

PHOTOELECTRIC ELEMENTS OF THE ECLIPSING BINARY XY CEP

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Abstract. The light curve and U , B and V observations of the system XY Cep have been presented. Photoelectric and absolute elements of the system have been determined. It is a semi-detached system.

1. Introduction

A photographic light curve, period and epoch of the binary XY Cep were first given by Schneller (1931). Struve (1946) gave the spectroscopic elements of the system. Gaposchkin (1953) again gave a photographic light curve and the approximate elements of the system. Other information on the system is scarce in the literature, except for a few times of minima.

2. Observations

A total of 25 nights of photoelectric observations of the system were secured, as detailed in Table I. BD + 67°1572 was used as the comparison star for all the computations as it was found to be better than the other comparison star BD + 68°1403, which was also observed at the beginning.

A total of 449 observations in U , 519 in B and 519 in V have been obtained and are given in Table II. The differential instrumental magnitudes were converted to standard differential magnitudes. While all the observations have been plotted in the light curve, only those observations taken with the 104-cm Sampurnanand reflector have been used for computation of the elements.

TABLE I
Observational details

Period and no. of nights	Telescope	Photomultiplier	Filters and electronics
1973 : 6 nights	56-cm reflector	RCA 1P21 uncooled	} U , B , V of Johnson and Morgan System; d.c. techniques
1974, 1975 and 1978: 19 nights	104-cm reflector	EMI 6094S cooled to -20 °C	

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TABLE II
Standard differential magnitudes of XY Cep

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2441 990.2541	+0.8580	-0 ^m 739	-0 ^m 656	-0 ^m 600
.2624	0.8610	-0.520	-0.581	-0.533
.2711	0.8642	—	-0.564	-0.535
.2803	0.8675	-0.746	-0.570	-0.557
.2914	0.8715	-0.680	-0.569	-0.546
.3002	0.8746	-0.739	-0.562	-0.552
2442 004.2689	-0.0907	-0.533	-0.567	-0.594
.2720	-0.0896	-0.526	-0.540	-0.501
.2813	-0.0862	-0.747	-0.561	-0.500
.2883	-0.0837	-0.645	-0.565	-0.520
.2952	-0.0812	-0.531	-0.534	-0.508
.3018	-0.0789	-0.745	-0.548	-0.612
.3074	-0.0768	-0.603	-0.549	-0.556
.3123	-0.0751	-0.557	-0.553	-0.574
.3517	-0.0609	-0.682	-0.590	-0.574
.3574	-0.0588	-0.550	-0.563	-0.564
.3637	-0.0566	-0.689	-0.620	-0.581
005.2250	+0.2539	-0.529	-0.526	-0.510
.2323	0.2565	-0.558	-0.518	-0.553
.2817	0.2743	-0.636	-0.553	-0.500
.2877	0.2765	-0.680	-0.561	-0.504
.2953	0.2792	-0.460	-0.539	-0.540
.3017	0.2815	-0.557	-0.561	-0.540
007.1077	-0.0662	—	-0.594	-0.555
.1131	-0.0656	—	-0.578	-0.557
.1242	-0.0616	—	-0.604	-0.575
.1284	-0.0601	—	-0.616	-0.605
.1339	-0.0581	—	-0.655	-0.618
.1401	-0.0559	—	-0.663	-0.612
.1443	-0.0544	—	-0.688	-0.632
.1480	-0.0530	—	-0.663	-0.577
.1553	-0.0504	—	-0.659	-0.644
.1630	-0.0476	—	-0.721	-0.713
.1680	-0.0458	—	-0.747	-0.774
.1730	-0.0440	—	-0.725	-0.723
.1785	-0.0420	—	-0.799	-0.769
.1850	-0.0397	—	-0.810	-0.803
.1902	-0.0378	—	-0.825	-0.825
.1933	-0.0367	—	-0.921	-0.868
.1987	-0.0347	—	-0.951	-0.898
.2121	-0.0299	—	-1.004	-0.962
.2179	-0.0278	—	-1.048	-1.021
.2244	-0.0255	—	-1.104	-1.085
.2292	-0.0238	—	-1.125	-1.098
.2356	-0.0214	—	-1.153	-1.170

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2442 007.2418	-0.0192	—	-1 ^m 248	-1 ^m 161
.2474	-0.0172	—	-1.252	-1.183
.2522	-0.0155	—	-1.290	-1.211
.2585	-0.0132	—	-1.418	-1.329
.2642	-0.0111	—	-1.468	-1.365
.2699	-0.0091	—	-1.547	-1.402
.2770	-0.0065	—	-1.553	-1.441
.2821	-0.0047	—	-1.426	-1.416
.2870	-0.0029	—	-1.420	-1.512
009.1061	0.6527	—	-0.527	-0.502
.1105	0.6543	—	-0.568	-0.480
.1165	0.6565	—	-0.583	-0.442
.1212	0.6582	—	-0.579	-0.536
.1388	0.6645	—	-0.572	-0.497
010.1312	0.0222	—	-1.379	-1.284
.1360	0.0239	—	-1.352	-1.228
.1403	0.0254	—	-1.149	-1.186
.1457	0.0274	—	-1.190	-1.155
.1510	0.0293	—	-1.146	-1.064
.1557	0.0310	—	-1.101	-1.047
.1607	0.0328	—	-1.081	-1.025
.1659	0.0347	—	-1.040	-0.985
.1718	0.0368	—	-1.013	-0.972
.1771	0.0387	—	-0.944	-0.934
.1805	0.0399	—	-0.926	-0.945
.1831	0.0409	—	-0.903	-0.905
.1895	0.0432	—	-0.888	-0.837
.1923	0.0442	—	-0.837	-0.827
.1966	0.0457	—	-0.814	-0.806
.2025	0.0479	—	-0.831	-0.799
.2076	0.0497	—	-0.728	-0.741
.2102	0.0506	—	-0.721	-0.730
.2159	0.0527	—	-0.692	-0.689
.2236	0.0555	—	-0.703	-0.678
.2294	0.0576	—	-0.664	-0.643
.2352	0.0596	—	-0.659	-0.622
.2397	0.0613	—	-0.611	-0.602
.2454	0.0633	—	-0.618	-0.585
.2502	0.0651	—	-0.608	-0.599
.2551	0.0668	—	-0.570	-0.589
.2607	0.0688	—	-0.577	-0.569
.2662	0.0708	—	-0.563	-0.555
327.2995	+0.3365	-0 ^m 571	-0.561	-0.535
.3201	0.3440	-0.636	-0.536	-0.523
.3390	0.3508	-0.623	-0.552	-0.542
.3505	0.3549	—	-0.610	-0.583
329.1710	0.0111	-1.592	-1.492	-1.381
.1744	0.0123	-1.557	-1.461	-1.359

