SOME INTERESTING VARIABLES, by Margaret W. Mayall

Blueprints of light curves covering 50 years or more were exhibited for most of these variables:

015254	U Per.	Depth of minima varies from about 9 1/2 to 14.
053326	RR Tau.	An RW Aurigae-type variable with overlapping periods of about 40, 200, and 500 days.
082405	RT Hya.	At times seems to show RV Tauri-type variation, but may be due to overlapping periods. Range varies from 3 mags. to less than 1 mag.
104620	V Hya.	Period of 530 days with 2 mag. range and overlapping period of 6500 days and range from about 7 to 12.
115158	Z UMa.	Period of 200 days, but sometimes nearly constant for several hundred days.
132422	R Hya.	A long period variable with change of period, decreasing from over 500 days in 1700, to less than 400 days at present.
154428	R CrB.	Comparison of 1960 min. with current 1962-63 min.
181141	Nova Her 1963.	Light curve showing slow drop of 3 mags. in 100 days.
192745	AF Cyg.	A semi-regular variable which has 97 day and 1000 day periods.
193449	R Cyg.	Shows alternating bright and faint maxima.
232848	Z And.	A "Nova-like" variable, which brightens 3 magnitudes about every 20 years, then gradually returns to minimum.

Set of curves for 9 variables: R And, o Cet, R Gem, R LMi, R Leo, R Hya, R Cyg, chi Cyg, and T Cep. Shows predicted mean curves from 1959-1964, with the observed curves superposed.

(Note. Copies of these blueprints may be purchased by members at cost: about $3.00 maximum, depending on size. The largest are about 3 x 5 feet.)

HOW WE EXPLORE SPACE, by Robert B. Leighton

Time lapse movies of the planets showing their rotation and changes. Taken at Mt. Wilson and Palomar, they were of excellent quality, and most interesting.

THE AAVSO, by Claude Carpenter

Mr. Carpenter showed a reel of his movies taken at various AAVSO Spring and Fall Meetings of the past. His films are of historic value and a fine supplement to the AAVSO 50th Anniversary movie. He had pictures of many old friends known only by name to our newer members.

SANCTUM OBSERVERS AND THE MINIMA OF THE MIRA STARS, by T.A. Cragg

There was a reason that the largest number of stars selected for the AAVSO in its early stages would be Mira stars, since basically they are the easiest to observe with large numbers of observers watching only once or twice per month. In more recent times observers have tended to side-step these objects for the more exciting irregulars. Yet Mira stars constitute one of the major populations (when compared with the more exotic variables) when looking over the general stellar population. Their very complex spectra and essentially regular variations have scared off many researchers to greener pastures.

The real challenge in Mira stars are good light curves over a long time period, and timing of maxima and minima, as well as brighter and fainter than normal maxima and minima. Probably one of the more interesting features is a flat minimum -- indicating perhaps the existence of a companion. Flat minima are very important and can be picked up only with concerted effort by several observers. Since most of the Mira stars we observe have minima from 13th to 15th magnitude, a real effort is at hand when one wishes to follow one of them through minimum.

Three Mira stars are known to have companions, and are listed below:

1. o Cet (M6e). Visual companion (Bep) probably irregular variable.
2. X Oph (M6e). Non-variable companion (K).
3. R Aqr (M7e). Spectroscopic behavior indicates an unresolved variable companion (Bep).

In 1955 Leon Campbell published "Studies of Long Period Variables", a compilation of the work of the AAVSO covering 44 years of accumulated data. Dr. Merrill published a list[1] of those included in the Campbell Volume whose light curves indicated they may have companions (flat minima). Probably no two people could go through those curves and come up with the same list of stars since some judgment is necessary as to what constitutes a flat minimum. Merrill's suggestion was to observe the color of the stars on his list at minimum photoelectrically to see if their color changes when the companion appears to dominate the light curve. Also, look to see if the "flat minima" group have variations in the flat minima, suggesting variability in the companion if its presence is the cause of the flat minimum in the first place. Table I lists the pertinent information concerning 31 Mira stars with flat minima suitable for working on this problem. Also listed are the next three minima for the convenience of those who wish to tackle this problem.

Note that the three Mira stars known to have companions do not appear on the list. The reason is that with the possible exception of R Aquarii, they don't have flat minima! Obviously, the degree of flattening of the minima depends entirely on whether or not the companion is brighter than the red star at minimum. Therefore, it is entirely possible many Mira stars have companions, but only those where the companion is brighter than the red star can be found by looking for flat minima.

