PHOTOMETRY OF SYMBIOTIC STARS

I. CH Cyg, UV Aur, 4 Dra

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ABSTRACT. New UBV observations of symbiotic stars CH Cyg and UV Aur and of symbiotic-like star 4 Dra are published. The observations were made between September 1988 an September 1989 at the Skalnaté Pleso Observatory. A sudden change in the brightness (-2 mag) of CH Cyg in U colour was indicated in May-August 1989. Flickering of the U magnitude ($\Delta U \approx 0.3 - 0.7$ mag) was again observed at the same time. These changes can be classified as a new outburst. The UV Aur observations indicate the expected variability with maximum amplitude in the V colour. The observations of 4 Dra in March trough September 1989 display a gradual decrease of brightness in all 3 colours with an occasional occurrence of short-term (weekly) variability, most pronounced in the B and V colours.

1. INTRODUCTION

This paper is the first of a series in which the results of the campaign of long-term observations of symbiotic stars of the northern sky in the standard photometric UBV system (Hric and Skopal, 1989) are to be published. The series is designed to serve as a reference source of information. The characteristics of the individual objects will only be mentioned when first reported in the series. Mo-

re detailed interpretations and analyses will become the subject of separate studies once a larger amount of material, relating to a particular star, has been compiled. The main purpose of the series is thus to serve as the primary source of photometric data for more detailed study.

a) CH Cyg

Outbursts of symbiotic stars belong to the most pronounced manifestations of these objects. In general, this involves a sudden change in the star's brightness by 2 to 7 mag, particularly in the blue region of the spectrum, which lasts weeks to years. Spectroscopic observations usually detect a nebular emission spectrum which is combined with the continuum of the radiation of the cold and hot star.

Outbursts of symbiotic star CH Cyg have so far been observed three times:in 1963-1965, 1967-1970 and 1977-1986. These outbursts, namely the last one, have been discussed in detail by a number of authors (e.g., Hack et al., 1986; Skopal et al., 1989 and references therein). Skopal (1989) discussed some of the peculiarities as well as the principal characteristics of the active and quiescent phases of CH Cyg. The main problem in explaining the generation of the observed outbursts, particularly with regard to the energy balance, is the strong and effective interaction between the components of this extensive binary system ($P_{orb} \cong 16$ years). It seems probable that the basic cause of the activity is the inherent instability of the red giant M6III, whose radius in this system with an elliptical orbit (e= 0.5) and non-synchronous rotation is close to the critical equipotential, which should be fulfilled at any point of the orbit (Skopal, 1988).

A typical manifestation of CH Cyg activity are the rapid fluctuations of its brightness by $\approx 0.05 - 0.5$ mag on a time scale of minutes to hours (e.g., Slovak and Africano, 1978; Chochol et al., 1984). These depend on the level of activity of the star and on the colour. During the maximum of the active phase (1982-1984), the largest changes were $\Delta U \approx \Delta B \approx \Delta V$, the inequality $\Delta U > \Delta V$ holding true as the activity decreased (e.g., Skopal, 1987; 1989). The degree of interaction between the CH Cyg components is reflected photometrically in the intensity of the blue continuum (e.g., Ipatov et al., 1984; Skopal et al., 1989); consenquently, the U light curve is most sensitive to the changes in the brightness properties of the interacting circumstellar matter. The preliminary analysis of its behaviour, observed from April to August 1989, is intended to draw attention to the existence of a new outburst of this symbiotic star.

b) UV Aur

The symbiotic star UV Aur (HD 34842) was originally classified as a carbon star. Its optical photometry was first published by Cannon (1918) who mentioned changes in brightness ranging from 7.9 to 10.1 mag. Zakharov (1951) determined its photometric ephemeris with a period of 395.2 days, and pointed out that the changes in brightness could be caused by pulsations or orbital motion. Although the star is relatively bright, only very few optical photometric observations have been published. More studies were devoted to the spectroscopy of the object; a re-

