.

T TAURI MYSTERY STARS, by Lewis J. Boss

At the Fall Meeting last year, at Woods Hole, Marcia Keyes read a paper suggesting that perhaps our sun once belonged to that mysterious group of stellar bodies which exhibit no mutual relationship or systematic correlation to any other type of variable star.

It is generally conceded that the sun has reached middle age and that it probably did indeed pass through the T Tauri phase about five billion years ago, some millions of years after attaining a luminous existence. A few activities reminiscent of its violently disturbed youth seem to persist and the present day turbulence of the solar surface is suggestive of the tremendous upheavals characteristic of the T Tauri stars. In fact the "solar wind" may be a minuscule remnant of the enormous amounts of material ejected by the sun in its early days.

Since the sun's energy output indicates that it must now be consuming hydrogen at the rate of about 700 million tons per second, our present estimates of the solar hydrogen available give it a lifetime of some 10 billion years. More massive stars, for example beta Orionis, having 50 to 100 times the mass of the sun, appear from their luminosities to be using up hydrogen a million times faster than the sun. Also in stars of this magnitude only about half the total amount of hydrogen in their mass is available for conversion in the nuclear furnace. The obvious inference is that such bodies must burn out within a few million years and shortly thereafter disappear from the celestial scene.

Up to about 35 years ago it was the accepted notion to think of the stars as the most permanent of objects, but now it seems that such may not be the case. The implications are striking, not to say downright amazing! Today the population of high-brilliancy stars in our galaxy appears to remain very nearly constant and, therefore, the old burnt-out stars must be constantly replaced. There are roughly 6000 high luminosity stars in our firmament and consequently such replacements must be made at what amounts to, in astronomical terms, feverish speed. It works out to about one bright new star, somewhere in the galaxy, showing up every 500 to 1000 years.

In 1940, Dr. Alfred H. Joy was investigating the peculiar properties of a type of variable which would not fit into any known classification. A number of these stars have now been found and are known as T Tauri stars, after the original stellar body that was investigated.

In an earlier paper (See Abstract of Papers, AAVSO Nantucket Meeting 11 October 1969) I outlined several recent investigations which tended to corroborate the "Big Bang" theory of the origin of the universe in which the generation of the raw material for galaxy building was accounted for. It now seems proper to go on from there.

The later phases of stellar formation, according to present day theoretical concepts, appears to follow the following sequence of events. Imagine a diffuse cloud of matter, with about the same mass as our sun, ready to condense into a star. The influence of gravity will cause the material to shrink and when it has contracted to the approximate diameter of the solar system it will have become a relatively cool, non-luminous cloud. However, as condensation continues some of the energy created begins to go, not into additional heating of the cloud, but to the breaking up of hydrogen molecules and the ionization of atoms. Since this diversion of energy reduces the pressure internally and thus removes support for the outer layers of the cloud, the whole structure collapses rapidly. Obviously this catastrophic action now generates terrific heat which in turn halts the condensation by a build-up of internal pressure in the cloud. By the time its diameter has been reduced to somewhere near 866 million miles, equilibrium is again achieved and it is at this point that the new star becomes visible with a surface temperature of around 4000° Kelvin and a brilliancy 100 times that of our sun.

The birth of a T Tauri star resulting from a nuclear dust cloud collapse may actually have been observed in 1936. In that year a new star, now catalogued as FU Orionis, appeared suddenly in the midst of a compact gas and dust filled area in Orion. Seemingly the event does fulfill the requirements for the generation of a T Tauri star but, of course, a single example is not acceptable as complete verification. Nevertheless, some fourteen class T Tauri stars have been photographically located in and about the Orion Nebula on plates taken with the 120-inch reflector at Lick Observatory, Mt. Hamilton, California.

This area may prove to be a breeding ground for T Tauri stars. About three years ago Drs. E.E. Becklin and G. Neugebauer of the California Institute of Technology, announced the discovery of a source of infrared energy in the Orion Nebula. A large amount of infrared radiation is almost always found in areas surrounding T Tauri stars and is probably emanating from the enormous clouds of star-material lying near to these objects.

Summarizing some of the peculiarities of these stars it is found that:

1. They have unusually deep and very active outer layers as compared to the atmospheres of ordinary stars.
2. Where a T Tauri star exhibits an absorption type spectrum the lines are apt to be unusually wide, probably due to Doppler-effect spreading.
3. They all have "solar winds" of enormous velocities. Material rising from the star's surface is somehow accelerated and driven outward by a force (not centrifugal) strong enough to overcome the star's gravitational pull.
4. Extremely erratic variations in brilliancy are characteristic of T Tauri stars. They have no predictable period and follow quite irregular cycles ranging from a few hours to, in extreme cases, many years.
5. This type of star has a spectrum displaying a most unusually high content of lithium, amounting to from 80 to 400 times the quantity found in our sun's chromosphere.