(continued)

Table II (Continued)

JD (Hel)	Phase	U	B	V
2442 329.1819	0.0150	-1 ^m 546	-1 ^m 434	-1 ^m 343
.1904	0.0181	-1.493	-1.371	-1.303
.1986	0.0210	-1.438	-1.317	-1.224
.2111	0.0255	-1.350	-1.226	-1.189
.2214	0.0292	-1.264	-1.152	-1.109
.2358	0.0344	-1.140	-1.050	-1.013
.2498	0.0395	-1.061	-0.961	-0.936
.2546	0.0412	-1.017	-0.927	-0.897
.2677	0.0459	-0.921	-0.838	-0.819
.2796	0.0502	-0.852	-0.777	-0.778
.2967	0.0564	-0.783	-0.698	-0.703
.3091	0.0608	-0.747	-0.649	-0.629
.3176	0.0639	-0.715	-0.627	-0.613
.3260	0.0669	-0.658	-0.597	-0.580
.3363	0.0706	-0.639	-0.570	-0.547
.3454	0.0739	-0.657	-0.603	-0.592
.3609	0.0795	-0.647	-0.570	-0.547
.3729	0.0838	-0.644	-0.581	-0.551
.3815	0.0869	-0.645	-0.569	-0.532
.3919	0.0907	-0.650	-0.594	-0.563
337.2093	-0.0918	-0.691	-0.632	-0.585
.2348	-0.0826	-0.691	-0.575	-0.592
.2498	-0.0772	-0.686	-0.587	-0.586
.2656	-0.0715	-0.654	-0.568	-0.597
.2728	-0.0689	-0.685	-0.585	-0.597
.2943	-0.0611	-0.686	-0.590	-0.596
.3070	-0.0566	-0.659	-0.601	-0.605
.3184	-0.0524	-0.743	-0.648	-0.652
.3299	-0.0483	-0.783	-0.694	-0.700
.3583	-0.0381	-0.926	-0.847	-0.826
.3702	-0.0338	-0.974	-0.911	-0.919
.3808	-0.0300	-1.054	-0.989	-0.956
361.1396	+0.5332	-0.590	-0.548	-0.540
.1484	0.5364	-0.568	-0.544	-0.540
.1563	0.5393	-0.614	-0.539	-0.516
.1690	0.5438	-0.587	-0.557	-0.528
.1772	0.5468	-0.600	-0.580	-0.562
.1928	0.5524	-0.610	-0.575	-0.546
.2018	0.5557	-0.587	-0.542	-0.531
.2241	0.5637	-0.578	-0.527	-0.513
.2322	0.5666	-0.627	-0.634	-0.592
.2427	0.5704	-0.579	-0.554	-0.547
.2566	0.5754	-0.573	-0.550	-0.509
.2675	0.5793	-0.559	-0.561	-0.537
.2883	0.5868	-0.563	-0.553	-0.530
.2944	0.5890	-0.514	-0.485	-0.529
.3095	0.5945	-0.563	-0.563	-0.523
.3249	0.6000	-0.563	-0.550	-0.533

(continued)

Table II (Continued)

JD (Hel)	Phase	U	B	V
2442 362.1207	+0.8868	-0 ^m 628	-0 ^m 593	-0 ^m 577
.1277	0.8894	-0.670	-0.612	-0.558
.1350	0.8920	-0.627	-0.595	-0.578
.1459	0.8959	-0.623	-0.567	-0.563
.1534	0.8986	-0.627	-0.595	-0.585
.1599	0.9010	-0.642	-0.582	-0.578
.1663	0.9033	-0.624	-0.576	-0.569
.1726	0.9056	-0.643	-0.621	-0.621
.1795	0.9080	-0.624	-0.582	-0.569
.1970	0.9144	-0.639	-0.596	-0.579
.2044	0.9170	-0.651	-0.625	-0.620
.2108	0.9193	-0.649	-0.597	-0.586
.2191	0.9223	-0.642	-0.578	-0.572
.2268	0.9251	-0.655	-0.603	-0.584
.2344	0.9278	-0.649	-0.610	-0.587
.2425	0.9308	-0.653	-0.613	-0.581
.2481	0.9328	-0.646	-0.594	-0.557
.2538	0.9348	-0.656	-0.600	-0.580
.2591	0.9367	-0.655	-0.590	-0.567
.2651	0.9389	-0.640	-0.597	-0.587
.2723	0.9415	-0.655	-0.600	-0.595
.2783	0.9426	-0.763	-0.623	-0.612
.2876	0.9470	-0.711	-0.662	-0.646
.2935	0.9491	-0.730	-0.673	-0.661
.2998	0.0514	-0.756	-0.700	-0.688
.3055	0.9534	-0.778	-0.727	-0.697
.3161	0.9573	-0.837	-0.771	-0.751
363.1479	0.2571	-0.644	-0.546	-0.514
.1563	0.2601	-0.609	-0.546	-0.581
.1622	0.2622	-0.642	-0.572	-0.548
.1694	0.2648	-0.607	-0.542	-0.521
.1741	0.2665	-0.657	-0.566	-0.554
.1788	0.2682	-0.622	-0.574	-0.537
.1851	0.2745	-0.640	-0.561	-0.514
.1911	0.2727	-0.656	-0.544	-0.525
.1970	0.2748	-0.632	-0.550	-0.540
.2022	0.2767	-0.641	-0.560	-0.534
.2074	0.2785	-0.628	-0.564	-0.541
.2129	0.2805	-0.609	-0.566	-0.545
.2191	0.2828	-0.628	-0.557	-0.536
.2256	0.2851	-0.628	-0.593	-0.572
.2313	0.2871	-0.593	-0.566	-0.562
.2369	0.2892	-0.624	-0.593	-0.569
.2424	0.2911	-0.604	-0.569	-0.545
.2494	0.2937	-0.615	-0.601	-0.581
.2546	0.2955	-0.623	-0.579	-0.553
.2728	0.3021	-0.622	-0.590	-0.563
.2776	0.3038	-0.618	-0.603	-0.573