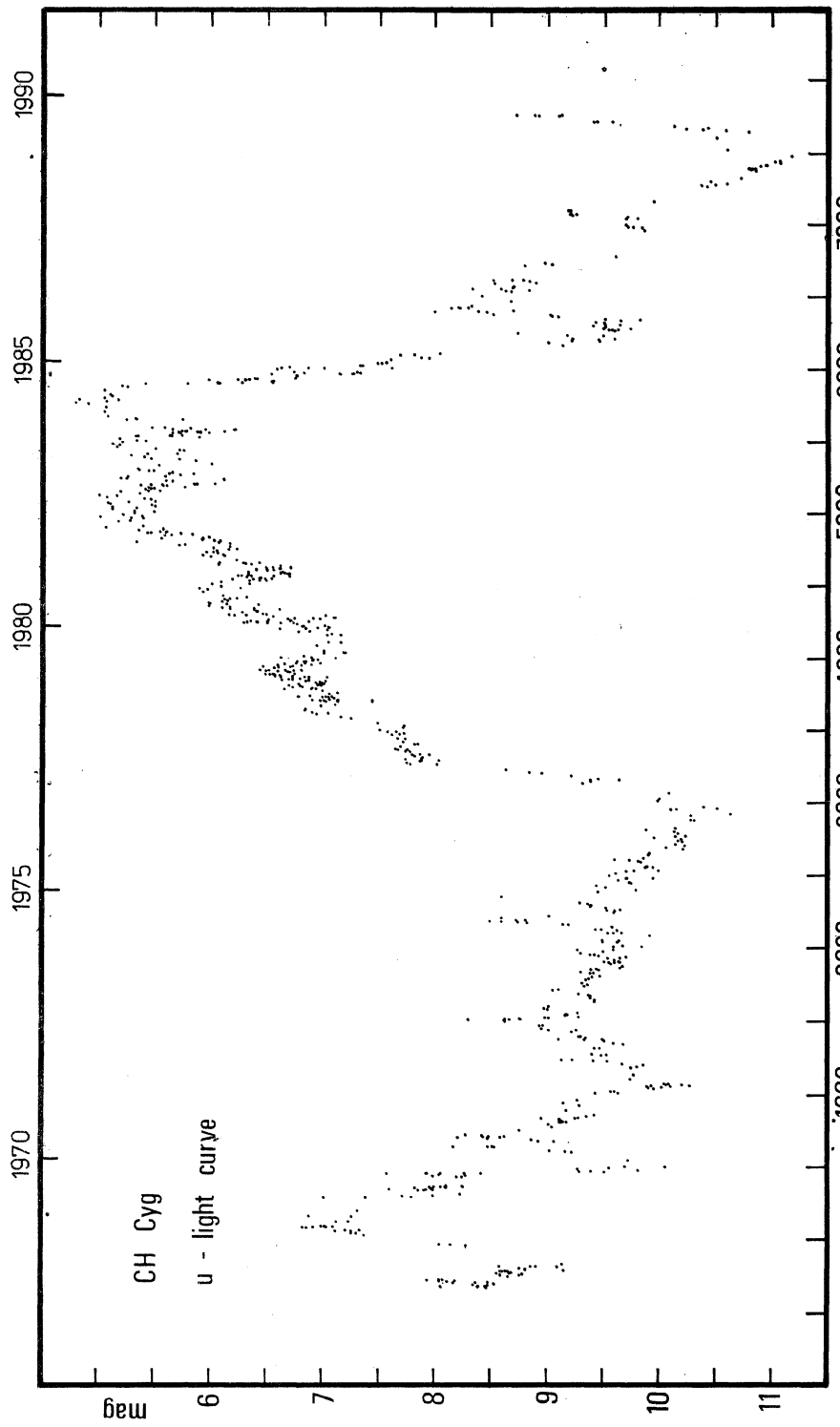

Fig. 1. Light curve of CH Cyg in U-colour plotted using the data published in the literature and in this paper.

view of the references can be found in (Kenyon, 1986).

UV Aur can be assigned to the small group of carbon symbiotic stars, only 3 such objects being known to exist in our Galaxy (Schulte-Ladbeck et al., 1988). Ricker (1971) determined the spectral type of UV Aur in brightness minimum as C9II. Reimers and Groot (1983) claim that the hot components of UV Aur is a white dwarf. Besides this, UV Aur is also interesting by being the brighter component of the visual binary ADS 3934 (d = 3".4). We are thus faced with a tri-star system: the relatively close symbiotic binary ADS 3934 A and the third component, ADS 3934 B, spectral type B9V (Olson and Ricker, 1975). Kenyon (1988) used the IR photometric observations from IRAS to estimate the rate of mass loss of the cold components of some symbiotic stars. He gives the value 10^{-6} $M_{\odot}$ yr^{-1} for UV Aur. Anandarao et al. (1988) give the mass of the dust envelope of UV Aur as 1.4×10^{-7} $M_{\odot}$ and its distance as 1000 pc. Seal (1988) determined the temperature of the hot component of UV Aur as 58 000 K. Using Kenyon's IR data (1983) he further determined M_{bol} = -5.2, T_{eff} = 3 200 K and luminosity of the order $L \approx 10^4$ $L_{\odot}$. Based on the absorption lines of the M star, Garcia and Kenyon (1988) constructed the curve of radial velocities due to orbital motion with a period of (388 ± 5) days. However, orbital motion with a period of around 390 days does not agree with the results of the polarimetric observations of UV Aur made by Khudyakova (1985, 1988) who claims that the polarization, probably related to the orbital motion of the binary with a period of about 14 years, combines with the polarization related to the cold component, which satisfies the period of 393.4 days.