Systematic observation of the infrared radiation area in the Orion Nebula may produce results of the greatest interest to galactic astronomers.Theory now indicates that the Becklin-Neugebauer object could have a diameter of about 1500 times that of the sun and a temperature of around 700° Kelvin. Present knowledge implies that a condensing cloud of this size should complete the transformation from its existing state to a visible T Tauri star in somewhere near 20 years.

Observers having telescopes of, say, 14 to 16 inches will do well to examine the area of the Orion Nebula from time to time during the next decade. Perhaps an AAVSO member will be the one to discover a new T Tauri star!

THE SHIELD OF SOBIESKI, by Carmine Borzelli

In his "Prodromis Astronomiae" dated 1690, Hevelius, also called Hewel or Hoevelke, honored King John III Sobieski of Poland by depicting his Coat of Arms in a new constellation. We know it as Scutum Sobieski or just plain Scutum. A more archaic name is Clypeus Sobieski or Clypeus. In French, it is known as Ecu or Bouchiere de Sobieski. In Italian, it is called Scudo di Sobieski; and in German, Sobieskischer Schild. Earlier in history, the Chinese called this constellation together with part of Aquila, Tien Pien. Probably, the reason why this and others of Hevelius' constellations have survived intact is that he created them where there were none previously.

Scutum has no name star, but the four stars around the shield Hevelius said, represented Sobieski's four sons. It occupies one of the richest star fields in the Milky Way and also contains M 11, a magnificent open cluster NGC 6705, known as the Wild Duck Cluster.

This constellation is unique in that it was named for a real person, not a myth. I wondered what the story was behind it. Somewhere in history was the reason why Hevelius so honored Sobieski. In Allen's "Star Names and Their Meanings", Scutum is depicted "as the coat of arms of the Third John Sobieski, King of Poland, who distinguished himself in the defensive wars of his native land, as well as in his successful resistance of the Turks in their march on Vienna when turned back at the Kahlenberg on the 12th of September, 1683". Having decided that Sobieski was so honored for lifting the siege of Vienna, my next question was, what was the event? Was it of such proportion that Hevelius was proper in his prounouncement? In the past year, I have read over two dozen books and traveled to Vienna in September 1970. While I was there, I visited the Kahlenberg, the site of the famous battle, toured the city locating signs and memories of the Siege and the ensuing battle. The best documentation I came across was at the Museum of the City of Vienna. It was very helpful later on in weeding out discrepancies, inconsistencies and contradictions I was to run into. In trying to piece together the event, I found that no two historians completely agreed with each other. What I finally came up with is what I believe most fairly represents what really happened.

In Europe in 1680, Louis XIV was King of France, Leopold I was King of Austria and the Hapsburg Empire, Sobieski was King of Poland, Mohammed IV was Ruler of the Ottoman Empire, and Innocent XI was the Pope.

The chief rivals in Europe were Louis and Leopold. Louis had wanted Sobieski to join forces with him against the Hapsburgs. He refused. Mohammed IV saw a chance for his son-in-law Kara Mustafa the Grand Vizier, to outdo Suleiman the Magnificent and Mohammed II by succeeding where their predecessors had failed, namely to take Vienna by force and finally Rome. In 1529, Suleiman laid siege to Vienna only to have to retreat after six weeks due to the fact that his army was decimated by disease and despair. Louis had secretly encouraged the Turks to attack Leopold. Hungary was divided by treaty at this time.

The northern half was under Hapsburg dominance, while the southern half, including Budapest, was under Ottoman occupation. Thokoly, who was leader of the Hungarian insurgents in the North, was receiving subsidies from Louis XIV to lead an uprising against the Austrians. In the meantime, seven French engineers were in the employ of Kara Mustafa. In early 1683, having failed to gain Sobieski's support, Louis tried to influence the Polish Sejm, the Polish Senate, to overthrow Sobieski. It was discovered the Sejm, in loyalty to the king, ratified a mutual defence treaty with Austria. It said that both countries would come to the aid of each other if either was attacked -- Austria to supply 60,000 men and Poland 40,000 men.