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2442 363.2828	0.3057	-0 ^m .609	-0 ^m .570	-0 ^m .549
.2878	0.3075	-0.601	-0.576	-0.557
.2933	0.3095	-0.608	-0.595	-0.566
364.1060	0.6024	-0.598	-0.561	-0.500
.1115	0.6044	-0.610	-0.550	-0.525
.1205	0.6076	-0.612	-0.544	-0.513
.1278	0.6103	-0.570	-0.556	-0.535
.1331	0.6122	-0.609	-0.578	-0.573
.1386	0.6142	-0.578	-0.570	-0.565
.1448	0.6164	-0.588	-0.562	-0.551
.1533	0.6195	-0.602	-0.554	-0.535
.1599	0.6218	-0.581	-0.556	-0.546
.1678	0.6247	-0.587	-0.552	-0.550
.1748	0.6272	-0.591	-0.558	-0.550
.1821	0.6298	-0.576	-0.560	-0.559
.1894	0.6325	-0.586	-0.551	-0.526
.1980	0.6356	-0.592	-0.566	-0.536
.2039	0.6377	-0.619	-0.562	-0.533
.2103	0.6400	-0.597	-0.572	-0.549
.2178	0.6427	-0.598	-0.599	-0.581
.2239	0.6449	-0.589	-0.561	-0.547
.2303	0.6472	-0.593	-0.547	-0.518
.2512	0.6547	-0.572	-0.557	-0.532
.2592	0.6576	-0.620	-0.575	-0.558
.2647	0.6596	-0.605	-0.594	-0.580
.2697	0.6614	-0.605	-0.548	-0.519
.2747	0.6632	-0.592	-0.559	-0.536
.2792	0.6648	-0.591	-0.562	-0.521
.2856	0.6671	-0.584	-0.570	-0.529
.2911	0.6691	-0.617	-0.563	-0.539
.2980	0.6716	-0.578	-0.547	-0.512
.3029	0.6734	-0.586	-0.563	-0.527
.3076	0.6751	-0.579	-0.573	-0.555
373.1494	0.8619	-0.616	-0.573	-0.554
.1521	0.8628	-0.662	-0.573	-0.561
.1659	0.8678	-0.646	-0.562	-0.550
.1829	0.8740	-0.629	-0.579	-0.566
.1896	0.8764	-0.637	-0.562	-0.548
.1966	0.8789	-0.630	-0.573	-0.547
.2078	0.8829	-0.614	-0.551	-0.501
.2262	0.8896	-0.641	-0.561	-0.549
.2353	0.8928	-0.653	-0.566	-0.559
.2430	0.8956	-0.633	-0.597	-0.577
.2496	0.8980	-0.643	-0.565	-0.559
.2575	0.9008	-0.635	-0.580	-0.573
.2679	0.9046	-0.661	-0.568	-0.567
.2933	0.9137	-0.651	-0.585	-0.566
.3015	0.9167	-0.662	-0.597	-0.574

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2442 373.3125	0.9207	-0 ^m .682	-0 ^m .619	-0 ^m .598
374.1031	0.2056	-0.625	-0.582	-0.568
.1135	0.2093	-0.618	-0.585	-0.561
.1229	0.2127	-0.613	-0.578	-0.546
.1318	0.2159	-0.629	-0.566	-0.541
.1374	0.2179	-0.609	-0.587	-0.519
.1428	0.2199	-0.621	-0.598	-0.574
.1554	0.2244	-0.593	-0.597	-0.599
.1646	0.2278	-0.604	-0.594	-0.583
.1703	0.2298	-0.619	-0.558	-0.537
.1758	0.2318	-0.603	-0.610	-0.589
.1813	0.2338	-0.614	-0.598	-0.586
.1927	0.2379	-0.583	-0.583	-0.565
.2033	0.2417	-0.595	-0.571	-0.551
.2091	0.2438	-0.605	-0.642	-0.619
.2142	0.2456	-0.600	-0.582	-0.558
.2192	0.2474	-0.620	-0.564	-0.541
.2256	0.2497	-0.601	-0.586	-0.563
.2382	0.2543	-0.636	-0.557	-0.543
.2459	0.2571	-0.614	-0.581	-0.555
.2508	0.2588	-0.630	-0.554	-0.575
.2555	0.2605	-0.602	-0.653	-0.652
.2608	0.2624	-0.607	-0.553	-0.521
.2740	0.2672	-0.613	-0.624	-0.598
.2850	0.2711	-0.617	-0.607	-0.583
395.1133	0.7781	-0.602	-0.558	-0.540
.1273	0.7832	-0.607	-0.549	-0.533
.1371	0.7867	-0.613	-0.564	-0.547
.1452	0.7896	-0.617	-0.555	-0.537
.1537	0.7927	-0.603	-0.563	-0.523
.1639	0.7964	-0.610	-0.561	-0.545
.1733	0.7997	-0.591	-0.551	-0.541
.1817	0.8028	-0.603	-0.563	-0.542
.2006	0.8096	-0.599	-0.553	-0.542
.2127	0.8139	-0.630	-0.577	-0.545
.2217	0.8172	-0.651	-0.579	-0.550
.2324	0.8210	-0.634	-0.577	-0.560
.2438	0.8251	-0.624	-0.558	-0.545
692.1562	0.8389	-0.541	-0.464	-0.519
.1697	0.8437	-0.688	-0.622	-0.604
.1786	0.8470	—	-0.597	-0.582
.1824	0.8483	-0.668	-0.604	-0.590
.1924	0.8519	-0.703	-0.582	-0.574
.1997	0.8586	-0.659	-0.575	-0.560
.2067	0.8571	-0.629	-0.528	-0.541
.2158	0.8604	-0.637	-0.557	-0.528
.2251	0.8637	-0.645	-0.569	-0.549
.2672	0.8789	-0.673	-0.585	-0.570

