

NO. 112 UBVRIJKL LIGHT CURVES OF CLASSICAL CEPHEIDS

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ABSTRACT

Observations of classical Cepheids are presented. Analyses will be published separately.

We have made multicolor photoelectric observations on the UBVRIJKL system (Johnson, Mitchell, Iriarte and Wisniewski 1966) for 20 classical Cepheid variable stars. For 18 of these stars, the observations extend from the ultraviolet to 2.2μ or 3.4μ in the infrared; for two, the data are limited to the UBVRI filters.

The individual observations are listed in Table 1. This table is divided into two parts; the first, contains the UBVRI data and the second, the JKL data. Since the photometric apparatus was the same as that used on the bright star program, the probable errors listed by Johnson, et al., (1966) also apply to the data of Table 1.

The data of Table 1 are sufficient to define light curves for these stars as wavelengths ranging from the ultraviolet to the infrared. Figures 1–20 show the observed light curves. The UBV data listed by Mitchell, Iriarte, Steinmetz and Johnson (1964) were also plotted, thereby increasing the weights of the UBV curves.

The light curves shown in Figures 1–20 exhibit the well-known shift of phase with wavelength. For example, the times of maximum and minimum light for T Mon shift to later and later phases as one progresses from U to L (from 0.36μ to 3.4μ). On the other hand several stars (SU Cas, DT Cyg and SZ Tau) seem not to show much phase shift. These same three stars are also almost constant in light output at 2.2μ and 3.4μ (K and L magnitudes).

Another group of stars (η Aql, U Aql, W Gem, S Sge and U Sge) exhibit another effect. These stars have secondary “bumps” on the visual light curves; as we proceed to the longer wavelengths these secondary “bumps” become the primary maxima. We suggest that this effect may be related to the phase shifts exhibited by stars with asymmetrical light curves; for example, T Mon and X Cyg.

We are preparing, for separate publication, analyses of the data given here in terms of the bolometric light curves and effective temperature curves. The combination of our data with the known radial velocity curves enables us to compute the absolute magnitude for each of these Cepheid variable stars. Our absolute magnitude determinations are entirely empirical and do not depend upon stellar model computations. The results of these analyses will be published in the near future.

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REFERENCES

- Johnson, H. L., Mitchell, R. I., Iriarte, B. and Wiśniewski, W. Z. 1966, *Comm. Lunar and Planet. Lab.*, 4, 99.
Mitchell, R. I., Iriarte, B., Steinmetz, D. and Johnson, H. L. 1964, *Bol. Obs. Tonantzinla y Tacubaya*, 3, 153.

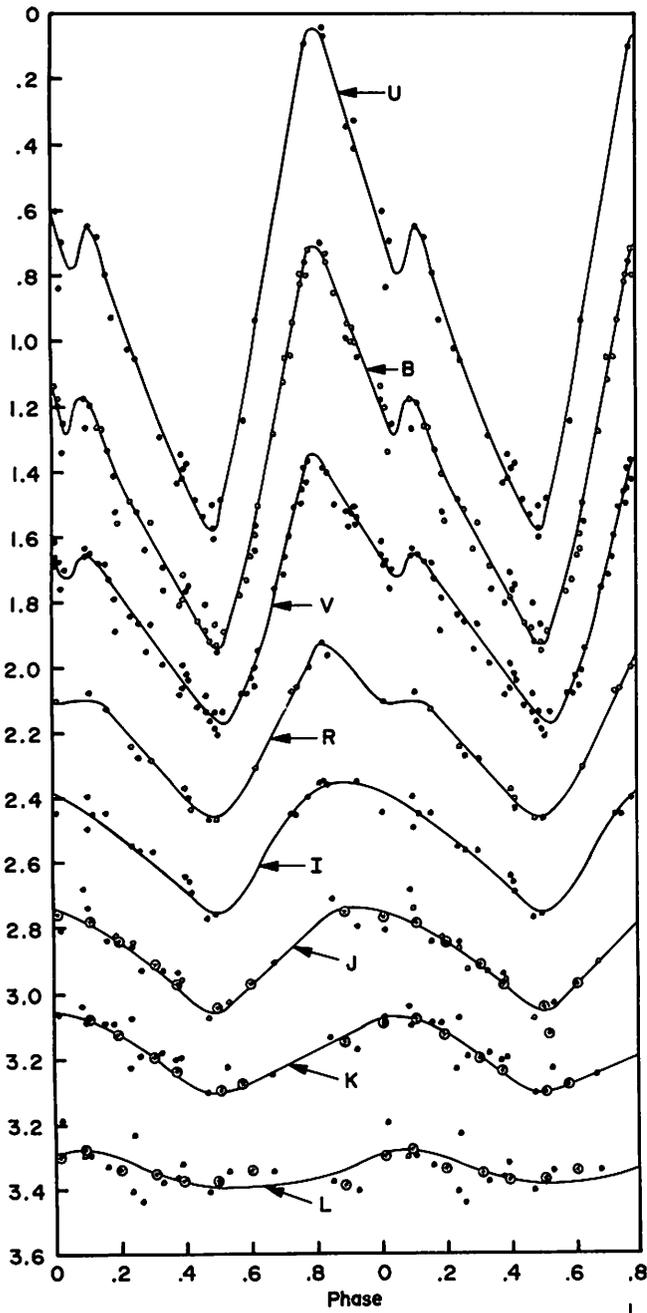


Fig. 1 The light curves for U Aql. Vertical scale gives magnitude differences with arbitrary zero point.

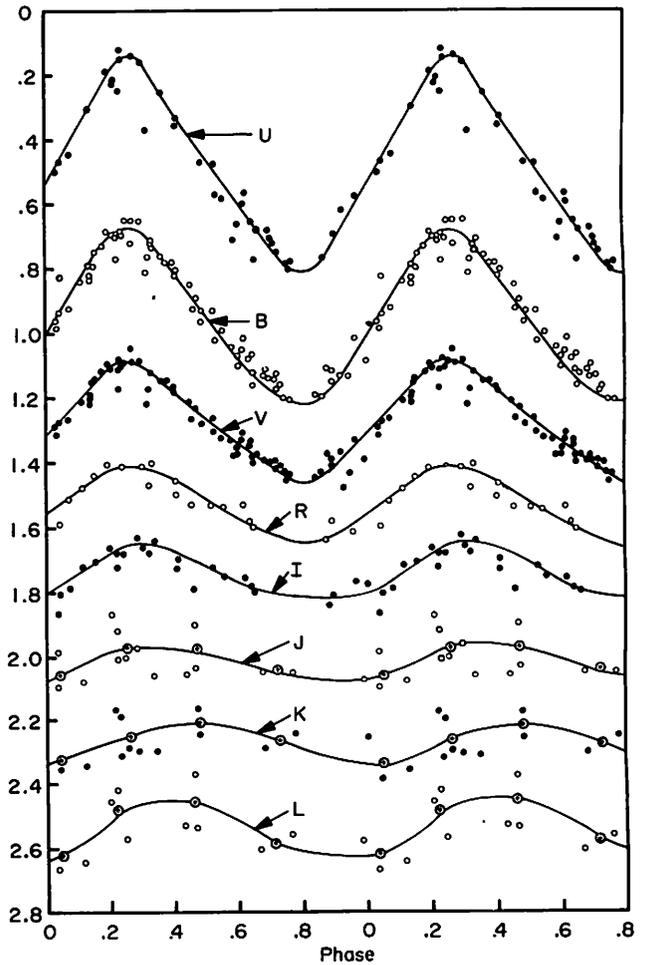


Fig. 2 The light curves for FF Aql.

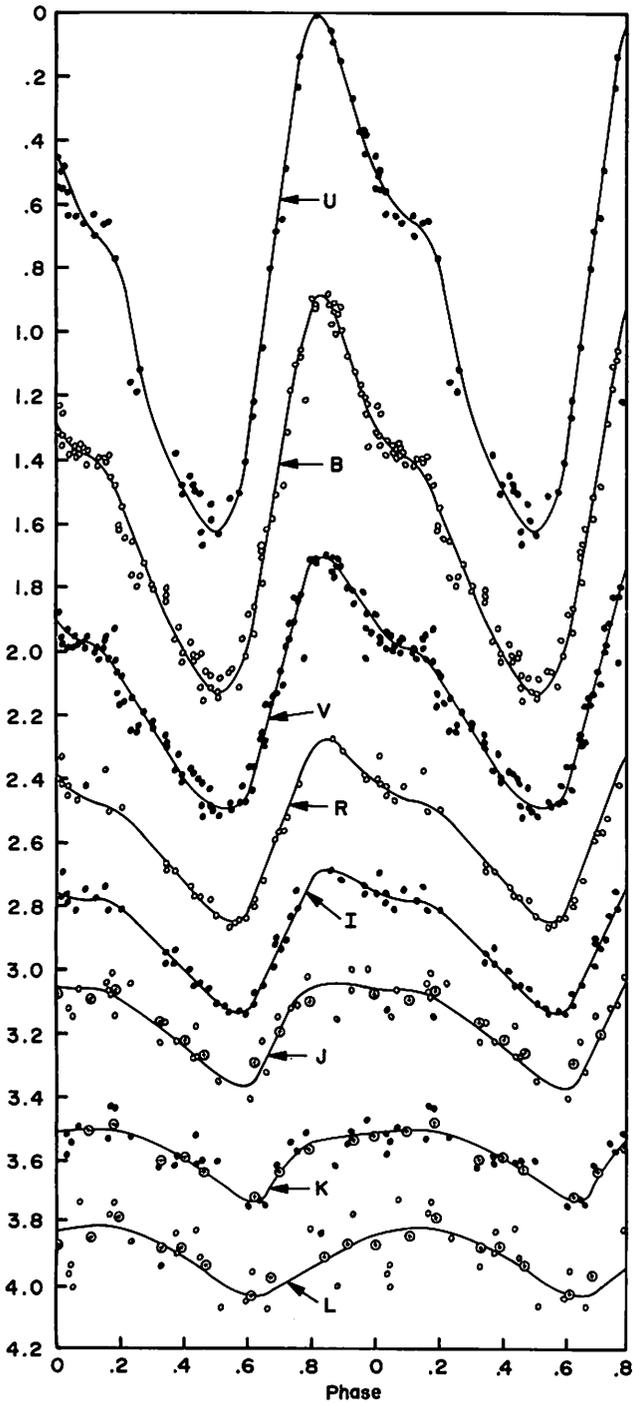


Fig. 3 The light curves for η Aql.

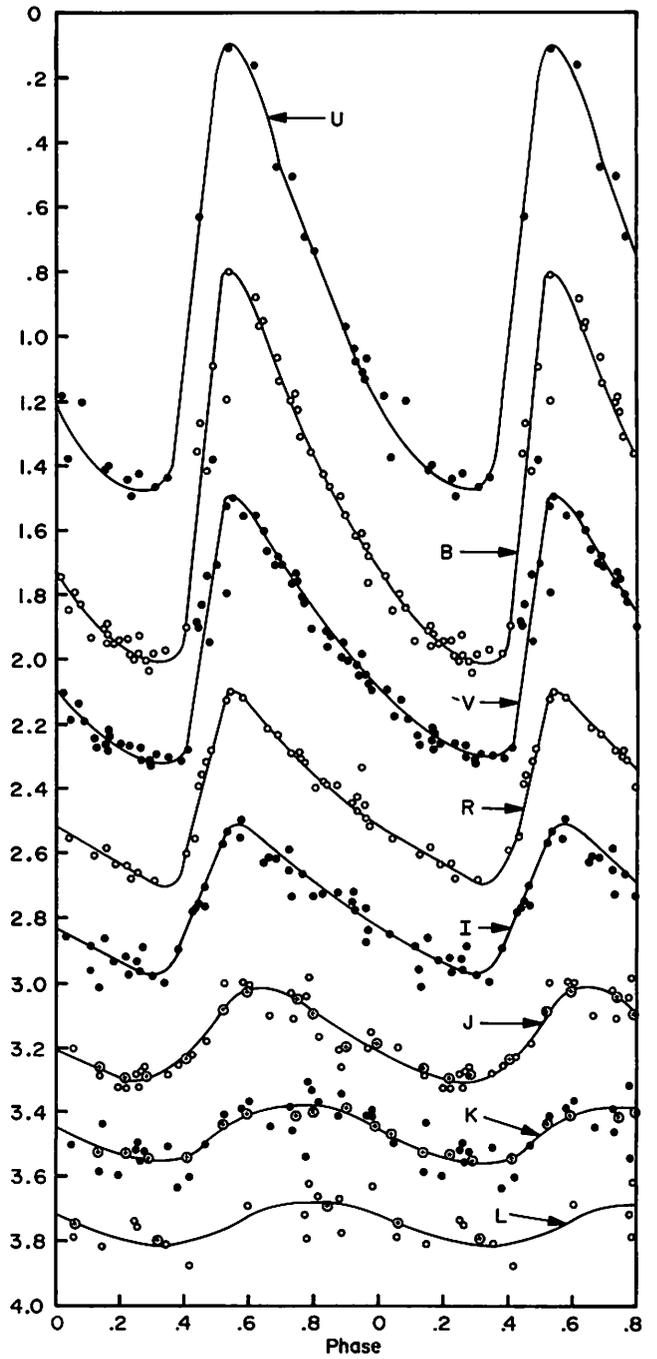


Fig. 4 The light curves for RT Aur.