Early in 1683, at Essek between Belgrade and Budapest, Mohammed IV, Kara Mustafa and Thokoly joined forces. Mohammed had made Thokoly Duke of Hungary, previously, and then Prince of Hungary at Essek. Kara Mustafa left for Vienna with 275,000 men. On their way to Belgrade, they received a bad omen in the form of a severe storm. The aged Pasha of Budapest and Thokoly tried in vain to dissuade Kara Mustafa, but he moved on,reaching Belgrade on 12 May. On 7 July the Austrians under Duke Charles of Lorraine were surprised by 15,000 Tartars at Petronel and he was forced to retreat to Vienna. Leopold left the city with 60,000 leaving 24,000 defenders under Stahremberg. He proved to be a most able leader and defender. Although he was severly wounded early in the siege, he would climb the spires of St. Stevens every day and sit in his stone chair in order to view the movements of the Turks. The spires were a favorite target of the Turkish cannons. The tops of all the spires of St. Stevens were shot off, but the stone chair was still intact and is on display today. The spires of most large churches were shot off.

Charles had retreated just north of Vienna to await help. The Tartars were in sight of Vienna of 7 July and Kara Mustafa arrived on 14 July to surround the city, and Turkish cannons opened fire. An estimated 100,000 shells fell upon the city during the siege.

Pope Innocent XI asked Louis XIV to go to the assistance of Leopold. He refused, but Sobieski answered the call, and left Cracow on 8 August. He arrived at the Kahlenberg on 10 September and had a choice of attacking up the Danube River Valley; but the allied army of 80,000 would be no match for 225,000 Ottoman Turks and their allies of Tartars, Kurds, Serbians and Egyptians.

On the evening of 11 September, the allies reached the summit of the Kahlenberg. After about two months of siege, Mustafa's army became lackadaisical and lost their fighting discipline. Too late, Mustafa realized that the allies could launch a successful attack and he hastily had to move his cavalry from the far side of the wall to the foot of the Kahlenberg. Hastily, they threw up crude defenses and dug shallow trenches. The allies sent up rockets to signal the defenders that one way or another, the siege was soon to be over for them.

On the morning of 12 September the Capuchin monk, Marco Aviano said mass assisted by Sobieski as his altar boy. At the conclusion, his two sons, James and Alexander were knighted and the troops received benediction. Then the king spoke, "Warriors and Friends! Yonder in the plain are our enemies, in numbers greater indeed than at Choczim, where we trod them under foot. We have to fight them on a foreign soil, but we fight for our own country, and under the walls of Vienna we are defending those of Warsaw and Cracow. We have to save today, not a single city, but the whole of Christiandom, of which that city of Vienna is the bulwark. The war is a holy one. There is a blessing on our arms, and a crown of glory for him who falls. You fight not for your earthly sovereign but for the King of Kings. His Power has led you unopposed up the difficult access to these heights, and has thus placed half the victory in your hands. The infidels see you now above their heads; and with hopes blasted and courage depressed, are creeping among the valleys destined for their graves. I have but one command to give -- Follow me. The time has come for the young to win their spurs".

Thus the battle began, with Sobieski, the Commander-in-Chief of the Allies, on the right flank with the Poles under Field Marshall Jablonowski; the center under the Elector of Saxony, who was to succeed Sobieski as King of Poland, commanding the Saxons, Bavarians and other German Troops; and the left flank under Duke Charles of Lorraine commanding the Austrians. The Turks were able to stall the first wave, and would have turned the tide except that the second wave arrived swiftly behind the first and by noon the allies had swept past the outposts and the first line of defense and were closing in on the second and main line. About three o'clock, two events were said to have occurred that decided the fate of the battle. First, a cloud was said to have passed over the face of the crescent moon which totaly demoralized the Turks which they took for a bad omen as the crescent moon is the symbol of Islam. At the sight of this omen, they were said to have fled. The second event was to have occurred about 5 o'clock. Sobieski, having come within sight of the camp of Kara Mustafa which lay at a midpoint between the Kahlenberg and Vienna, made straight for that camp with a large number of determined Polish cavalry and infantry. Seeing Sobieski in the midst of their camp, the Turks fled with Kara Mustafa at their head. Neither of these events could be corroborated at the City Museum of Vienna. All that is certain, is that the allies, with the advantage of the higher ground and a downhill momentum were able to overcome better than three to one odds.

The next day, the Archbishop of Vienna began his Thanksgiving Mass sermon with this quote from the Bible; "There was a man sent by God whose name was John." This battle of Vienna was the high point in

Sobieski's career. He was disappointed to have failed to secure the Hapsburg Arch-duchess as a wife for his son Jacob. This would have insured an heir to the Throne. As it was, his sons did not succeed him after his death in 1694. His countrymen still remember him as their greatest King. They cheered him as he rode triumphantly into Cracow on Christmas Eve 1683. For his failure, Kara Mustafa was throttled on Christmas Day.