(continued)

Table II (Continued)

JD (Hel)	Phase	U	B	V
2442 692.2765	0.8822	-0 ^m 665	-0 ^m 589	-0 ^m 567
.2877	0.8863	-0.641	-0.562	-0.583
.2949	0.8889	-0.659	-0.577	-0.532
.3034	0.8919	-0.656	-0.537	-0.547
.3104	0.8945	-0.658	-0.563	-0.565
.3771	0.9185	-0.621	-0.540	-0.501
.3848	0.9213	-0.668	-0.590	-0.567
.3936	0.9244	-0.714	-0.595	-0.571
711.2809	0.7318	-0.620	-0.566	-0.559
.2919	0.7355	-0.614	-0.583	-0.554
.3038	0.7401	-0.602	-0.543	-0.529
.3113	0.7428	-0.602	-0.551	-0.523
.3163	0.7446	-0.631	-0.546	-0.533
.3217	0.7465	-0.676	-0.568	-0.548
.3300	0.7495	-0.657	-0.561	-0.541
.3370	0.7521	-0.649	-0.580	-0.559
.3458	0.7552	-0.628	-0.558	-0.556
.3535	0.7580	-0.641	-0.564	-0.533
.3581	0.7597	-0.671	-0.527	-0.534
.3659	0.7625	-0.638	-0.561	-0.547
.3769	0.7664	-0.583	-0.542	-0.564
.3850	0.7694	-0.526	-0.541	-0.544
.3944	0.7727	-0.598	-0.543	-0.557
713.1251	0.3965	-0.605	-0.552	-0.560
.1282	0.3976	-0.628	-0.556	-0.551
.1658	0.4112	-0.617	-0.546	-0.541
.1744	0.4143	-0.600	-0.552	0.536
.1818	0.4169	-0.596	-0.545	-0.530
.1909	0.4202	-0.590	-0.538	-0.524
.2002	0.4236	-0.594	-0.547	-0.529
.2078	0.4263	-0.604	-0.540	-0.540
.2148	0.4288	-0.649	-0.543	-0.546
.2267	0.4331	-0.606	-0.545	-0.539
.2549	0.4433	-0.620	-0.564	-0.543
.2642	0.4466	-0.594	-0.542	-0.529
.2726	0.4497	-0.602	-0.560	-0.545
.2811	0.4527	-0.604	-0.551	-0.545
.2899	0.4559	-0.611	-0.559	-0.546
.3043	0.4611	-0.612	-0.561	-0.568
.3138	0.4645	-0.605	-0.556	-0.557
.3219	0.4674	-0.612	-0.564	-0.555
.3303	0.4704	-0.614	-0.565	-0.566
.3384	0.4734	-0.595	-0.565	-0.560
723.1347	0.0042	-1.627	-1.492	-1.405
.1443	0.0076	-1.611	-1.472	-1.389
.1495	0.0095	-1.581	-1.465	-1.401
.1545	0.0113	-1.549	-1.451	-1.374
.1595	0.0131	-1.553	-1.425	-1.352

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2442 723.1642	0.0148	-1 ^m 501	-1 ^m 401	-1 ^m 330
.1703	0.0170	-1.474	-1.368	-1.308
.1755	0.0189	-1.440	-1.335	-1.275
.1812	0.0209	-1.401	-1.301	-1.245
.1864	0.0228	-1.372	-1.259	-1.206
.1916	0.0247	-1.341	-1.224	-1.171
.1975	0.0268	-1.287	-1.189	-1.140
.2059	0.0298	-1.209	-1.132	-1.098
.2129	0.0324	-1.168	-1.076	-1.063
.2205	0.0351	-1.037	-1.183	-1.172
.2262	0.0372	-1.009	-1.147	-1.111
.2334	0.0398	-1.039	-0.933	-0.896
.2406	0.0423	-0.974	-0.879	-0.857
.2511	0.0461	-0.898	-0.829	-0.790
.2582	0.0487	-0.869	-0.776	-0.755
.2648	0.0511	-0.831	-0.744	-0.730
.2711	0.0533	-0.817	-0.718	-0.689
.2764	0.0553	-0.782	-0.700	-0.679
.2812	0.0570	-0.772	-0.682	-0.664
.2878	0.0594	-0.723	-0.651	-0.628
726.1000	0.0729	-0.630	-0.579	-0.558
.1098	0.0765	-0.625	-0.570	-0.557
.1193	0.0799	-0.625	-0.554	-0.554
.1307	0.0840	-0.632	-0.569	-0.579
.1400	0.0874	-0.648	-0.565	-0.552
.1500	0.0910	-0.629	-0.575	-0.575
.1573	0.0936	-0.632	-0.563	-0.565
.1664	0.0969	-0.659	-0.579	-0.569
.1765	0.1005	-0.651	-0.568	-0.562
.1871	0.1043	-0.633	-0.554	-0.561
.1969	0.1079	-0.630	-0.569	-0.571
.2063	0.1113	-0.630	-0.567	-0.570
.2147	0.1143	-0.637	-0.579	-0.581
.2246	0.1179	-0.636	-0.577	-0.563
.2316	0.1204	-0.645	-0.568	-0.568
.2405	0.1236	-0.631	-0.559	-0.559
.2487	0.1265	-0.630	-0.560	-0.570
.2564	0.1293	-0.642	-0.564	-0.569
.2633	0.1318	-0.642	-0.566	-0.560
.2696	0.1341	-0.643	-0.562	-0.540
.2781	0.1371	-0.632	-0.553	-0.561
.2840	0.1393	-0.636	-0.554	-0.552
.2908	0.1417	-0.653	-0.553	-0.563
.2978	0.1442	-0.657	-0.551	-0.571
727.0964	0.4321	-0.602	-0.548	-0.519
.1052	0.4352	-0.610	-0.548	-0.533
.1141	0.4384	-0.602	-0.539	-0.528
.1229	0.4416	-0.623	-0.552	-0.539