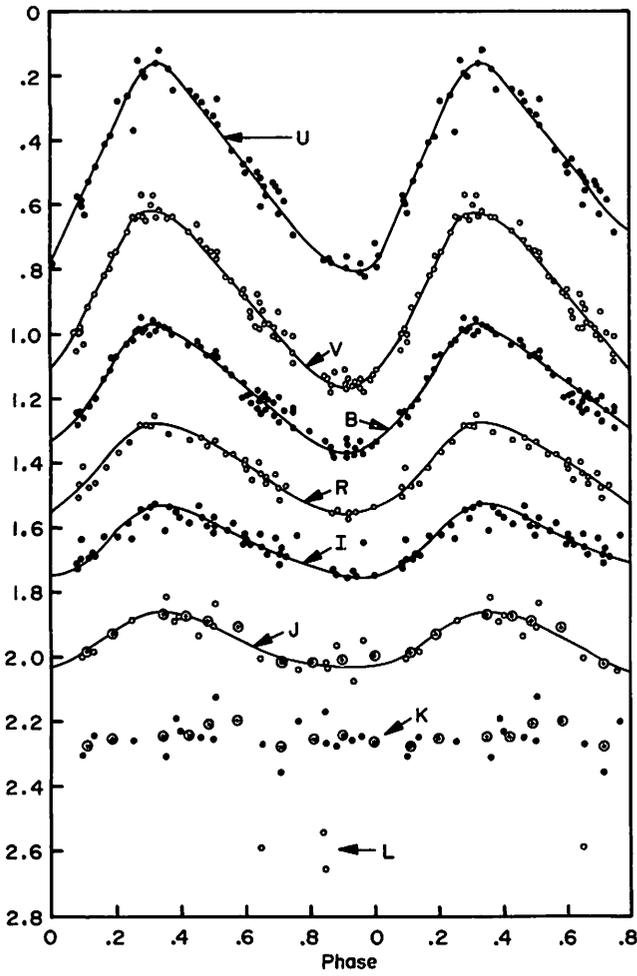


Fig. 5 The light curves for SU Cas.

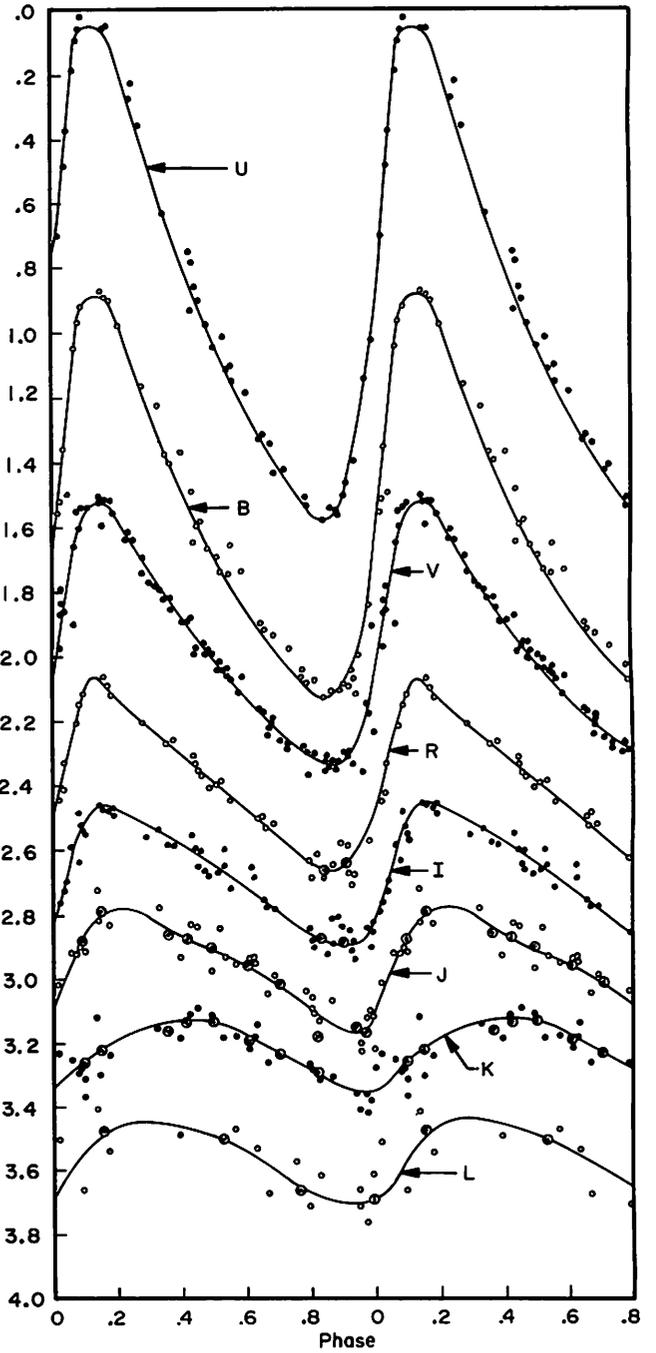


Fig. 6 The light curves for δ Cep.

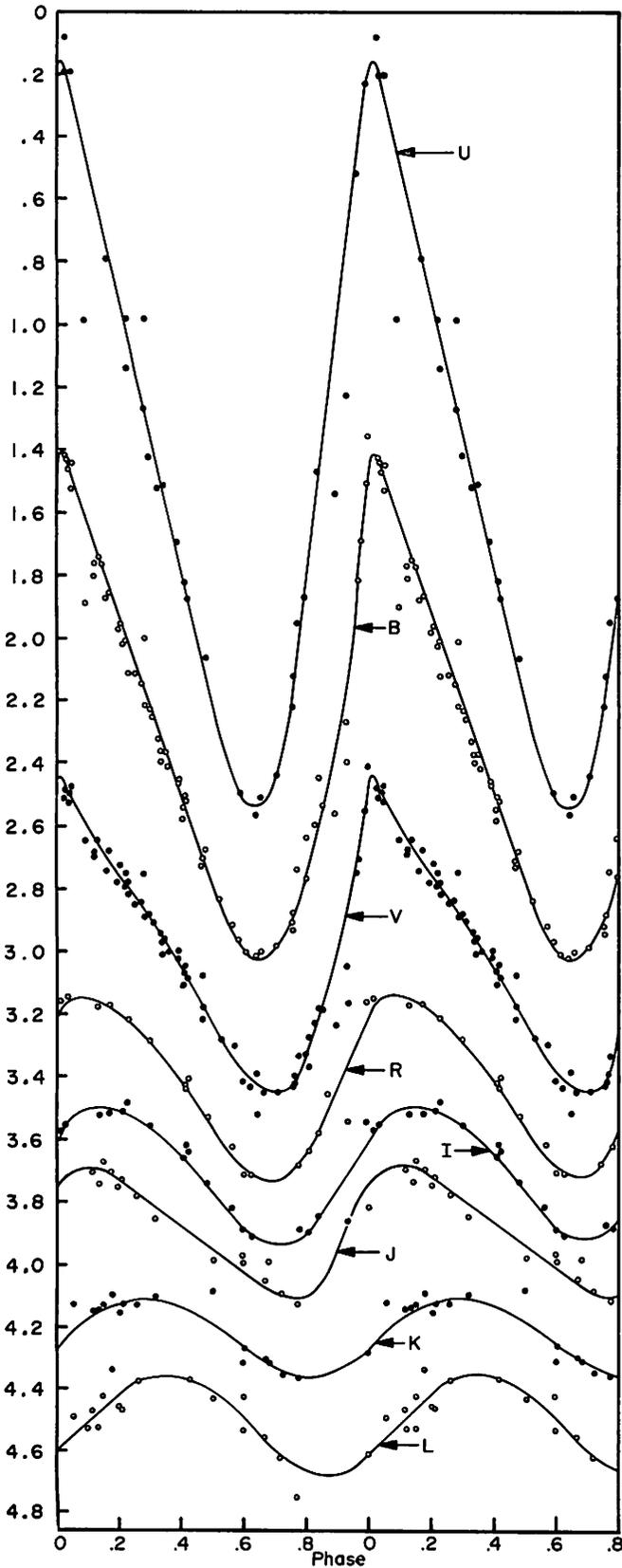


Fig. 7 The light curves for X Cyg.

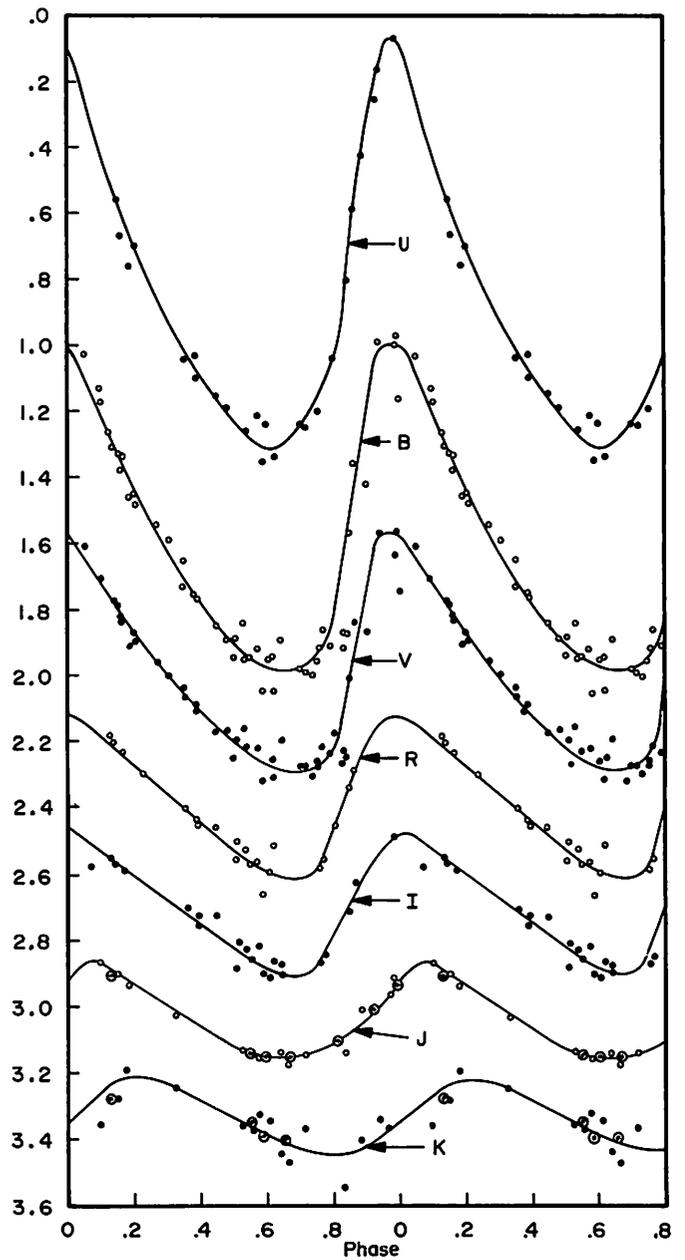


Fig. 8 The light curves for SU Cyg.