Sobieski was a learned man and was interested in Astronomy, having read Galileo, Descartes and probably Kepler. He was also the patron of Hevelius, having supported him very generously both financially and morally. Sobieski was very generous as a ruler, for even though he was a very religious Roman Catholic he was very tolerant of his Orthodox, Protestant and Jewish subjects.

I have not finished the research on this project as of now. For example, I would like to know if there was a crescent moon over Vienna on 12 September 1683. At any rate, I cannot conclude at this time whether or not Hevelius was right in his pronouncement. I will say that this research was intriguing, very interesting and challenging. The constellation of Scutum is unique in that it was named for a mortal.

NEW SEQUENCE FOR UY & UZ CMa, by Charles E. Scovil

Mr. Scovil told of the difficulty in identifying these 2 close variables. Each has a nearby companion which also varies. A new chart will be available soon with all four stars properly marked and with a revised sequence. (ED.)

COMPUTER-PLOTTED LIGHT CURVES, by Margaret W. Mayall

AAVSO Report 28 contains curves of Mira stars and other long period variables. The next report, No. 29, will have plots of the curves of U Gem, Z Cam, R CrB and other irregular variables. We have run off a few preliminary curves to test the plotting of daily means. The first are SS Cygni, a U Gem-type with 52-day intervals; CZ Ori, a U Gem with 27-day intervals; and CN Ori, a Z Cam-type with a period of about 19 days. We will probably use 5-day means for some of the variables.

REAWAKENING OF THE NOVA SEARCH COMMITTEE, by George Diedrich

Kits have been prepared to be sent to prospective observers. They contain instructions and report cards and assign fields to be watched for novae. In addition to the special fields, it is good to learn all the brighter stars and check the whole dome at each opportunity.

RECENT WORK ON CHARTS, by Clinton B. Ford

Chart work is continuing at a good pace and more stars are being added to the list. Many more remain which will be good stars to observe, but need identification charts and sequences. The following new blueprints are now available from AAVSO headquarters:

010621	X Psc	e	
020356	UV Per	f	
022132	S Tri	d	
032443	GK Per	f	
045048	TV Aur	e+	
051011	V431 Ori	d	
052036	W Aur	f	
053915	CP Tau	b, d	
060443	RR Aur	d	
070205	RS Mon	d, e	
070714	VX Gem	e+	
071026	WZ Gem	d	
072811	T CMi	e	
072820b	Z Pup	e	
073234	ST Gem	e	
074922	U Gem	e	
182502	FH Ser	(Nova 1970)	b,d,f
184008	V368 Sct	(Nova 1970)	d
191904	V1229 Aql	(Nova 1970)	b,d,e
194326	LV Vul	(Nova 1968)	b,d
203718	HR Del	(Nova 1967)	e

TOTAL SOLAR ECLIPSE JULY 1972, by Casper H. Hossfield

There was a great deal of discussion about this eclipse which crosses from Alaska to the Hudson Bay area, Prince Edward Island and Nova Scotia. George L. Fortier was asked to look into conditions around the Nova Scotia area, and the possibilities of getting together after the eclipse. (ED.)

CLASSICAL CEPHEID PROGRAM FOR AAVSO, by Thomas A. Cragg

With the publication of the 1969 General Catalogue of Variable Stars, it seems worthwhile to reappraise the Classical Cepheid Program because of other stars and newer information available.

To reiterate, the basic program is to look for period changes which could be attributed to evolutionary changes in these stars. The period-luminosity law in classical cepheids demonstrates the longer the period, the greater the luminosity. We find also that the more luminous stars evolve much faster than the less luminous. Then it becomes evident that the long period cepheids are expected to evolve faster than shorter period stars. The period of any pulsating star is clearly quite dependent upon the characteristics of the interior, so one may expect rather evident period changes to correspond to rather small changes in the star's core. Some reflection upon these changes makes it seem possible that a period change in a star with a 30-day period might be noticeable in the order of a decade.

To make this program suitable for amateurs, it seems the best method of attack would be to determine several maxima of a star during an apparition and take the mean. This becomes the mean epoch for that apparition. A few years later a similar epoch is determined. From several of these epochs over a ten or more year interval one hopes a plot of O-C values(Observed minus Calculated)can show a slope characteristic of the period change. It is possible several apparitions might be averaged to improve the accuracy of an epoch for one apparition. As an example, one might combine the efforts of 5 years of observing into one epoch, then do the same for the next 5-year interval, etc. In this manner rather small period changes should become evident. A number of maxima during each epoch would be desirable to be sure no change in shape of light curve might be interpreted as a period change.