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2442 727.1307	0.4444	-0 ^m .615	-0 ^m .554	-0 ^m .538
.1407	0.4480	-0.621	-0.554	-0.555
.1515	0.4519	-0.608	-0.549	-0.544
.1621	0.4558	-0.601	-0.545	-0.553
.1730	0.4597	-0.620	-0.552	-0.544
.1802	0.4623	-0.598	-0.549	-0.534
.1859	0.4643	-0.623	-0.552	-0.552
.1966	0.4682	-0.629	-0.563	-0.554
.2018	0.4701	-0.629	-0.571	-0.562
.2137	0.4744	-0.620	-0.567	-0.561
.2213	0.4771	-0.635	-0.582	-0.580
.2300	0.4802	-0.621	-0.578	-0.577
.2383	0.4832	-0.640	-0.574	-0.579
.2465	0.4862	-0.632	-0.574	-0.585
.2542	0.4889	-0.641	-0.582	-0.585
.2606	0.4913	-0.623	-0.583	-0.565
.2690	0.4943	-0.631	-0.589	-0.592
.2775	0.4973	-0.627	-0.574	-0.582
.2841	0.4997	-0.623	-0.581	-0.586
.2916	0.5024	-0.630	-0.551	-0.585
.2997	0.5053	-0.633	-0.574	-0.589
.3071	0.5080	-0.626	-0.570	-0.592
.3159	0.5112	-0.654	-0.585	-0.576
759.1126	-0.0286	-1.125	-1.038	-1.009
.1209	-0.0256	-1.191	-1.070	-1.060
.1239	-0.0245	-1.217	-1.095	-1.077
.1309	-0.0220	-1.264	-1.167	-1.105
.1344	-0.0207	-1.278	-1.176	-1.131
.1406	-0.0185	-1.319	-1.238	-1.184
.1442	-0.0172	-1.357	-1.279	-1.231
.1512	-0.0147	-1.412	-1.291	-1.259
.1550	-0.0133	-1.462	-1.333	-1.273
.1623	-0.0107	-1.458	-1.392	-1.314
.1664	-0.0092	-1.521	-1.408	-1.320
.1752	-0.0060	-1.592	-1.437	-1.357
.1799	-0.0043	-1.583	-1.458	-1.369
.1881	-0.0014	-1.635	-1.500	-1.385
760.0780	+0.3194	-0.636	-0.572	-0.540
.0824	0.3210	-0.635	-0.575	-0.561
.0898	0.3236	-0.626	-0.567	-0.561
.0938	0.3251	-0.644	-0.560	-0.539
.1021	0.3281	-0.630	-0.553	-0.546
.1068	0.3297	-0.629	-0.563	-0.548
.1126	0.3318	-0.612	-0.545	-0.539
.1163	0.3332	-0.619	-0.544	-0.538
.1231	0.3356	-0.615	-0.557	-0.554
.1275	0.3372	-0.616	-0.546	-0.548
.1352	0.3400	-0.617	-0.560	-0.553