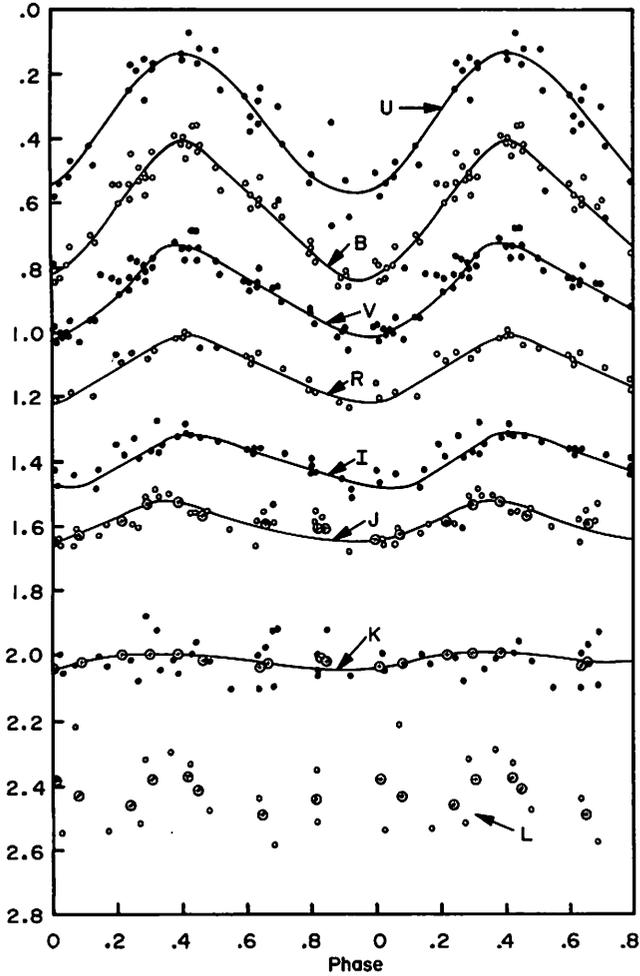


Fig. 9 The light curves for DT Cyg.

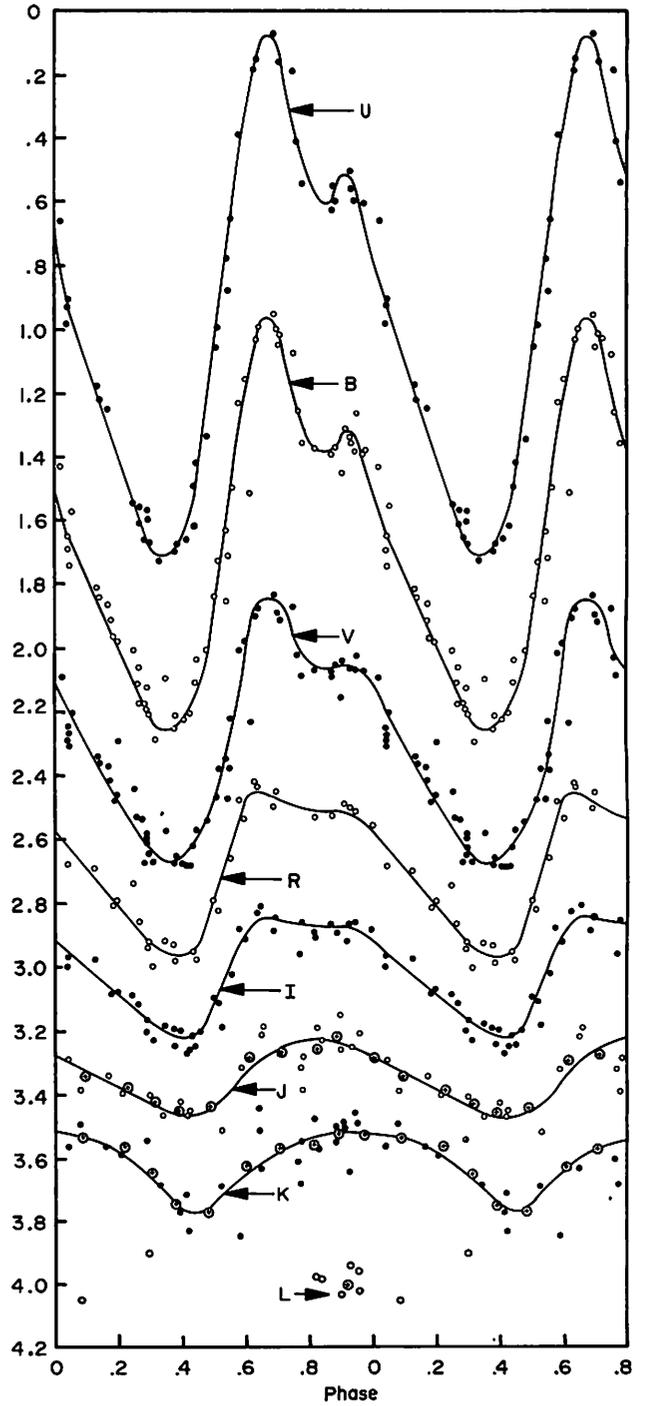


Fig. 10 The light curves for W Gem.

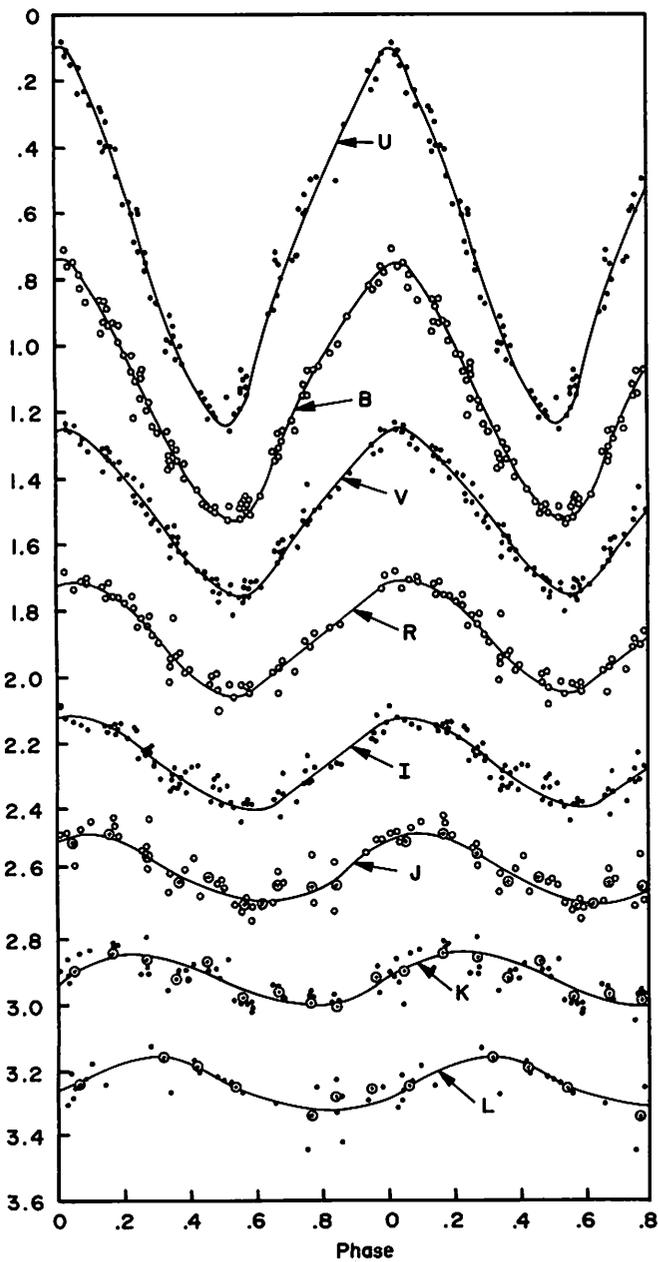


Fig. 11 The light curves for ζ Gem.

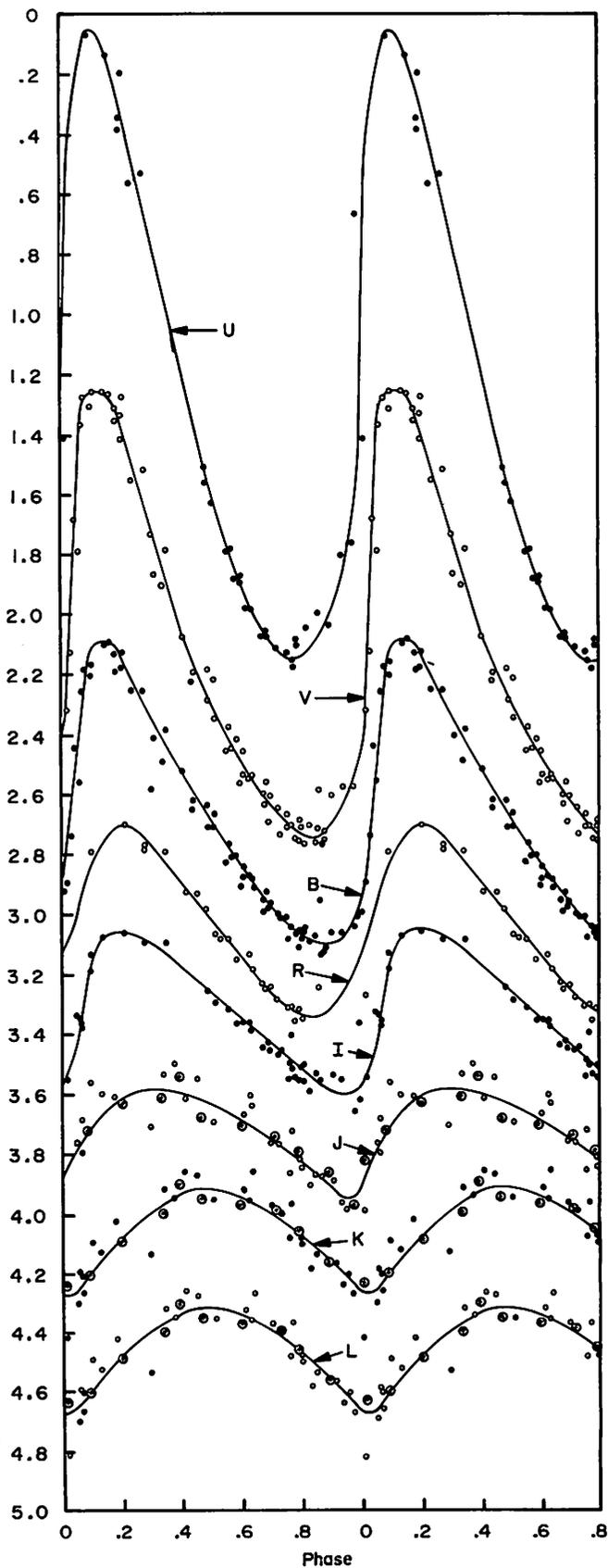


Fig. 12 The light curves for T Mon.