To choose stars applicable to amateur instruments and observing methods(visual), those were chosen satisfying the following characteristics: (1) The period should be 10 days or longer(the longer the better!); (2) it should have a range of at least 1.0 magnitude in (v); (3) its maximum should be brighter than 12.0 in (v).

The spectral range of most classical cepheids runs from early or mid-F at maximum down to mid-G or early K at minimum. This means in (v) most classical cepheids are between 0.7 and 1.0 magnitude brighter in (v) than in (B) (photoelectric blue) or (p) (photographic) at maximum, and the difference would be greater still at minimum. For this reason one finds a number of stars in the accompanying list which appear outside the limits set forth before. Most of these have published magnitudes in (B) or (p) and after making the correction to (v) would be within the previously mentioned parameters.

It should be noted that both disk and halo population cepheids are included. Naturally, while acquiring data of this kind it would be wise to learn if there be any significant difference between delta Cephei and W Virginis types. In the case of the CW's (W Vir stars) one should be aware of the shoulder on the descending branch of his light curves. It's feasible that in some cases this may blur the time of maximum to such an extent that the epoch may be better determined from the minima. This conclusion can be reached only after studying each individual to see what is best for it.

Several interesting conclusions can be ascertained by merely inspecting the list:

1. There are only 117 classical cepheids fitting the parameters of our program. Adding 18 probable or marginal stars makes the total only 135 at best.
2. 80 of the 135 have declinations south of -20° demonstrating the ardent need of cooperation from observers in the southern hemisphere for any semblance of complete coverage. Of the 84 delta Cephei type, 45 are south of -20°; and of the 26 CW type, 18 are south of -20°.
3. Charts available through the AAVSO currently exist for only 15 of the 135 stars.

The numbered references are those given in the General Catalogue of Variable Stars for 1969. Notice that 14 of the included stars are shown on either the BD or CoD.

Notes on Special Individual Stars

050542 SY Aur. Although 0.1 magnitude (B) too small a range for the set up criteria, it would be on a b chart of YZ and ER Aur so might as well be included.
071069 RU Cam. Long known as one of the most irregular of the class, a rather poor example from which to learn generalities of the class.
021959 SZ Cas. On b chart of S Per so is a feasible star to work despite its range.
053262 beta Dor. Included because it is a good naked eye star. The period is slightly short.
065820 zeta Gem. Very good naked eye star and a very good sequence makes this one usable despite its small range.
153620b RX Lib. On the d chart of U Lib. My observations indicate minimum is fainter than 13.0 and would therefore qualify.
184667 kappa Pav. Included because it is a good naked eye star and as such should be useful.
140512b AL Vir. Among the sequence stars for the Mira star Z Vir. My observations indicate this one is usable despite its small range.

STAR	RA (1900)	DEC	TYPE	MAGNITUDE	PERIOD	CHARTS
SZ Aql	$18^h59^m35^s$	+01° 09.4	Cδ	8.92 - 10.83(B)	$17^d.137939$	b
TT Aql	19 03 09	+01 08.5	Cδ	7.47 - 9.27(B)	13.7546	b
EV Aql	19 02 13	+14 46.5	Cδ	12.4 - 13.9 (p)	39.5989	0869
PP Aql	19 48 06	+12 24.7	Cep	11.6 - 13.4 (p)	24.01	2098
V916 Aql	19 05 21	+12 22.3	Cep	11.6 - 13.2 (p)	13.44155	2596