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2442 760.1397	0.3416	-0 ^m .608	-0 ^m .555	-0 ^m .545
.1478	0.3445	-0.606	-0.561	-0.546
.1521	0.3461	-0.606	-0.547	-0.547
.1586	0.3484	-0.651	-0.568	-0.547
.1627	0.3499	-0.634	-0.560	-0.543
.1751	0.3544	-0.643	-0.553	-0.539
.1809	0.3565	-0.644	-0.557	-0.539
.1879	0.3590	-0.633	-0.565	-0.554
.1917	0.3603	-0.621	-0.559	-0.557
.1988	0.3629	-0.595	-0.554	-0.554
.2037	0.3647	-0.593	-0.578	-0.555
.2115	0.3675	-0.611	-0.563	-0.543
.2155	0.3689	-0.613	-0.560	-0.532
.2230	0.3716	-0.607	-0.554	-0.543
.2271	0.3731	-0.608	-0.558	-0.537
.2346	0.3758	-0.604	-0.563	-0.538
.2385	0.3772	-0.581	-0.564	-0.554
2443 791.1476	-0.0607	-0.738	-0.690	-0.589
.1523	-0.0590	-0.770	-0.655	-0.626
.1652	-0.0544	—	-0.709	-0.654
.1677	-0.0535	-0.783	-0.713	-0.667
.1790	-0.0494	-0.849	-0.797	-0.748
.1804	-0.0489	-0.825	-0.754	-0.735
.2031	-0.0407	-0.934	-0.886	-0.858
.2048	-0.0401	-0.952	-0.894	-0.883
.2129	-0.0372	-1.005	-0.927	-0.921
.2143	-0.0367	-1.018	-0.944	-0.927
.2194	-0.0348	-1.047	-0.976	-0.956
.2216	-0.0340	-1.072	-0.996	-0.976
.2262	-0.0324	-1.091	-1.034	-1.004
.2279	-0.0318	-1.142	-1.075	-1.038
.2303	-0.0309	-1.149	-1.107	-1.035
.2326	-0.0301	-1.151	-1.092	-1.034
.2432	-0.0263	-1.234	-1.168	-1.112
.2466	-0.0250	-1.260	-1.190	-1.144
.2558	-0.0217	-1.338	-1.285	-1.220
.2575	-0.0211	-1.356	-1.361	-1.234
.2599	-0.0202	-1.356	-1.312	-1.236
.2612	-0.0198	—	-1.321	-1.250
.2668	-0.0177	-1.375	-1.316	-1.258
.2677	-0.0174	-1.381	-1.320	-1.258
.2687	-0.0170	-1.407	-1.355	-1.283
.2729	-0.0155	-1.440	-1.379	-1.317
.2739	-0.0152	-1.429	-1.378	-1.317
.2794	-0.0132	-1.443	-1.396	-1.317
.2809	-0.0127	-1.435	-1.373	-1.312
.2854	-0.0110	-1.495	-1.440	-1.365

(continued)

Table II (Continued)

JD (Hel)	Phase	<i>U</i>	<i>B</i>	<i>V</i>
2443 791.2866	-0.0106	-1 ^m 508	-1 ^m 470	-1 ^m 375
.2917	-0.0088	-1.538	-1.501	-1.400
.2941	-0.0079	-1.549	-1.482	-1.397
.2982	-0.0064	-1.532	-1.476	-1.397
.2996	-0.0059	-1.542	-1.490	-1.405
.3068	-0.0033	-1.566	-1.492	-1.427
.3088	-0.0026	-1.566	-1.520	-1.423
.3151	-0.0003	-1.607	-1.586	-1.455
.3169	+0.0003	-1.586	-1.540	-1.443
.3227	0.0024	-1.579	-1.533	-1.435
.3245	0.0031	-1.587	-1.525	-1.434
.3267	0.0039	-1.572	-1.514	-1.425
.3278	0.0042	-1.573	-1.514	-1.432
.3291	0.0047	-1.562	-1.497	-1.422
.3302	0.0051	-1.566	-1.511	-1.424
.3316	0.0056	-1.568	-1.479	-1.420
.3326	0.0060	-1.558	-1.496	-1.411
.3340	0.0065	-1.559	-1.500	-1.412
.3353	0.0070	-1.554	-1.480	-1.409
.3369	0.0075	-1.567	-1.506	-1.408
.3382	0.0080	-1.552	-1.496	-1.410
.3396	0.0085	-1.534	-1.460	-1.396
.3444	0.0102	-1.531	-1.470	-1.402
.3460	0.0108	-1.523	-1.464	-1.388
.3477	0.0114	-1.516	-1.461	-1.380
.3489	0.0119	-1.510	-1.458	-1.379
.3506	0.0125	-1.474	-1.400	-1.347
.3520	0.0130	-1.485	-1.447	-1.353
.3534	0.0135	-1.482	-1.426	-1.347
.3550	0.0141	-1.469	-1.413	-1.339
.3566	0.0146	-1.434	-1.372	-1.311
.3585	0.0153	-1.436	-1.382	-1.318
.3636	0.0172	-1.414	-1.366	-1.301
.3660	0.0180	-1.377	-1.331	-1.270
.3730	0.0205	-1.303	-1.241	-1.205
.3751	0.0213	-1.292	-1.238	-1.205
.3804	0.0232	-1.295	-1.246	-1.200
.3828	0.0241	-1.246	-1.194	-1.152
.3897	0.0266	-1.076	-1.017	-0.989
.3921	0.0274	-1.077	-1.025	-0.989
.3999	0.0302	—	-1.071	-1.048
.4069	0.0328	-1.089	-1.011	-0.987
.4138	0.0352	-1.044	-0.965	-0.943

3. Light and Colour Curves

The ascending and descending branches of the primary minimum could be covered in one single night in October 1978 only. Using this primary minimum (given at serial no. 5 in Table III) and the earlier observations during the phase of primary minima, the first four times of minima (Table III) have been obtained by a tracing-paper method. The most accurate time of minimum (no. 5) when used with the epoch given by Kordylewski (1975) enables us to obtain a revised period of

$$\text{Primary min.} = 2433514.468 + 2^d774527 E.$$

Although Schneller (1931) has reported the absence of secondary minimum, our observations indicate the presence of a shallow minimum at phase 0.5. The light curves are given in Figure 1 and the colour curves in Figure 2. The depths of the minima are:

	<i>U</i>	<i>B</i>	<i>V</i>
Primary min.	0 ^m 99	0 ^m 93	0 ^m 85
Secondary min.	0.04	0.04	0.05

The colours of the comparison stars and of the variable are given in Table IV.

4. Orbital Elements

The rectification of the light curve was done by the graphical method (Russell and Merrill, 1952). The rectification constants are given in Table V. The light curve appears to be free from complications and, as such, the sine terms were not considered. The values of the reflection coefficients C_0 and C_2 are 0.0135 and 0.0045, respectively.

For the determination of the elements the nomographic method (Russell and Merrill, 1952) showed that the primary eclipse is a partial occultation. The best fit to the light curves were obtained for $k = 0.60$. Only the primary minimum was used for element determination as the secondary minimum is very shallow. The computed points have been plotted with the observations in Figure 3. The orbital elements are listed in Table VI.