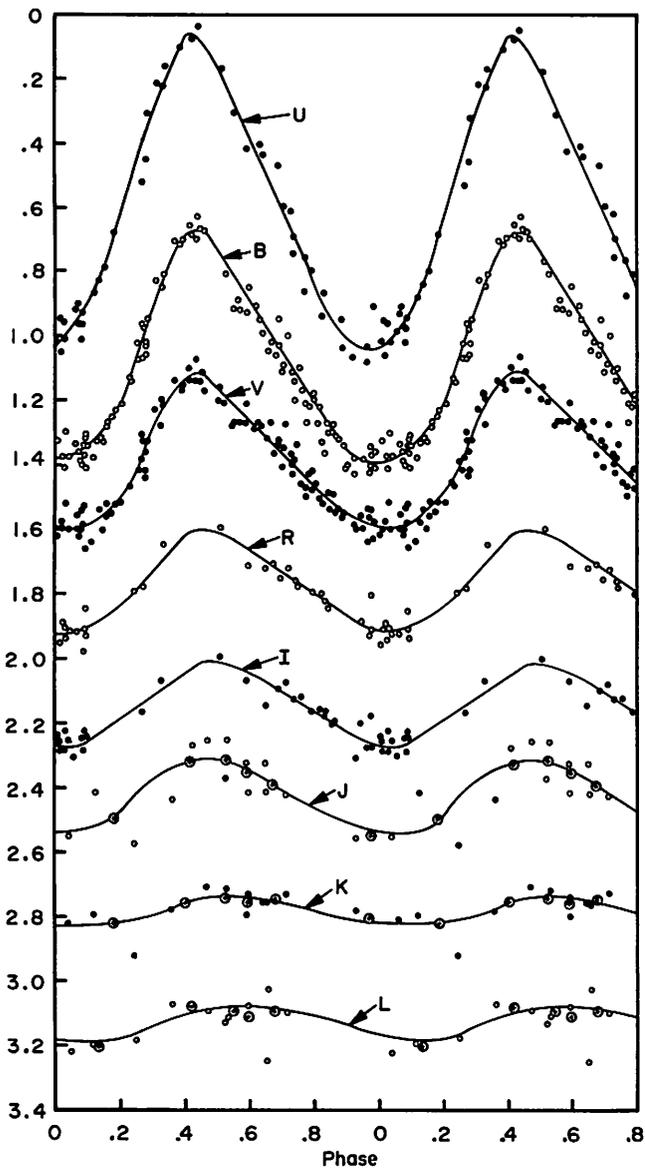


Fig. 13 The light curves for Y Oph.

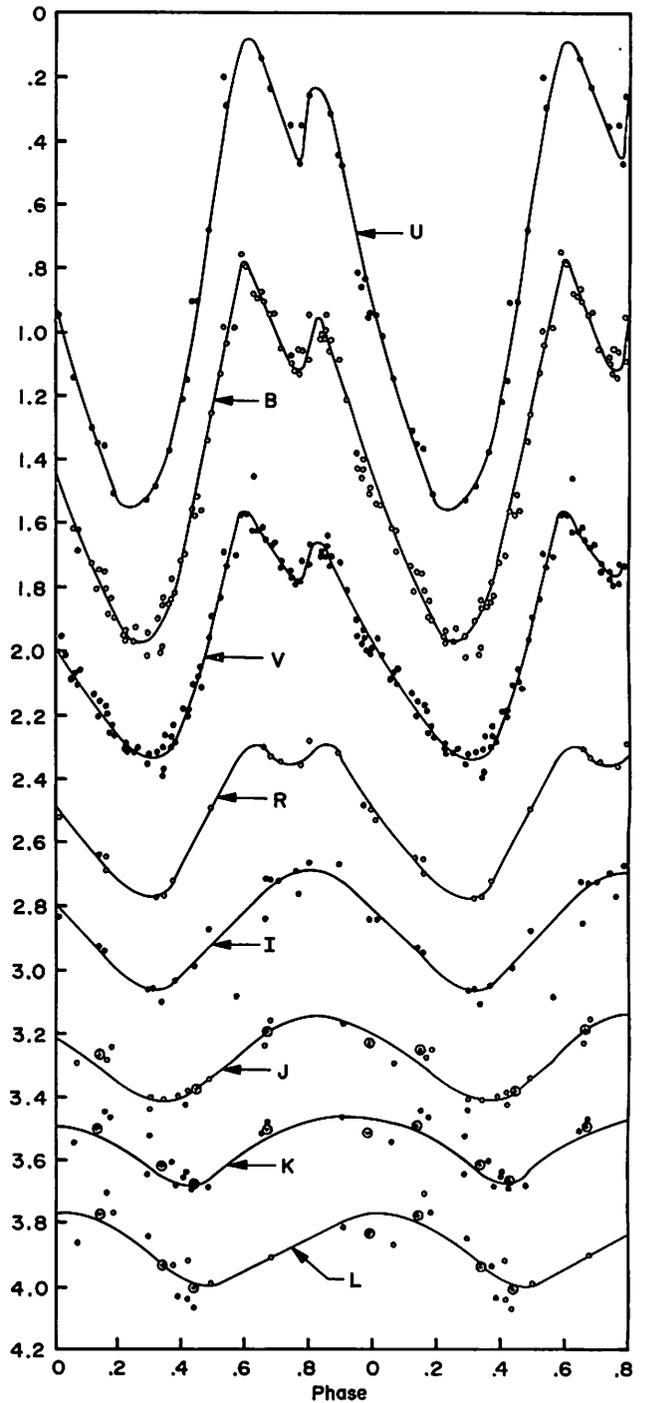


Fig. 14 The light curves for S Sge.

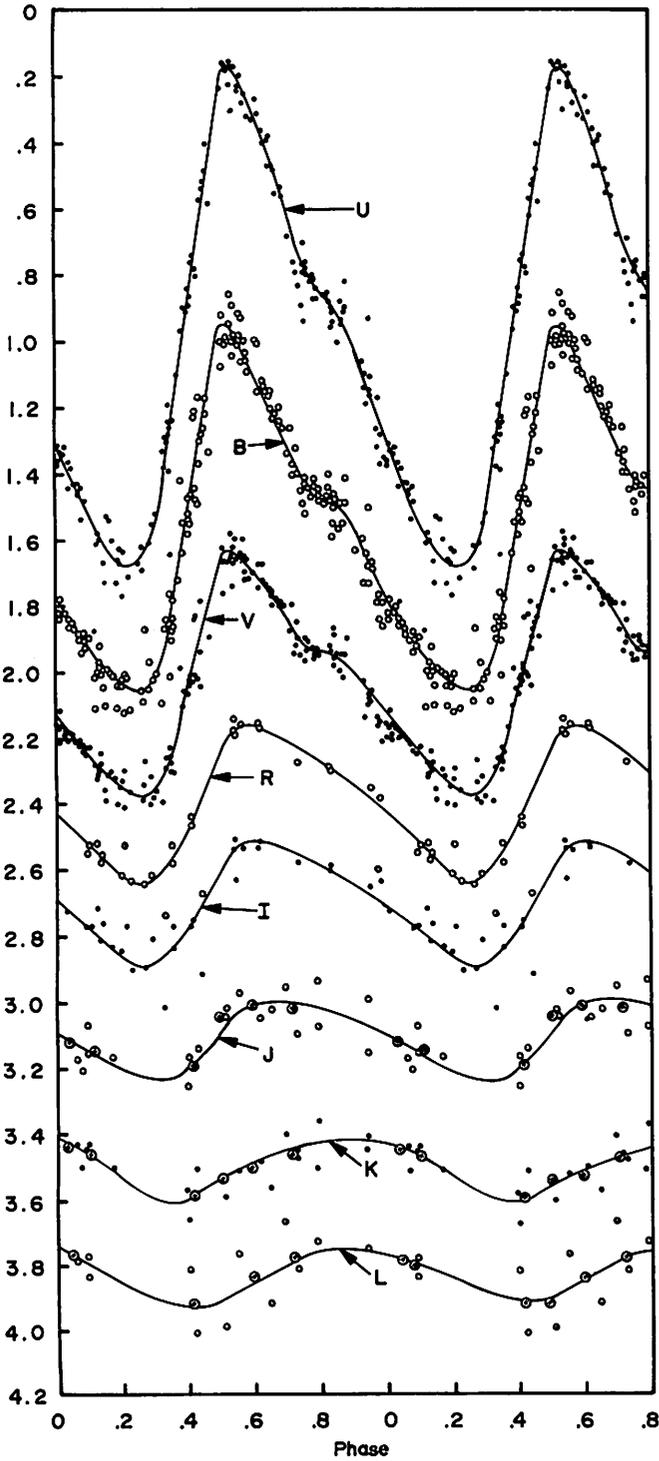


Fig. 15 The light curves for U Sgr.

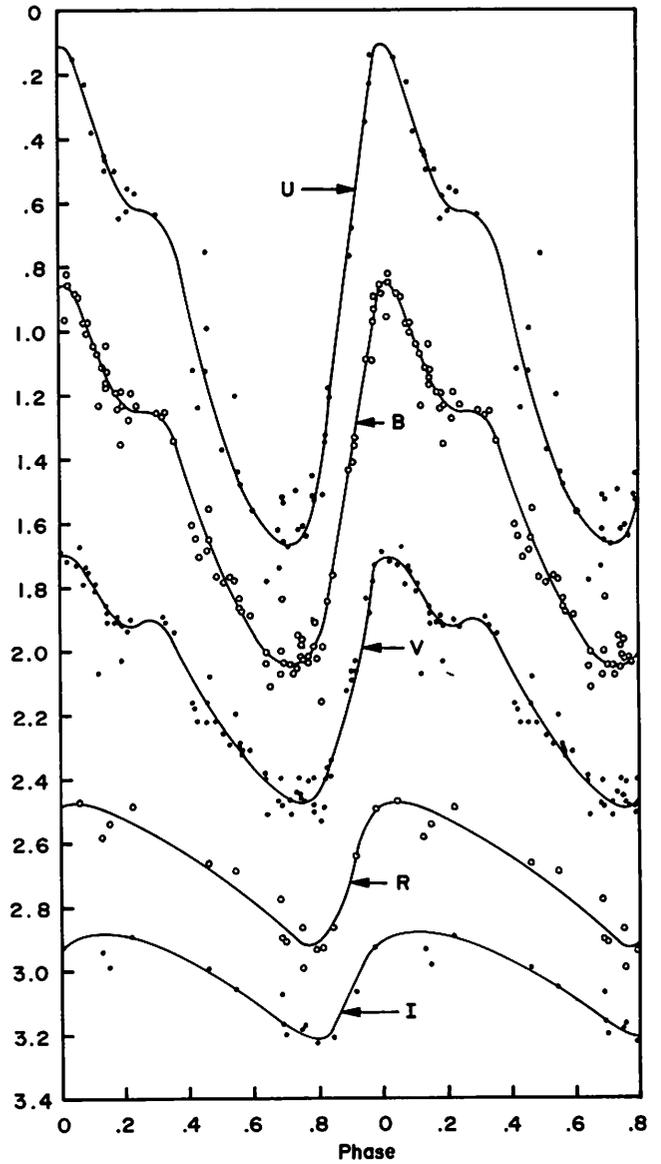


Fig. 16 The light curves for W Sgr.

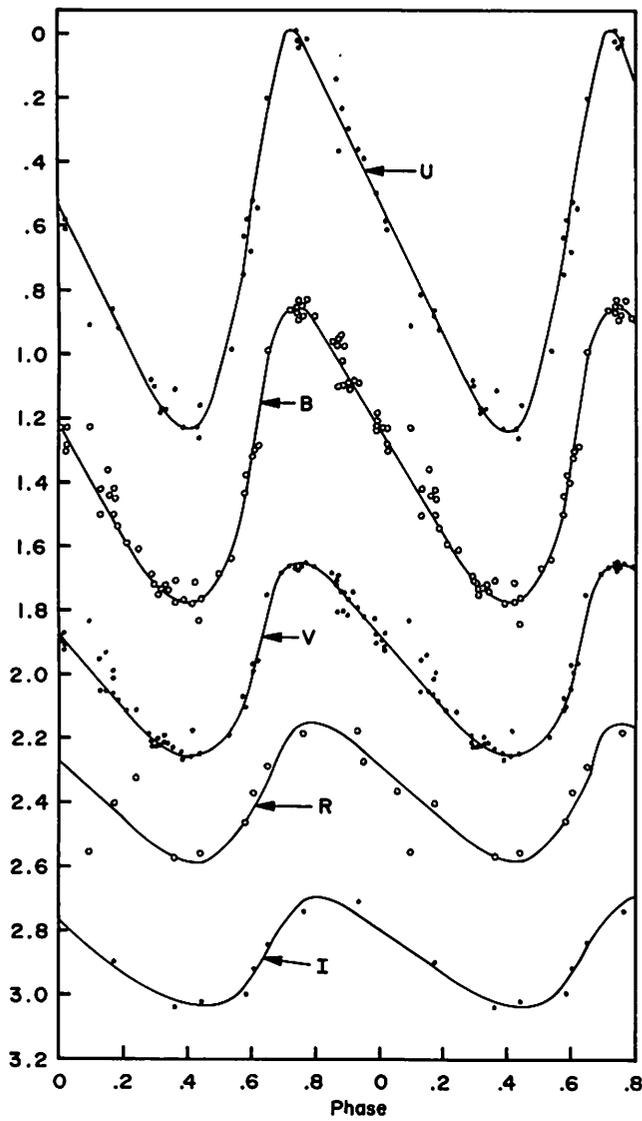


Fig. 17 The light curves for X Sgr.