STAR	RA	(1900) DEC	TYPE	MAGNITUDE	PERIOD	CHARTS
AD Ara	16 37 47	-55 35.8	CW	12.4 - 15.4 (p)	15.9556	0433
MR Ara	17 49 17	-45 45.4	Cep	11.5 - 13.1 (p)	19.827	3513
V340 Ara	16 37 38	-51 08.9	Cδ	9.8 - 11.1 (v)	20.8090	2382
RX Aur	04 54 28	+39 48.7	Cδ	8.14 - 9.22 (B)	11.624125	0884
(SY Aur	05 05 31	+42 42.5	Cδ	9.68 - 10.59(B)	10.144330	0884)
YZ Aur	05 08 25	+39 57.7	Cep	11.08 - 12.30(B)	18.1929	0884
AN Aur	04 52 44	+40 41.0	Cep	10.32 - 12.24(B)	10.2906	1934
CY Aur	04 50 20	+45 56.1	Cδ	12.6 - 13.9 (p)	13.850	1059
ER Aur	05 06 06	+41 53	Cδ	12.1 - 13.1 (p)	15.69073	1059
RW Cam	03 46 10	+58 21.3	Cδ	9.38 - 10.55(B)	16.41437	BD
RU Cam	07 10 54	+69 51.2	CW	9.28 - 10.43(B)	22.055	b
SS CMa	07 21 58	-25 03.6	Cδ	10.26 - 11.77(B)	12.3620	1717
TW Cap	20 08 53	-14 08.5	CW	10.27 - 12.00(B)	28.5578	b
l Car	09 42 30	-62 02.8	Cδ	4.33 - 5.51(B)	35.5412	CoD
U Car	10 53 44	-59 11.8	Cδ	6.67 - 8.48(B)	38.7560	CoD
VY Car	10 40 35	-57 02.4	Cδ	7.71 - 9.51(B)	18.9484	2463
XZ Car	11 00 06	-60 26.4	Cδ	9.05 - 10.57(B)	16.65159	CoD
YZ Car	10 24 38	-58 50.3	Cδ	9.15 - 10.52(B)	18.1631	3308
CT Car	10 33 17	-61 03.7	Cδ	12.80 - 14.30(B)	18.0565	1875
FI Car	10 47 01	-58 03.6	Cδ	12.5 - 13.8 (p)	13.4542	--
FO Car	10 57 29	-61 45.1	Cδ	11.58 - 12.56(B)	10.3559	--
FQ Car	11 06 00	-60 18.2	Cδ	12.8 - 14.0 (p)	10.27399	--
FR Car	11 10 01	-59 30.5	Cδ	10.27 - 11.42(B)	10.7173	CoD
HQ Car	10.17 08	-60 44.7	Cδ	12.5 - 13.9 (p)	14.0722	0077
RW Cas	01 30 43	+57 14.9	Cδ	9.44 - 11.38(B)	14.7943	0880
RY Cas	23 47 10	+58 11.1	Cδ	10.45 - 11.97(B)	12.13726	0879
(SZ Cas	02 19 55	+59 00.6	CW	10.94 - 11.64(B)	13.6274	0884)
CH Cas	23 17 36	+62 12.5	Cδ	11.72 - 13.37(B)	15.08619	0926
CY Cas	23 24 44	+62 49.3	Cδ	12.47 - 14.15(B)	14.3777	0926
TX Cen	14 27 36	-60 33	Cep	11.24 - 13.14(B)	17.0936	--
VW Cen	13 27 06	-63 32.4	Cep	10.68 - 12.29(B)	15.03618	0022
XX Cen	13 33 46	-57 06.4	Cδ	8.02 - 9.44(B)	10.9558	CoD
KK Cen	11 37 59	-58 26.3	Cδ	11.94 - 13.51(B)	12.1803	0045
KN Cen	13 29 35	-64 02.8	Cδ	10.57 - 12.05(B)	34.019	0022
MZ Cen	13 07 30	-63 47.5	Cep	12.4 - 13.6 (p)	10.353	--
OO Cen	13 19 50	-62 38.3	Cδ	13.0 - 14.9 (p)	12.8805	0013
V415 Cen	14 07 10	-44 25.3	CW	12.5 - 14.3 (p)	26.735	--
V420 Cen	11 34 58	-47 24.5	CW	9.86 - 11.62(B)	24.7678	0074
V686 Cen	11 27 03	-60 30.0	Cep	12.4 - 14.0 (p)	69.9	4160
CP Cep	21 54 27	+55 41.2	Cδ	11.7 - 12.92(B)	17.8559	0155
DR Cep	20 46 42	+58 31.7	Cep	12.9 - 15.3 (p)	19.06588	2370
AL CrA	18 08 24	-37 06.7	CW	12.25 - 13.86(B)	17.045	4151
KQ CrA	17 52 37	-39 34.4	CW	12.8 - 14.3 (p)	30.864	3513
QT CrA	18 02 12	-40 13.0	Cep	11.4 - 12.5 (p)	79.145	0021
(V347 CrA	18 05 22	-39 15.2	Cδ	12.95 - 13.9 (p)	15.3460	3516)
V449 CrA	18 50 30	-38 16.1	Cep	13.0 - 15.2 (p)	16.4943	4229
SU Cru	12 12 50	-62 43.5	Cδ	10.79 - 12.10(B)	12.8476	CoD
VX Cru	12 28 44	-60 40.9	Cδ	12.75 - 14.2 (p)	12.2126	0045
X Cyg	20 39 29	+35 13.6	Cδ	6.65 - 8.39(B)	16.3866	a
SZ Cyg	20 29 38	+46 15.6	Cδ	10.24 - 11.66(B)	15.10955	0097 (d)
TX Cyg	20 56 26	+42 12.4	Cδ	10.34 - 12.41(B)	14.70825	0097
VX Cyg	20 53 34	+39 47.5	Cδ	11.00 - 12.62(B)	20.13133	0097
CD Cyg	20 00 37	+33 49.7	Cδ	9.36 - 11.20(B)	17.07133	0834
EZ Cyg	19 53 52	+29 59.8	Cδ	11.7 - 13.4 (p)	11.659717	0530
KX Cyg	20 20 44	+40 13.9	Cδ	12.8 - 14.5 (p)	20.0467	0133