TABLE III
Primary minima of XY Cep

1.	JD (Hel)	244 2007.304
2.	JD (Hel)	2010.075
3.	JD (Hel)	2329.148
4.	JD (Hel)	2723.131
5.	JD (Hel)	3791.3164

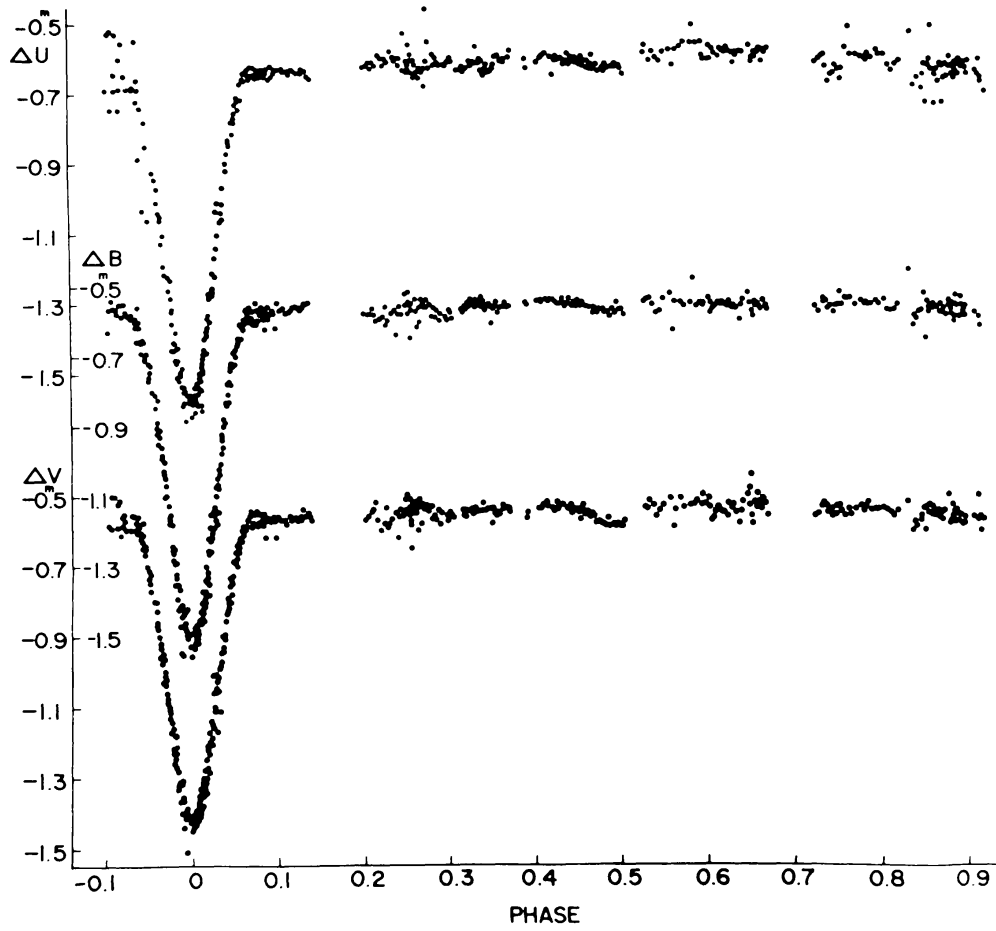


Fig. 1. Light curves of XY Cep.

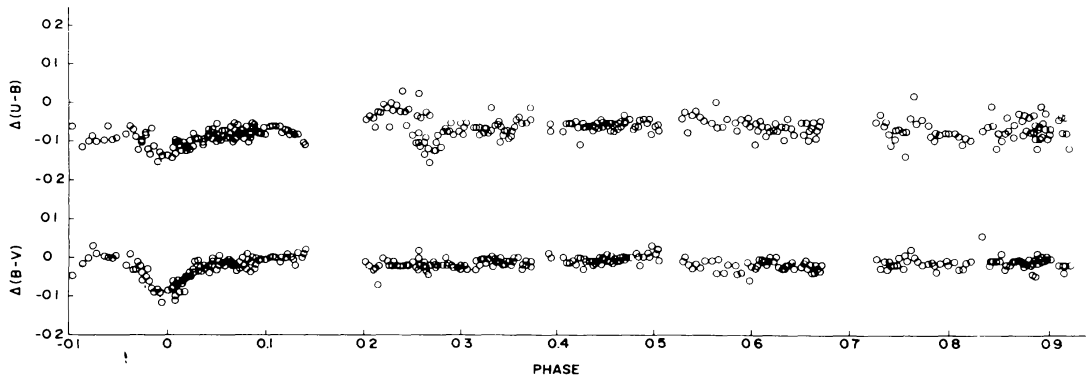


Fig. 2. Colour curves of XY Cep.

TABLE IV

Colours and visual magnitudes of the comparison and variable stars

Star	$B-V$	$U-B$	V	Standard errors
XY Cep (at light max.)	0 ^m 50	0 ^m 15	10 ^m 05	U : 0 ^m 004–0 ^m 031
(at prim. min.)	0.57	0.21	10.90	
BD + 67°1572	0.48	0.07	9.50	B : 0.002–0.020
BD + 68°1403	0.38	0.14	10.01	V : 0.002–0.027

TABLE V

Fourier coefficients for the U , B , V light curves of XY Cep

Filter	A_0	A_1	A_2
U	0.9590	−0.0164	0.0000
B	0.9777	−0.0031	−0.0003
V	0.9722	−0.0078	−0.0003