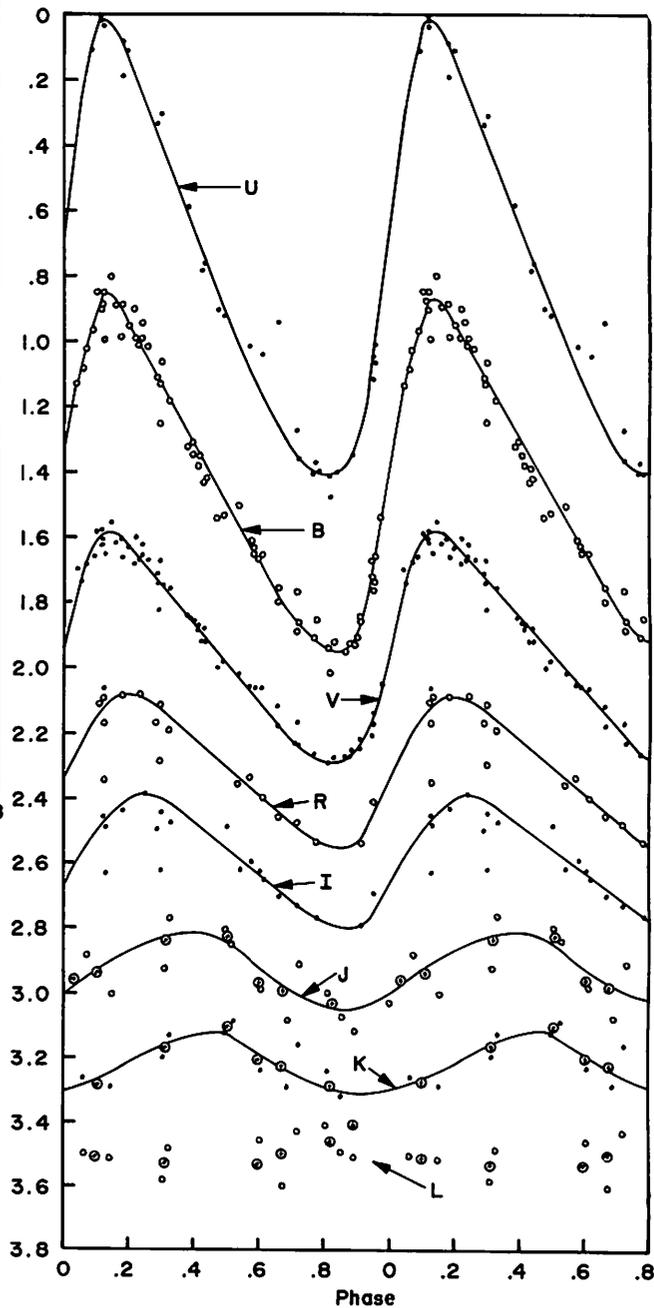


Fig. 18 The light curves for Y Sgr.

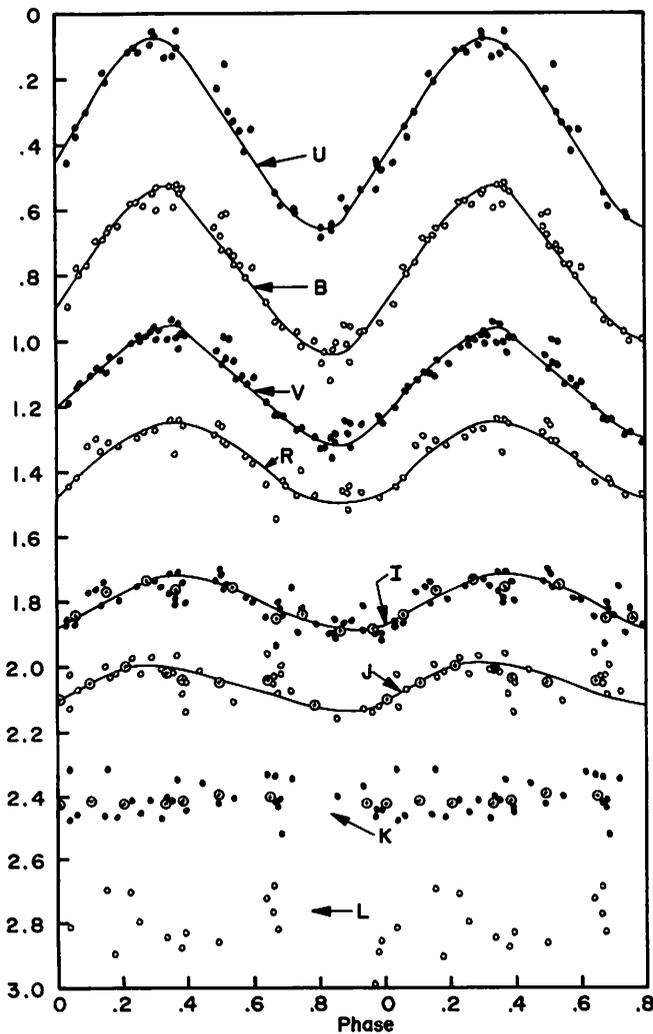


Fig. 19 The light curves for SZ Tau.

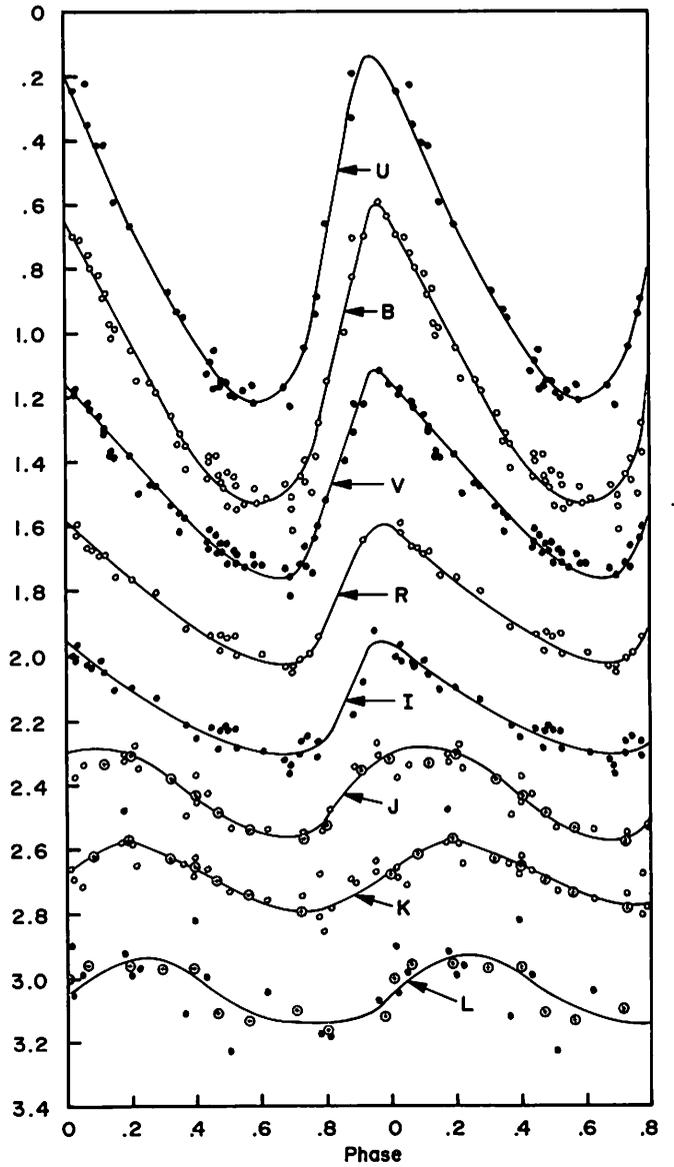


Fig. 20 The light curves for T Vul.

TABLE 1A
UBVRI CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	JD2430000+	V	B	U	R	I
8658.6819	6.209	7.140		5.462	9028.6638	5.284	6.017	6.554	4.707	4.228
8674.6014	6.314	7.337		5.500	9029.6093	5.414	6.215	6.769	4.737	4.258
8675.6604	6.385	7.465		5.530	9035.6264	5.432	6.212	6.780	4.813	4.268
8676.6531	6.570	7.755		5.678	9037.6249	5.284	6.003	6.532	4.664	4.199
8679.6402	6.299	7.245		5.469	9038.6398	5.447	6.276	6.855	4.785	4.287
8930.9055	6.839	8.070	9.002	5.869	9040.5978	5.366	6.120	6.641	4.718	4.289
8932.8651	6.131	6.998	7.593	5.399	9041.5968	5.188	5.847	6.350	4.614	4.161
9028.6748	6.742	7.949	8.878	5.832	9042.6010	5.361	6.129	6.676	4.736	4.221
9035.6406	6.719	7.960	8.887	5.801	9045.6055	5.194	5.882	6.389	4.613	4.165
9038.6497	6.102	6.956	7.563	5.362	9066.5908	5.501	6.311		4.784	4.310
9040.6079	6.353	7.392	8.146	5.500	9068.5770	5.218	5.919		4.595	4.139
9041.6180	6.563	7.714	8.554	5.672	9069.5591	5.423	6.189	6.782	4.740	4.250
9042.6246	6.696	7.911	8.844	5.770	9281.8972	5.374	6.134	6.666	4.798	4.305
9045.6161	6.092	6.933	7.538	5.337	9376.6646	5.204	5.896		4.617	4.183
9066.5975	6.055	6.901		5.324	9377.6422	5.367	6.121		4.733	4.292
9068.5827	6.332	7.363		5.466						
9069.5654	6.544	7.682	8.520	5.638			ETA AQL			
9281.9046	6.784	8.006		5.858						
9377.6500	6.355	7.466		5.500	8209.8687	3.616	4.412	4.871	3.092	2.634
					8496.9658	3.727	4.459	4.940	3.103	2.664
					8506.9990	4.177	5.171	5.885	3.395	2.883
					8515.9797	4.233	5.143	5.769	3.504	3.012
					8517.9670	3.542	4.194	4.652	3.014	2.620
7592.6268	5.228	5.898	6.413		8518.9789	3.789	4.585	5.129	3.123	2.691
8658.6745	5.484	6.319		4.804	8522.9687	4.274	5.222	5.903	3.540	3.039
8659.6973	5.476	6.309		4.821	8526.9639	3.766	4.603	5.160	3.077	2.641
8670.6167	5.275	5.969		4.675	8536.9699	4.278	5.267	6.017	3.571	3.036
8678.6268	5.309	6.037		4.680	8655.6994	3.756	4.575		3.123	2.652
9000.7069	5.251	5.992		4.646						