STAR	RA (1900)	DEC	TYPE	MAGNITUDE	PERIOD	CHARTS
MZ Cyg	21 17 53	+37 02.3	Cδ	11.8 - 12.8 (p)	21.25877	1235
V396 Cyg	20 12 45	+41 48.0	Cδ	12.1 - 13.7 (p)	33.243	0155
V438 Cyg	20 15 21	+39 44.9	Cδ	11.9 - 13.4 (p)	11.211058	1282
V609 Cyg	21 23 46	+54 05.5	Cδ	12.2 - 13.6 (p)	31.072	0170
(β Dor	05 32 45	-62 33.3	Cδ	4.05 - 5.07(B)	9.84200	CoD)
(zeta Gem	06 58 11	+20 43.0	Cδ	3.68 - 4.16(V)	10.15082	BD)
Z Lac	22 36 55	+56 18.4	Cδ	7.91 - 8.93(V)	10.88583	0884
(RX Lib	15 36 12	-20 43.0	CW	11.65 - 12.54(V)	24.9459	d)
UX Lup	14 45 31	-45 29.7	CW	12.9 - 14.7 (p)	16.22	3384
AL Lyr	19 15 28	+27 22.6	CW	12.8 - 14.0 (p)	12.98047	0530
T Mon	06 19 49	+07 08.4	Cδ	5.59 - 6.62 (V)	27.0205	ab
SV Mon	06 16 04	+06 30.9	Cδ	7.79 - 8.88(V)	15.2321	b
SZ Mon	06 46 24	-01 15.2	Cδ	10.4 - 11.6 (p)	16.3363	3453
UU Mus	11 49 23	-64 50.8	Cδ	9.14 - 10.23(V)	11.63641	0544
U Nor	15 34 37	-54 59.3	Cδ	8.64 - 9.69 (V)	12.64133	0546
RV Nor	15 56 12	-55 48.1	Cep	12.5 - 13.9 (p)	32.295	0427
(SY Nor	15 46 57	-54 16.1	Cδ	8.99 - 9.87(V)	12.6449	0427)
BH Oph	18 11 11	+12 04.0	Cep	12.02 - 13.29(B)	11.05314	--
(V478 Oph	17 54 33	+00 47.7	CW	12.56 - 13.49(V)	16.38	2313)
V554 Oph	17 36 51	-21 27.1	Cδ	12.6 - 14.5 (p)	14.865	0478
RS Pav	17 58 32	-58 58.3	CW	10.14 - 11.25(V)	19.954	CoD
(kappa Pav	18 46 38	-67 21.5	CW	3.92 - 4.78(V)	9.0653	CoD)
SV Per	04 42 46	+42 06.8	Cδ	9.30 - 10.43(B)	11.12875	0884
BM Per	04 22 14	+48 12.0	Cδ	11.4 - 13.3 (p)	22.9519	1078
X Pup	07 28 26	-20 41.7	Cδ	8.78 - 10.66(B)	25^{d}.9610	b de
RS Pup	08 09 14	-34 16.6	Cδ	7.69 - 9.35(B)	41.3876	2440
ST Pup	06 45 29	-37 09.7	CW	9.66 - 11.50(B)	18.8864	CoD
VZ Pup	07 34 34	-28 16.2	Cδ	9.73 - 11.65(B)	23.1688	0391
AD Pup	07 43 53	-25 19.7	Cδ	10.04 - 11.60(B)	13.5940	0391
AQ Pup	07 54 19	-28 51.6	Cδ	9.40 - 10.59(B)	29.8568	0391
BN Pup	08 02 20	-29 48.5	Cδ	10.06 - 11.66(B)	13.6731	3581
CE Pup	08 10 43	-42 15.8	Cδ	12.5 - 13.6 (p)	49.53	0280
CO Pup	08 22 06	-29 57.5	Cep	11.32 - 12.36(B)	16.0192	--
HW Pup	07 53 35	-27 19.8	Cδ	11.9 - 13.3 (p)	13.4532	4028
LS Pup	07 54 57	-29 02.2	Cep	9.8 - 10.8 (p)	14.1464	4134
VY Sgr	18 06 07	-20 43.4	Cδ	12.57 - 13.75(B)	13.5572	0920
WZ Sgr	18 11 06	-19 06.6	Cδ	8.46 - 10.14(B)	21.849708	1601
(YZ Sgr	18 43 42	-16 50.1	Cδ	7.83 - 8.86(B)	9.55345	3203)
AV Sgr	17 58 45	-22 44.1	Cδ	11.8 - 13.4 (p)	15.4093	c
BZ Sgr	19 53 04	-14 13.1	Cep?	11.7 - 13.4 (p)	---	BD
V383 Sgr	18 44 44	-32 22.3	CW	12.8 - 14.3 (p)	16.449	0243
V626 Sgr	18 01 54	-34 57.4	CW	12.12 - 13.56(B)	26.745	--
V1181 Sgr	18 07 50	-27 51.2	CW	12.2 - 14.0 (p)	21.315	1638
V1189 Sgr	18 16 52	-35 48.7	CW	11.9 - 13.6 (p)	14.0696	1638
V1290 Sgr	18 15 05	-32 40.8	Cδ	12.5 - 13.7 (p)	27.973	1640
V1303 Sgr	18 22 39	-26 49.2	CW?	13.01 - 14.69(B)	18.4586	1640
V1304 Sgr	18 22 58	-32 26.3	Cδ	12.9 - 14.2 (p)	12.9287	1640
V1670 Sgr	18 24 20	-23 47.8	Cep?	12.8 - 14.2 (p)	29.65	--
(V1711 Sgr	19 54 51	-30 47.1	CW	11.0 - 11.9 (p)	30.46	2570)
V1828 Sgr	18 07 19	-26 25.2	Cδ	12.6 - 14.9 (p)	12.985	--
(V1833 Sgr	18 09 24	-31 09.9	Cep	13.1 - 14.2 (p)	48.87	2447)
V1911 Sgr	18 28 45	-33 58.8	Cep	12.8 - 14.3 (p)	10.0581	2447
V1996 Sgr	18 24 27	-24 41.5	Cδ	12.4 - 14.2 (p)	18.15	4218