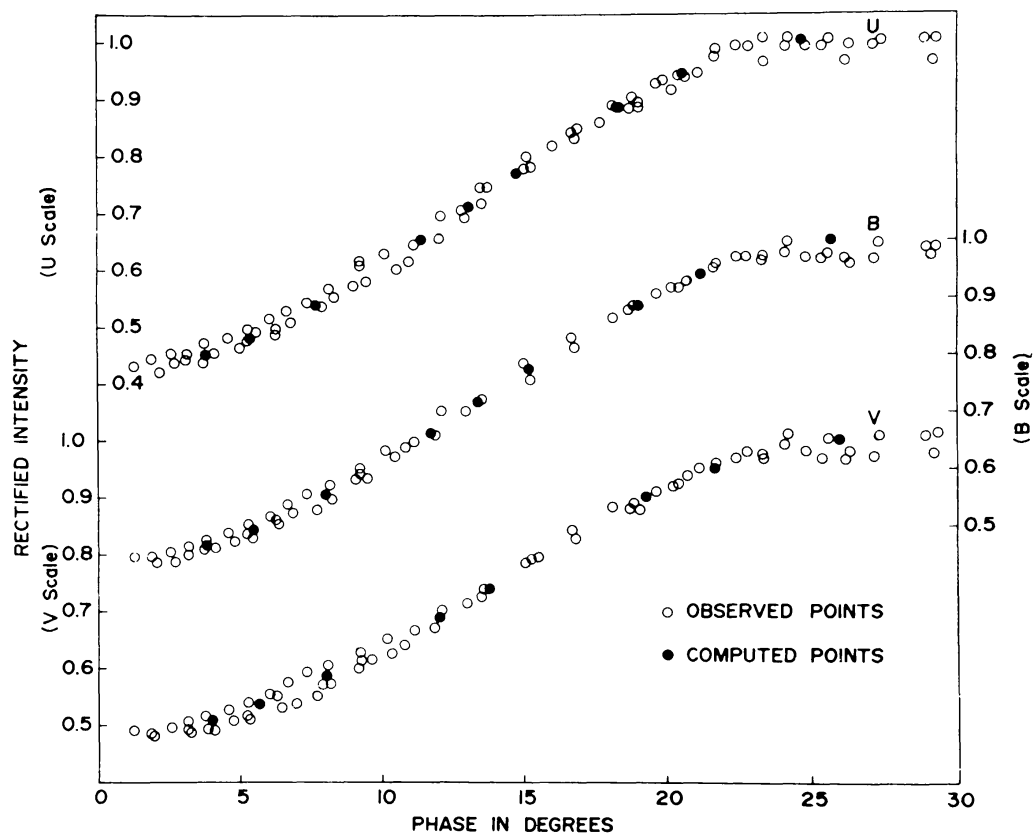


Fig. 3. Primary eclipse of XY Cep.

TABLE VI
Photometric elements of XY Cep

Elements	U	B	V	Mean
x (assumed)	0.6	0.6	0.6	
k	0.60	0.60	0.60	
α_0^{oc}	0.668	0.652	0.643	
α_0^{tr}	0.587	0.572	0.564	
$1-I_0^{\text{oc}}$	0.575	0.560	0.515	
$1-I_0^{\text{tr}}$	0.032	0.032	0.045	
L_s	0.863	0.859	0.800	
L_g	0.137	0.141	0.200	
p_0	-0.335	-0.312	-0.299	
θ_e	24°7	25°7	26°0	25°5
i	76°5	75°0	75°3	75°6
r_s	0.176	0.191	0.185	0.184
r_g	0.293	0.319	0.309	0.307
J_s/J_g	17.5	16.9	11.1	

5. Absolute Elements and Evolutionary Status

Using the spectroscopic elements obtained by Struve (1946) and the mean values of r_s , r_g , i and taking $T_e = 13\,400$ K for the B8 primary component, the absolute elements have been determined and are given in Table VII.

The colours for the primary and secondary components were derived using the total and the fractional luminosities of the components in the respective colours from Tables IV and VI respectively. Reddening corrections amounting to $0^{\text{m}}47$ in $(B-V)$ and $0^{\text{m}}35$ in $(U-B)$ have been applied to these values. The colours thus obtained are given in Table VII together with the absolute elements of XY Cep.

The colours of the components indicate that the primary component belongs to the Main Sequence while the secondary component lies well above the $(B-V)_0$ and

TABLE VII
Absolute elements of XY Cep

	Primary comp.	Secondary comp.
R	2.6 R_\odot	4.3 R_\odot
m	3.9 m_\odot	1.1 m_\odot
ϱ	0.22 ϱ_\odot	0.01 ϱ_\odot
M (bol)	-1 ^m 0	+1 ^m 0
$\log g$	4.2 (cm s ⁻²)	3.2 (cm s ⁻²)
$U-B$	-0 ^m 21	-0 ^m 17
$B-V$	-0 ^m 05	+0 ^m 41
Sp	B9	F5
A	14.1 R_\odot	

$(U-B)_0$ diagram for Main Sequence. While the radius and the surface gravity of the primary component conform to a Main Sequence star of that mass, the radius of the secondary component is about four times larger than the radius of a Main Sequence star of the same mass. The surface gravity of the secondary component is therefore quite small in comparison to that of a Main Sequence star of spectral type F5.

The value of Roche constants (Kopal, 1959) were calculated and it was found that $C_0 = 3.83$ is near to $C_2 = 3.6$, indicating that the secondary component has almost filled its Roche lobe. The value of $C_1 = 9.0$ is much higher than C_0 , which means that the primary component is well inside its Roche lobe.

The above findings on the state of evolution indicate that the secondary component is fairly evolved and may be in the stage of slow mass transfer to the primary component, but Struve (1946) has found no bright H lines and thus the possibility of a ring around the primary is ruled out. One manifestation of this could be a change in period. The period variation has not been studied owing to the lack of times of minima in the literature.

Acknowledgement

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