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	I	JD2430000+	V	B	U	R	I
8658.7072	4.294	5.330		3.534	3.007	8367.8963	5.331	5.869	6.225	4.858	4.552
8670.6227	3.824	4.657		3.204	2.714	8368.7729	5.181	5.665	6.069	4.728	4.415
8681.6113	3.876	4.641		3.268	2.829	8369.7750	5.548	6.267	6.750	4.941	4.543
8699.5909	3.882	4.750		3.196	2.713	8370.7686	5.764	6.542	7.041	5.136	4.726
8712.5934	3.762	4.527	5.051	3.119	2.672	8408.8685	5.402	5.961	6.247	4.884	4.573
8724.5963	3.934	4.718	5.184	3.295	2.825	8410.8084	5.563	6.231	6.612	4.980	4.578
8910.9235	4.096	4.990	5.551	3.427	2.949	8468.6707				4.777	
8930.9173	4.225	5.232	5.999	3.475	2.952	8469.6837				4.788	
8931.8919	4.282	5.317	6.001	3.547	3.029	8658.9837	5.031	5.410		4.627	4.374
8932.8867	3.903	4.685	5.143	3.270	2.841	8676.9376	5.804	6.575	7.034	5.200	4.802
9028.6986	3.787	4.593	5.135	3.172	2.715	8679.9793	5.714	6.497		5.083	4.667
9031.6825	4.236	5.283	6.042	3.484	2.961	8682.9863	5.556	6.279		4.957	4.574
9035.6659	3.734	4.538	5.060	3.153	2.658	8723.9125	5.492	6.213	6.711	4.833	4.557
9038.6687	4.215	5.211	6.007	3.473	2.943	9037.9928	5.769	6.556		5.135	4.734
9040.6247	3.783	4.519	4.992	3.224	2.809	9041.9010	5.790	6.590	7.090	5.179	4.774
9041.6380	3.508	4.114	4.555	2.980	2.588	9045.8966	5.791	6.587	7.067	5.185	4.782
9042.6447	3.684	4.433	4.952	3.104	2.659	9067.0111	5.597	6.360		5.018	4.636
9045.6350	4.173	5.180	5.948	3.446	2.905	9098.9560	5.001	5.408	5.709	4.600	4.332
9066.6104	4.090	5.048		3.373	2.850	9100.8293	5.684	6.453	6.972	5.052	4.659
9068.5948	4.160	5.063	5.714	3.476	2.972	9148.6948	5.497	6.170		4.887	4.527
9069.5795	3.644	4.288	4.739	3.123	2.715	9148.8872	5.551	6.250		4.978	4.580
9281.9181	4.067	5.012		3.390	2.879	9150.7660	5.388	5.945	6.282	4.921	4.598
9377.6637	3.942	4.718		3.295	2.895	9151.6763	5.209	5.697			
						9151.8503	5.268	5.813		4.786	4.455
						9154.6134	5.241	5.723		4.814	4.506
7668.7426	5.513	6.212	6.640	4.974	4.555	9159.5902	5.411	6.037		4.896	4.535
8108.6994	5.496	6.216	6.677	4.924	4.525	9159.7156	5.467	6.053		4.887	4.509

RT AUR

RT AUR

ETA AQL

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	I	JD2430000+	V	B	U	R	I
9173.6665	5.059	5.456		4.622	4.358	9035.8059	5.784	6.440	6.880	5.207	4.738
9174.6128	5.414	6.059		4.879	4.528	9036.7865	6.160	6.976	7.478	5.456	4.924
9175.6856	5.772	6.581		5.104	4.691	9037.8815	5.831	6.485	6.943	5.231	4.787
9177.6800	5.164	5.622		4.711	4.430	9038.8309	6.181	6.966	7.491	5.465	4.955
9178.6649	6.343	7.148		5.579	4.869	9041.8546	5.835	6.511	6.979	5.226	4.768
9468.9180	5.327	5.908	6.286	4.814	4.471	9042.7274	6.173	6.958	7.463	5.471	4.954
						9045.7875	5.864	6.534	7.011	5.248	4.790
						9045.9346	5.924	6.639	7.130	5.276	4.786
						9066.6829	5.869	6.547	6.978	5.267	4.822
7592.7799	6.040	6.786	7.293	5.316	4.834	9068.6999	5.830	6.483	6.962	5.226	4.780
7597.7843	5.986	6.723	7.236			9069.6397	6.034	6.796	7.289	5.375	4.882
8367.6409	5.995	6.681	7.171	5.309	4.847	9098.7681	6.031	6.768	7.268	5.365	4.877
8367.7442	6.007	6.706	7.215	5.335	4.859	9099.5872	6.040	6.802	7.279	5.407	4.922
8368.6558	6.037	6.732	7.236	5.368	4.885	9100.5889	5.944	6.662		5.299	4.821
8369.6007	6.005	6.698	7.212	5.308	4.826	9100.8023	6.071	6.815	7.326	5.379	4.878
8370.6416	6.008	6.682	7.183	5.365	4.886	9154.6046	5.803	6.402		5.186	4.735
8371.5817	5.983	6.729	7.160	5.355	4.847	9159.6148	6.182	6.920		5.450	4.940
8408.6634	5.977	6.681	7.199	5.299	4.819	9159.7329	6.174	6.957		5.452	4.945
8410.7360	5.991	6.729	7.246	5.415	4.906	9173.6595	6.077	6.853		5.376	4.912
8658.8733	6.145	6.929	7.420	5.438	4.946						
8674.7998	5.938	6.623	7.111	5.315	4.827			DEL CEP			
8680.8546	5.784	6.436		5.184	4.744	7592.7544	4.327	5.204	5.851	3.580	3.145
8682.8851	5.756	6.373		5.153	4.724	8368.5873	3.958	4.670	5.196	3.362	2.971
8700.7914	5.865	6.544	7.021	5.237	4.769	8369.5924	4.161	4.986	5.625	3.482	3.053
8720.6548	6.050	6.806	7.238	5.337	4.830	8370.6230	4.356	5.236	5.877	3.686	3.239
9004.9639	5.902	6.626		5.274	4.808	8371.5731	4.004	4.652	5.088	3.451	3.068
9028.9927	6.167	6.981		5.460	4.929	8408.5811	4.338	5.190	5.817	3.595	3.155
9031.7725	5.786	6.451	6.899	5.185	4.770						

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	I	JD2430000+	V	B	U	R	I
8410.5580	3.691	4.257	4.655	3.204	2.865	9151.5804	3.824	4.493		3.267	2.893
8655.7872	4.183	4.936	5.420	3.571	3.167	9154.5697	4.324	5.172		3.711	3.246
8677.7534	3.655	4.136	4.498	3.209	2.895	9159.5829	4.342	5.203		3.661	3.204
8679.7104	3.877	4.581		3.309	2.905	9377.8025	4.016	4.831		3.388	2.959
8699.6627	3.521	3.967		3.075	2.780						
8722.7145	3.973	4.688	5.156	3.360	2.911						
8724.5809	4.372	5.277		3.691	3.211	8224.8599	6.449	7.560	8.424	5.644	5.063
8931.9296	3.987	4.744	5.234	3.335	2.956	8555.8999	6.047	7.039		5.278	4.717
8939.9428	4.340	5.220	5.758	3.668	3.245	8655.7359	6.181	7.307		5.320	4.676
9004.8617	3.973	4.612	5.002	3.426	3.039	8658.7384	6.469	7.835		5.524	4.854
						8678.6542	6.837	8.302		5.815	5.111
9028.7674	3.991	4.762	5.272	3.412	2.986						
9031.7304	3.865	4.453	4.833	3.331	3.006	8681.6250	6.676	7.925		5.740	5.094
9035.7694	4.296	5.175	5.812	3.640	3.161	9028.7435	5.950	6.806	7.428	5.265	4.743
9036.7625	4.197	4.953	5.444	3.567	3.153	9031.6999	6.078	7.154	7.989	5.276	4.716
9037.8003	3.516	3.982	4.356	3.092	2.786	9035.7137	6.448	7.798	9.022	5.539	4.815
						9038.6985	6.816	8.261	9.694	5.813	5.088
9038.8064	3.824	4.467	4.932	3.269	2.888						
9041.8197	4.313	5.179	5.768	3.674	3.223	9041.6568	6.738	8.028	9.151	5.785	5.088
9042.7142	3.600	4.060	4.397	3.152	2.844	9042.6946	6.581	7.740	8.668	5.684	5.047
9045.7989	4.170	5.013	5.615	3.530	3.085	9066.6360	6.286	7.525	8.618	5.386	4.753
9066.6752	4.058	4.839	5.408	3.451	3.028	9068.6099	6.484	7.810	9.075	5.503	4.833
						9069.5940	6.573	7.972	9.268	5.630	4.937
9068.6651	4.322	5.140	5.772	3.628	3.190						
9069.6164	3.540	4.010	4.362	3.116	2.818						
9098.6612	4.038	4.786	5.339	3.389	2.981	8655.6922	7.119	7.761		6.554	6.146
9099.5943	4.196	5.030	5.642	3.520	3.092	8658.6951	7.137	7.844		6.570	6.158
9100.5823	4.347	5.233	5.882	3.649	3.198	8681.6058	7.098	7.785		6.504	6.104
						8931.8811	7.226	7.951	8.255	6.633	6.203
9148.5866	4.299	5.167		3.621	3.172	8932.8768	6.914	7.467	7.703	6.340	6.012
9150.5828	3.518	3.989		3.124	2.799						

DEL CEP

X CYG

SU CYG

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	W GEM				JD2430000+	V	ZET GEM			
		B	U	R	I			B	U	R	I
8658.9893	7.004	8.041		6.176	5.593	8143.6327	3.802	4.586	5.189	3.159	2.738
8674.0277	6.761	7.671	8.294	6.009	5.460	8147.6229	4.136	5.075	5.827	3.448	3.007
8676.9463	7.365	8.586		6.496	5.833	8367.9144	3.866	4.765	5.450	3.215	2.807
8680.9553	6.763	7.670		6.024	5.490	8368.7934	4.014	4.939	5.735	3.320	2.890
8723.9315	7.147	8.303	9.248	6.236	5.683	8369.7884	4.137	5.102	5.931	3.380	2.924
9038.0023	6.759	7.650		5.995	5.459	8369.8951	4.107	5.082	5.898	3.372	2.894
9041.9947	7.318	8.400	9.187	6.447	5.820	8370.7835	4.138	5.074	5.830	3.426	2.986
9042.9506	6.921	7.790	8.353	6.152	5.620	8371.8949	4.030	4.932	5.417	3.449	3.023
9045.9054	6.747	7.653	8.260	6.016	5.468	8376.9809	3.758	4.526	5.095	3.155	2.772
9067.0170	6.680	7.453		6.029	5.509	8378.9056	3.992	4.941	5.672	3.338	2.896
9098.9643	6.573	7.295	7.853	5.927	5.429	8379.9302	4.113	5.107	5.917	3.424	2.977
9100.8361	6.775	7.685	8.324	6.020	5.463	8380.9785	4.118	5.064	5.772	3.445	3.007
9148.6076	6.733	7.605		5.980	5.439	8381.8637	4.026	4.915	5.602	3.387	2.974
9151.6586	7.310	8.484		6.432	5.799	8397.8254	3.798	4.624	5.267	3.154	2.753
9154.8581	6.587	7.349		5.949	5.443	8431.7905	4.123	5.053	5.799	3.429	2.987
9159.5985	7.343	8.499		6.416	5.769	8441.8147	4.179	5.088	5.842		
9174.5937	7.175	8.263		6.298	5.677	8443.8127	3.884	4.672	5.244	3.313	2.926
9174.6323	7.165	8.274		6.293	5.676	8449.7746	4.005	4.940	5.692	3.367	2.938
9175.8476	7.272	8.390		6.414	5.781	8461.7298	4.123	5.085	5.854	3.419	2.982
9177.6875	6.709	7.523	8.090	5.973	5.474	8469.6901	3.958	4.856	5.571	3.297	2.910
9468.9452	7.356	8.512	9.374	6.479	5.843	8480.6503	4.054	4.997	5.757	3.383	2.950
						8481.6745	4.172		6.128	3.488	3.060
						8482.6394	4.118	5.060	5.796	3.424	2.983
						8483.6307	3.992	4.852	5.456	3.350	2.957
8080.7593	3.672	4.379	4.815	3.094	2.745	8498.6163	3.745	4.528	5.095	3.114	2.749
8108.7136	3.935	4.750	5.283	3.289	2.885						
8113.6326	3.855	4.677	5.301	3.189	2.761						
8142.6444	3.715	4.462	4.930	3.102	2.755						
						8499.6307	3.877	4.757	5.415	3.218	2.828
						8509.6412	3.871	4.702	5.387	3.249	2.849