STAR	RA (1900)	DEC		TYPE	MAGNITUDE	PERIOD	CHARTS
(RY Sco	17 44 16	-33	40.5	Cδ	7.49 - 8.39 (V)	20.31529	2852)
(CQ Sco	17 42 53	-40	17.7	Cep	13.16 - 14.6 (B)	30.447	3513
KQ Sco	16 44 24	-45	15.4	CW?	11.03 - 12.42(B)	28.6890	0021
(V446 Sco	17 51 35	-36	15.1	CW	13.23 - 14.6 (B)	28.6195	3513
V470 Sco	17 10 39	-37	12.5	Cδ	12.51 - 14.4 (B)	16.2615	0262
V567 Sco	16 42 54	-40	44.6	Cδ	12.2 - 13.8 (p)	34.0483	0263
(V708 Sco	17 44 14	-34	33.4	Cep	13.3 - 14.6 (p)	27.178	0296)
(V709 Sco	17 44 22	-34	49.0	CW	13.1 - 14.1 (p)	17.430	0296)
Y Sct	18 32 36	-06	27.3	Cδ	10.50 - 11.85(B)	10.341504	1385
Z Sct	18 37 36	-05	55.1	Cδ	10.12 - 11.79(B)	12.9014	b(1385)
RU Sct	18 36 39	-04	12.4	Cδ	8.87 - 9.97(V)	19.69767	b(1385)
TY Sct	18 36 50	-04	23.3	Cδ	11.79 - 13.19(B)	11.05302	0494
UZ Sct	18 25 44	-12	59.9	Cδ	12.43 - 13.80(B)	14.7442	0844
BO Tel	19 07 44	-55	01.2	Cep	11.6 - 13.4 (p)	14.842	2339
SV Vel	10 40 55	-55	45.9	Cδ	7.91 - 9.06(V)	14.09707	0021
SW Vel	08 40 21	-47	02.5	Cδ	7.52 - 8.77(V)	23.4744	CoD
EZ Vel	09 21 53	-52	46.6	Cδ	11.89 - 13.3 (V)	34.5346	0720
W Vir	13 20 52	-02	51.5	CW	9.51 - 10.71(V)	17.2736	b d
YZ Vir	13 12 01	-04	33.3	CW	12.1 - 13.7 (p)	14.46796	4219
(AL Vir	14 05 45	-12	50.3	CW	9.14 - 9.88(V)	10.3040	b de)
SV Vul	19 47 25	+27	12.3	Cδ	6.73 - 7.76(V)	45.035	b d
DG Vul	19 54 33	+27	24.1	Cep	12.7 - 14.4 (p)	13.60831	4427