One must be careful, for a class of Mira stars where increasing period varies with increasing rate of climb from minimum to maximum, the minimum phase is thusly drawn out to be rather flat[2]. X Cephei (21h382) is a very good example of an advanced member of that class. So, with a Mira star whose period is in excess of 400 days one should be aware of this possibility.

I was concerned over this problem rather recently when comparing my sanctum estimates with values found in the various recent Quarterly Reports. The annual reports of recent years indicate steadily some 25 or so sanctum observers (those who submit estimates at 13.8 or fainter). One might be led to believe, as was I, that as a result of that many, most of the minima of the fainter Mira stars were being covered well; especially since in the 40's and early 50's there were less than 10 sanctum observers. However, I was startled to find in many cases my own observations made up 50% or more of what was published for many minimum phases of these stars.

Two conclusions are immediately apparent: 1) There is a lack of interest in working Mira stars at minimum, or 2) many "sanctum" observers get only very few "sanctum" estimates since they're probably made when visiting a large instrument. At any rate

whatever the cause, the minima of Mira stars are NOT currently being covered sufficiently well to answer questions concerning their flatness. Therefore, I should appeal strongly to those whose location and instrumentation permit them to reach into the 14's so let's get with it and see what the faint end of the curve is doing.

1. P.A.S.P., 68, 162, 1956.
2. "The Story of Variable Stars", by Campbell & Jacchia, Figs. 39 & 40, pp. 96 & 97.

TABLE I

LIST OF STARS TO WATCH FOR FLAT MINIMA

Number	Star	Period	Days Flat	1st Min	2nd Min	3rd Min
042209	R Tau	324d	40d	12/17/63	11/05/64	9/25/65
053337	RU Aur	468	130	5/16/63	8/25/64	12/06/65
054615a	Z Tau	495	200	7/10/64	11/18/65	3/27/67
061647	W Aur	353	65	10/19/63	10/06/64	9/24/65
070772	R Vol	452	180	2/04/64*	5/01/65	7/27/66
072811	T CMi	317	80	8/27/63	6/30/64	5/02/65
072820b	Z Pup	509	220	9/25/63	2/12/65	7/07/66
083019	U Cnc	305	120	11/17/63	9/18/64	7/15/65
092551	Y Vel	446	160	2/04/64*	4/25/65	7/14/66
093178	Y Dra	326	60	5/02/63	3/23/64	2/07/65
111561	RY Car	416	240	5/08/64	6/28/65	8/16/66
132202	V Vir	249	90	10/17/63	6/21/64	2/24/65
140512	Z Vir	306	100	1/19/64	11/21/64	9/23/65
142205	RS Vir	350	50	6/21/63	6/05/64	5/21/65
143417	V Lib	256	60	11/07/63	7/20/64	4/01/65
144646a	S Lup	335	110	6/07/63	5/07/64	4/07/65
155018	RR Lib	277	70	4/27/63	1/28/64	11/01/64
161122a	R Sco	222	50	9/29/63	5/08/64	12/15/64
171401	Z Oph	351	50	9/19/63	9/04/64	8/21/65
173543	RU Sco	367	60	10/01/63	10/02/64	10/04/65
184243	RW Lyr	505	180	8/20/63	1/06/65	5/26/66
185512	ST Sgr	395	120	10/19/63	11/17/64	12/17/65
190925	S Lyr	438	210	10/21/63	1/01/65	3/15/66
203611	Y Del	466	290	9/09/63	12/18/64	3/27/66
204215	U Cap	204	90	9/18/63	4/09/64	10/30/64
204318	V Del	533	240	6/13/63	11/17/64	5/02/65
205030a	UX Cyg	557	250	5/13/64	11/20/65	5/29/67
210124	V Cap	277	45	12/31/63	10/03/64	7/07/65
220613	Y Peg	206	45	6/16/63	1/08/64	8/02/64
222129	RV Peg	391	110	11/08/63	12/03/64	12/27/65
235715	W Cet	350	45	12/21/63	12/05/64	11/20/65

* Derived from dates in the Campbell Memorial Volume.

Other "1st" dates derived or copied directly from Bulletin 25, the 1963 Annual Predictions of Long Period Variables, by Margaret W. Mayall.