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	I	JD2430000+	V	B	U	R	I
8510.6310	4.043	4.968	5.715	3.413	2.944	8369.7682	6.581	8.004	9.260	5.491	4.783
8658.9956	3.707	4.418	4.872	3.147	2.793	8370.7597	6.550	7.983	9.236	5.516	4.815
8671.0208	3.780	4.554	5.082	3.126	2.746	8408.8598	5.626	6.568	7.332	4.907	4.364
8675.0154	4.216	5.213	5.958	3.458	2.998	8410.8007	5.757	6.816	7.665	4.977	4.389
8676.9584	4.014	4.856	5.445	3.389	2.984	8468.6659				5.122	4.505
8678.0174	3.860	4.619		3.254	2.877	8469.6885				5.134	4.499
8679.9853	3.632	4.307	4.783	3.080	2.729	8674.0204	6.394	7.614	8.549	5.470	4.851
8699.8893	3.660	4.360	4.840	3.136	2.781	8682.9807	5.883	7.081		4.992	4.392
8723.9389	3.946	4.903	5.696	3.217	2.876	8723.8714	6.454	7.878	9.130	5.442	4.854
9038.0094	3.937	4.837	5.556	3.272	2.846	9037.9503	6.133	7.482	8.645	5.186	4.556
9041.9104	3.995	4.857	5.441	3.378	2.960	9041.9846	6.383	7.828	9.125	5.384	4.688
9042.9733	3.901	4.670	5.199	3.267	2.878	9042.9297	6.449	7.896	9.206	5.430	4.747
9045.9242	3.696	4.423	4.935	3.110	2.743	9045.8878	6.567	8.045	9.315	5.552	4.847
9067.0235	3.736	4.524	5.110	3.156	2.769	9067.0046	6.263	7.671	8.925	5.286	4.622
9098.9710	3.929	4.839	5.554	3.279	2.857	9151.6998	6.459	7.900	9.210	5.445	4.756
9129.9113	4.008	4.928	5.682	3.345	2.914	9154.6203	6.579	8.003		5.547	4.866
9148.8413	3.790	4.622	5.274	3.177	2.785	9159.6618	6.504	7.780	8.805	5.561	4.928
9151.7265	4.150	5.108	5.916	3.438	2.990	9173.7886	6.212	7.641	8.763	5.267	4.593
9159.6697	3.912	4.788	5.473	3.245	2.837	9207.6478	6.539	7.999	9.288	5.507	4.819
9174.6198	3.906	4.712	5.289	3.313	2.928	9391.9840	6.307	7.712	9.020	5.350	4.665
9175.7333	3.835	4.591	5.204	3.241	2.865	9392.9952	6.376	7.843	9.115	5.337	4.666
9177.6957	3.642	4.347	4.851	3.136	2.735	9470.9422	6.164	7.514			
8108.6928	5.705	6.603	7.204	4.993	4.492						
8367.8854	6.423	7.854	9.189	5.449	4.734	8510.9334	6.401	7.873	9.110	5.116	4.151
8368.7660	6.500	7.942	9.247	5.466	4.750	8518.9611	5.962	7.264	8.263	4.796	3.892

T MON

ZET GEM

Y OPH

T MON

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	I	JD2430000+	V	B	U	R	I
8522.9370	6.186	7.599	8.784	4.959	4.017	8567.9187	5.885	6.910		5.186	
8526.9259	6.342	7.872	9.128	5.009	4.068	8658.7133	5.691	6.591		4.992	4.533
8528.9382	6.385	7.863	9.065	5.045	4.120	8678.6477	5.932	6.880		5.217	4.735
8658.6415	6.068	7.520		4.904	3.992	9028.7082	5.854	6.849	7.647	5.138	4.627
8674.5898	6.011	7.351		4.911	3.961	9031.6912	5.589	6.362		4.986	4.567
8676.6075	6.076	7.500		4.922	3.965	9035.6917	5.635	6.501	7.132	4.982	4.471
8680.5731	6.359	7.882		5.080	4.098	9038.6778	6.013	7.006	7.774	5.272	4.756
8937.7937	6.367	7.904	9.168	5.129	4.167	9041.6475	5.372	6.045	6.528	4.820	4.417
8938.7725	6.393	7.911	9.152	5.136	4.177	9042.6546	5.363	6.055	6.554	4.779	4.362
8939.7929	6.380	7.873	9.109	5.148	4.177	9045.6440	5.868	6.857	7.655	5.146	4.641
9014.6245	5.916	7.178				9066.6160	5.350	6.003		4.795	4.416
9018.6211	6.128	7.532		4.947	3.998	9068.6019	5.422	6.184	6.745	4.800	4.361
9019.6119	6.138	7.598		4.968	4.015	9069.5869	5.653	6.640	7.245	5.017	4.532
9025.6028	6.348	7.841		5.127	4.144	9100.5617	5.423	6.156		4.835	4.417
9028.5984	6.106	7.465		4.984	4.063	9281.9236	6.008	6.940		5.263	4.801
9029.5990	6.009	7.309	8.319	4.845	3.961	9377.6723	5.421	6.158		4.849	4.462
9037.6136	6.221	7.693	8.892	4.988	4.056						
9038.6203	6.296	7.777		5.041	4.095						
9040.5873	6.342	7.846	9.125	5.114	4.167						
9041.5864	6.321	7.799	9.053	5.105	4.124	8224.7839	6.724	7.838	8.591	5.839	5.169
9042.5909	6.343	7.810	9.036	5.112	4.144	8510.9520	6.652	7.758	8.579	5.699	4.987
9175.0232	6.308	7.824		5.007	4.056	8522.9600	6.375	7.298	7.967	5.562	4.934
9238.8901	6.082	7.414	8.398			8526.9563	6.996	8.307	9.337	5.925	5.172
9246.9052	6.373	7.875	9.043	5.091	4.184	8527.9563	7.000	8.311	9.345	5.925	5.176
9280.8805	6.420	7.824	9.109	5.150	4.138						
9281.8801	6.353	7.835	9.075	5.120	4.202	8528.9530	6.363	7.301	7.933		
9377.6031	6.122	7.547		4.917	4.039	8553.8769	7.048	8.342	9.368	6.013	5.247
						8559.9323	6.929	8.199		5.948	5.170
						8655.6464	7.020	8.270		6.015	5.208

S SGE

U SGR

Y OPH

TABLE 1A UBVR I CEPHEID MAGNITUDES

JD2430000+	V	B	U	R	I	JD2430000+	V	B	U	R	I
Y SGR						SZ TAU					
8526.9487	5.935	6.864	7.510	5.109	4.599	8408.7139	6.635	7.556	8.164	5.862	5.264
8528.9470	5.473	6.266	6.804	4.813	4.346	8410.7450	6.383	7.211	7.755	5.719	5.145
8553.8530	5.864	6.851	7.540	5.095	4.550	8469.6007				5.666	
8655.6366	5.422	6.145		4.780	4.286	8680.9496	6.335	7.123		5.638	5.113
8682.5798	6.049	7.048		5.236	4.693	8681.8847	6.578	7.485		5.836	5.252
8937.8161	5.376	6.061	6.509	4.810	4.360	8720.7431	6.628	7.549	8.065	5.880	5.318
8938.7946	5.518	6.317	6.832	4.866	4.398	9004.9885	6.379	7.183		5.674	5.125
9018.6417	5.389	6.051		4.806	4.360	9029.0023	6.712	7.669		5.924	5.292
9025.6135	5.559	6.382		4.889	4.377	9037.9406	6.666	7.575	8.208	5.876	5.294
9246.9327	5.917	6.959		5.156	4.609	9038.8753	6.597	7.494	8.056	5.846	5.263
9264.9293	6.237	7.054	7.902	5.230	4.670	9041.8766	6.632	7.539	8.135	5.876	5.294
9280.8893	5.819	6.706		5.052	4.520	9042.8577	6.389	7.138	7.654	5.671	5.129
9281.8877	5.968	6.970	7.775	5.174	4.631	9045.8444	6.382	7.176	7.706	5.695	5.149
9376.6429	5.450	6.199		4.866	4.389	9068.9302	6.524	7.403	8.013	5.752	5.185
9377.6198	5.626	6.453		4.988	4.525	9098.7845	6.538	7.379	7.943	5.818	5.234
7592.8938	6.654	7.607	8.218	5.801	5.222	9099.7502	6.419	7.119	7.651	5.646	5.111
7594.0033	6.505	7.365	7.899	5.719	5.169	9100.7552	6.618	7.555	8.187	5.824	5.244
7594.8342	6.384	7.187	7.725	5.744	5.195	9148.5950	6.676	7.610		5.867	5.285
7595.8181	6.622	7.543	8.145	5.946	5.329	9148.7443	6.647	7.575		5.863	5.287
7597.8041	6.364	7.132	7.672			9151.5963	6.686	7.620		5.896	5.295
8367.6915	6.701	7.625	8.258	5.885	5.310	9154.5906	6.685	7.600		5.877	5.269
8367.8597	6.640	7.553	8.195	5.843	5.258	9154.7730	6.677	7.610	8.240	5.899	5.297
8368.6743	6.447	7.255	7.811	5.710	5.165	9159.6218	6.374	7.137		5.657	5.136
8369.7611	6.463	7.282	7.830	5.651	5.104	9173.6508	6.751	7.649		5.884	5.299
8370.7495	6.713	7.635	8.283			9174.5797	6.487	7.293		5.737	5.207
						9174.7538	6.457	7.251		5.722	5.189
						9175.6699	6.425	7.256		5.687	5.137

JD2430000+	I	J	K	L	JD2430000+	I	J	K	L	
		U AQL					ETA AQL			
8558.9134			4.060		9274.9144		2.467	2.009	1.829	
8640.7446		4.425	3.785		9391.6713		2.527	2.128	2.040	
8674.6673		4.405	3.758	3.592	9393.6762		2.367	1.945	1.838	
8675.6679		4.439	3.783	3.726	9425.6410	2.836	2.526	1.987	1.893	
8694.5708		4.308	3.826	3.774						
							RT AUR			
9041.6612		4.523	3.886	3.833	8339.9878	4.679	4.398	3.909		
9061.5864		4.338	3.784	3.694	8368.9258	4.392	4.229	3.882		
9062.5744		4.444	3.771	3.638	8370.9382	4.765	4.470	4.047		
9063.5659		4.553	3.891	3.718	8378.8221	4.699	4.450	4.130		
9064.5849		4.625	3.921	3.747	8379.8659	4.417	4.299	3.942		
9072.5876		4.507	3.940	3.744						
9273.8910		4.531	3.875	3.777	8392.8312	4.818	4.481	4.081		
9274.8930		4.669	3.998	3.803	8396.7753		4.522	4.093		
9391.6343		4.281	3.733	3.777	8397.7844	4.569	4.380	3.997		
9392.6317		4.458	3.925	3.804	8398.7735	4.531	4.308	3.959		
					8400.7883	4.690	4.458	4.025		
9393.6438		4.536	3.893	3.767						
9425.6213	4.751	4.397	3.863	3.808	8431.7587	4.297	4.191	3.885		
					8482.6141	4.735	4.525	4.035		
		FF AQL								
8320.6069	4.365	3.993	3.575		8739.9766		4.481	4.014	3.835	
8339.5961	4.132	3.874	3.492		8740.9866		4.192	3.909		
8558.9086		3.959	3.490		8771.7779		4.178	3.802	3.890	
8669.7056		3.979	3.543	3.443						
8674.6570		3.906	3.506	3.216	9060.9738		4.479	4.004	3.905	
					9061.9030		4.205	3.862	3.787	
8676.6587		3.949	3.480	3.403	9062.9350		4.405	3.909	3.865	
8693.6376		3.931	3.440	3.331	9063.9466		4.454	3.931	3.910	
9061.5744		3.945	3.430	3.359	9140.8533		4.233	4.039	3.817	
9062.5649		3.970	3.449	3.371						
9063.5535		3.768	3.363	3.249	9184.6745		4.640	4.103	4.040	
					9185.6337		4.175	3.831	3.719	
9072.5727		3.817	3.388	3.275	9185.7326		4.364	3.863	3.761	
9273.8856		3.900	3.482	3.364	9227.6561		4.396	3.995	3.886	
9386.6196		3.795	3.355	3.168	9424.9489	4.700	4.350	3.905	3.731	
9393.6363		3.880	3.522	3.460						
					9425.9892	4.728	4.518	3.990	3.850	
					9448.9695		4.426	4.009	3.977	
					9461.8835		4.458	3.840	3.770	
		ETA AQL					SU CAS			
8301.6618	2.655	2.411	1.969		8323.7783	4.897	4.594	4.198		
8494.9656	2.803	2.448	2.022		8323.8424	4.881	4.576	4.143		
8497.0069		2.299	1.874		8339.8759	4.808	4.406	4.203		
8521.9722	2.951	2.568	1.999		8343.8297	4.754	4.474	4.084		
8523.9773	2.735	2.422	1.943		8377.6057	4.867	4.610	4.251		
8558.9339		2.707	2.143	1.954	8378.6612	4.839	4.478	4.158		
8564.8931		2.473	1.921	1.822	8379.6509	4.822	4.630	4.093		
8669.6788		2.420	1.981	1.935	8395.5822	4.933	4.665	4.155		
8669.7280		2.447	1.942	2.005	8396.6114	4.732	4.527	4.145		
8670.6390		2.310	1.831	1.734	8397.5879	4.848	4.538	4.140		
8671.7247		2.523	2.022	1.934	8398.6431	4.797	4.421	4.017		
8675.6995		2.457	2.013	2.002	8400.5911	4.811	4.499	4.152		
8694.5840		2.648	2.201	2.065	8430.5729	4.941	4.555	4.167		
9035.6343		2.423	1.915	1.958	8431.5795	4.767	4.468	4.123		
9036.5885		2.367	1.932	1.768	8669.8854		4.590	4.167	3.983	
9038.6010		2.569	2.008	1.916	8693.6708		4.622	4.163	4.049	
9061.6463		2.620	2.141	2.071	8771.6360		4.615	4.066	3.935	
9062.6081		2.320	1.915	1.818						
9063.5981		2.298	1.908	1.768						
9064.6084		2.358	1.896	1.730						
9072.6070		2.446	1.835	1.780	8298.7316	2.823	2.643	2.187		
9273.9115		2.340	1.927	1.848	8315.7095	2.963	2.737	2.316		
							DEL CEP			

JD2430000+	I	J	K	L	JD2430000+	I	J	K	L
W GEM					T MON				
9227.6650		5.151	4.594	4.536	8377.8585	4.641	4.263	3.695	
9391.9673		5.079	4.726		8378.8146	4.437	4.058	3.588	
9392.9622		5.170	4.642		8379.8573	4.371	4.100	3.621	
9424.9392	5.498	5.085	4.568	4.476	8392.8184	4.662	4.168	3.423	
9425.9980	5.491		4.547	4.461	8396.7695	4.853	4.360	3.580	
ZET GEM					8397.7733	4.857	4.315	3.587	
8315.9850	2.744	2.427	2.007		8398.7681	4.892	4.398	3.680	
8316.0243	2.742	2.451	2.023		8400.7809	4.844	4.387	3.668	
8316.9714	2.835	2.516	2.038		8431.7503	4.638	4.293	3.794	
8317.0089	2.817	2.576	1.991		8482.6236	4.852	4.457	3.735	
8317.9688	2.935	2.637	2.104		8483.6451	4.964	4.443	3.769	
8318.0047	2.925	2.645	2.092		8727.7924		4.480	3.914	3.851
8323.9943	2.775	2.550	2.149		8771.7690		4.136	3.362	3.184
8324.0213	2.796	2.518	2.150		9060.9626		4.030	3.417	3.364
8339.9957	2.995	2.693	2.181		9061.8903		3.995	3.443	3.324
8369.9408	2.903	2.628	2.090		9062.9266		4.109	3.361	3.230
8370.9809	2.982	2.701	2.206		9063.9380		4.040	3.371	3.318
8427.7765	2.755	2.482	2.017		9140.8397		4.204	3.633	3.458
8431.7674	2.980	2.683	2.192		9185.6210		4.478	3.702	3.718
8476.7744	2.686	2.480	2.097		9227.6445		4.193	3.449	3.306
8480.6207	2.888	2.587	2.090		9392.9523		4.107	3.458	3.327
8481.6629	2.941	2.624	2.115		9394.9570		4.258	3.473	3.356
8482.6369	2.981	2.745	2.221		9425.9784	4.839		3.634	3.439
8483.6173	2.891	2.633	2.183		9461.8766		4.103	3.518	3.440
8493.6179	2.948	2.592	2.141						
8494.6303	2.836	2.545	2.150						
					Y OPH				
8496.6733	2.718	2.503	2.080		8320.5834	4.203	3.557	2.685	
8499.6014		2.526	2.103		8565.8297		3.582	2.821	2.583
8502.6192	3.040	2.716	2.193		8670.5926		3.439	2.679	2.469
8505.6383	2.865	2.616	2.189		8674.5856		3.422	2.698	2.477
8669.9720		2.575	2.128	2.086	8675.5930		3.422	2.663	2.424
8670.9810		2.560	2.086	2.040	8676.6106		3.430	2.634	2.395
8739.9608		2.539	2.028	2.089	9041.5812		3.556	2.729	2.623
8740.9992		2.510	2.108	2.009	9270.8512		3.282	2.651	
8771.7990		2.465	2.042	2.028	9272.8018		3.261	2.617	2.510
8773.8767		2.570	2.085	1.921	9273.8544		3.330	2.646	2.483
9036.0168		2.443	2.030	1.971	9274.8279		3.329	2.655	2.654
9060.9943		2.694	2.186	2.062	9385.5681		3.419	2.697	2.597
9061.9477		2.687	2.138	2.097	9391.5858		3.263	2.612	2.488
9062.9533		2.702	2.241	2.237	9392.5850		3.376	2.663	2.525
9063.9623		2.642	2.149	2.076					
9140.8735		2.662		1.998					
9185.6523		2.567	2.164	2.018					
9197.7443		2.477	2.056	2.107	8317.6449	4.753	4.419	3.733	
9227.6715		2.502	2.160	2.049	8320.6296	4.542	4.211	3.719	
9424.9578	2.872	2.550	2.068	1.964	8670.6514		4.358	3.863	3.836
9426.0066	2.930	2.642	2.058	2.031	8674.7281		4.144	3.675	3.607
9448.9877		2.688	2.171	2.044	8693.6287		4.262	3.653	3.498
9461.8899		2.573	2.199	2.052	9061.6556		4.272	3.756	3.658
					S SGE				
8323.9793	4.676	4.294	3.762		9062.6200		4.223	3.676	3.560
8324.0146	4.650	4.181	3.700		9063.6070		4.387	3.853	3.640
8368.9097	4.761	4.263	3.492		9064.6139		4.405	3.854	3.709
8369.9562	4.704	4.222	3.469		9072.6198		4.386	3.819	3.732
8370.9112	4.811	4.347	3.597		9273.9241		4.373	3.893	3.829
					9391.6795		4.365	3.903	3.863
					9393.6842		4.133	3.691	3.699
					9425.6477	4.572	4.320	3.897	3.787

JD2430000+	I	J	K	L	JD2430000+	I	J	K	L
U SGR					SZ TAU				
8317.6193	5.232	4.667	3.998		8323.8918	5.211	4.930	4.265	
8320.5954	4.920	4.544	3.981		8343.8809	5.134	4.770	4.312	
8557.8656		4.575	3.991		8377.7290	5.257	4.826	4.216	
8558.8727		4.650	3.939	3.390	8378.7552	5.186	4.763	4.244	
8640.7060		4.706	3.999		8379.7380	5.205	4.825	4.303	
8667.5952		4.671	3.929	3.895	8396.6967	5.270	4.876	4.352	
8670.6240		4.543			8397.7430	5.205	4.939	4.343	
8674.5956		4.657	3.935	3.936	8398.6602	5.218	4.796	4.418	
8676.6231		4.754	4.160		8400.6519	5.149	4.809	4.368	
9256.8799		4.642	3.998	4.112	8430.6737	5.247	4.960	4.297	
9258.9403		4.597	3.965	3.917	8431.5977	5.134	4.796	4.354	
9272.8349		4.428	3.855	3.828	8480.6035	5.154	4.873	4.239	
9273.8656		4.491	3.901	3.851	8482.6039	5.172	4.821	4.310	
9274.8590		4.568	3.947	3.882	8674.9419		4.811		3.991
9298.8741		4.519	4.056	4.017	8727.7808		4.773	4.309	4.106
9385.6065		4.519	4.083	4.091	8769.7089		4.905	4.300	
9391.6044		4.667	4.069	3.921	8771.6463		4.837	4.207	4.092
9392.6029		4.468	4.004	3.871	9041.8690		4.901	4.338	4.252
9393.6028		4.450	3.896	3.763	9045.8543		4.824	4.352	4.192
					9060.9197		4.929	4.373	4.209
W SGR									
8670.6038		3.515	2.844	2.805	9061.8476		4.807	4.298	4.239
9270.8629		3.505	2.984	2.881	9062.9185		4.887	4.324	4.213
9272.8198		3.343	3.001	2.966	9063.8461		4.938	4.374	4.395
9273.8493		3.130	2.835	2.699	9140.6975		4.887		4.272
9274.8411		3.157	2.609	2.604	9185.5979		4.760	4.229	4.122
9274.8469		3.139	2.759	2.719	9185.6595		4.832	4.317	4.167
9391.5783		3.187	2.700	2.590	9391.9300		4.822	4.365	4.294
9393.5862		3.497	3.098	3.053	9392.9290		4.840	4.316	4.253
					9424.9229	5.081	4.856	4.235	4.078
					9425.9343	5.300	4.926	4.338	4.285
X SGR									
9270.8576		2.978	2.528	2.418	9461.8664		4.848	4.335	4.223
9272.8112		3.159	2.665	2.630					
9273.8441		3.147	2.634	2.566					
9386.5563		3.123	2.651	2.727					
9391.5707		2.903	2.424	2.355					
9392.5716		3.154	2.616	2.547					
9393.5799		3.363	2.765	2.825					
Y SGR									
8339.5872	4.387				8320.6402	4.882	4.542	4.195	
8557.8550		4.123	3.602	3.682	8340.6327	4.954	4.568	4.176	
8564.8333		4.049	3.491		8377.5734	4.960	4.745	4.242	
8694.6081		4.228			8378.5764	4.622	4.471	4.138	
9270.8690		4.200	3.644	3.507	8379.5718		4.505	3.978	
9272.8280		4.206	3.694	3.617	8395.5550	5.013	4.878	4.307	
9273.8602		3.969	3.531	3.584	8671.7583		4.538	4.216	4.086
9274.8522		4.006	3.528		8673.7882		4.726	4.230	4.324
9385.5953		4.287	3.696	3.702	8694.6251		4.472	4.082	4.081
9386.5994		4.270	3.723	3.591	9040.6751		4.545	4.142	4.068
9391.5943		4.113	3.566	3.529	9061.6798		4.513	4.176	4.170
9392.5937		4.324	3.813	3.610	9062.6483		4.520	4.079	4.022
9393.5949		4.084	3.666	3.601	9063.6590		4.649	4.128	3.912
9425.5802	4.529	4.179	3.641	3.555	9064.6379		4.733	4.254	4.139
					9072.6539		4.624	4.162	4.092
					9385.7252			4.165	4.002
					9391.7216		4.695	4.142	4.216
					9393.7082		4.678	4.281	4.277
					9424.6641		4.733	4.357	4.268
					9425.6738	4.707	4.574	4.190	4.150