The properties of the symbiotic star UV Aur mentioned above make it a very interesting system. This is the reason why UV Aur has been included in our programme of long-term photometric observations of symbiotic stars. Moreover, Kenyon (1986) already pointed out that urgent need of UBV observations of this star.

c) 4 Dra

The bright red giant 4 Dra (MIIIa, m ≈ 5) has been classified as a spectroscopic binary (e.g., Hoffleit, 1982). Some of the details in the published spectra, indicating the binary nature of 4 Dra, were discussed by Reimers (1982) who included this object in his list of stars with a "hybrid atmosphere". With the aid of the IUE satellite, Reimers (1985) also found that 4 Dra had a hot companion whose UV spectral characteristics were strongly reminiscent of a cataclysmic object of the AM Her or SS Cyg type. The hot companion was labelled 4 Dra B, the designator 4 Dra A corresponding to the red giant component. The analysis of all published optical spectra of 4 Dra (Reimers et al., 1988) yielded the parameters of the spectroscopic orbit of the giant MIIIa (4 Dra A) around the centroid of the system, which it forms with the hot companion (4 Dra B): P_{orb}=1703 days, e=0.30, $a_1 \sin i$ = 82 Gm (roughly 4 AU), f(m) = 0.0076 M . The same paper also gives other UV observations of 4 Dra B which indicate that the hot companion, in accordance with its preliminary cataclysmic classification based on the UV spectrum (Reimers, 1985), is itself a binary system with a probable orbital period of (238±2) mins. Moreover, orbital modulation was observed on different nights and at various ove-

rall UV fluxes, which indicates the existence of long-term variability. The same conclusion can be drawn from the results of radio observations of 4 Dra with the VLA antenna system (Brown, 1987). Changes in radio emission on a time scale of weeks to months were observed on wavelength 6 cm in 4 Dra, however, the existence of short-term radio variability on a time scale of hours cannot be excluded. The summary of all UV observations of 4 Dra indicates that this objects is evidently a magnetic cataclysmic binary of the AM Her type or possibly an intermediate polar (Reimers et al., 1988).

The triple system of 4 Dra A/B is thus a unique object which combines in itself certain fundamental properties of a symbiotic binary (red giant plus hot companion), as well as of a cataclysmic system: according to the canonic model of cataclysmic binaries, the components of 4 Dra B are apparently a white dwarf and a cold red star of the lower main sequence of small mass. This combination, together with the directly determined distance of 4 Dra, may prove to be invaluable with regard to a deeper understanding of the problems of symbiotic and cataclysmic interacting binaries.

The observed UV and radio variability of 4 Dra may have certain, albeit less significant responses also in the optical region (in spite of the radiation of the allegedly normal red giant component being uniquely dominant in this region; Reimers, 1985). With a view to this possibility, as well as to the basic that the observed physical structure of the 4 Dra A/B system represents an astrophysically very attractive enviroment with a high probability of occurence of optical variability as well, we decided to include additionally 4 Dra in our campaign of long-term UBV monitoring of symbiotic binaries of the nothern sky. This paper is a brief report on the first half-year of observations.

2. OBSERVATIONS AND RESULTS

All observations were made in the standard photometric UBV system using a one-channel photoelectric photometer installed in the Cassegrain focus of the 0.6/7.5 m reflector of the Skalnaté Pleso Observatory, operating on the principles of the method of pulse counting. The photometer is equipped with an EMI 6295B photomultiplier. The electronic system of the photoelectric photometer and its interfacing with the EMG 666B calculator were described by Klocok et al. (1986).

The observations were conducted in roughly hourly cycles: S, C, S, V, S, V, ..., S, V, S, C, S (of 4 Dra: S, C, S, V, V, V, V, S,...,S, V, V, V, V, S, C, S) where S stands for the standard star, C the check star and V the variable. The integration time of one measurement was 10 s. The measurements were reduced to the international system and are collected in Tables 1, 3 and 5. Each value represents the average of the observations made during one night. The letter "n" designates the number of individual measurements pre night.

The analysis of the measuring errors was made on the basis of 5.5 - hour observations of CH Cyg on August 15./16. 1989 (Fig. 4). As it is seen from this figure, the errors caused by the measuring device and the conditions of observati-

on are of order 0.01 mag per 1 measurement of the comparison or check star. The scatter Δ is colour-dependent, i.e. $\Delta U > \Delta B > \Delta V$. For example, the root mean square error for 6 measurements of the magnitude differences of the check and comparison star σ (C-S) is 0.013, 0.006 and 0.002 in U, B and V filters respectively.

Observations are corrected for the influence of differential extinction. Recent measurements of the extinction coefficients at the Skalnaté Pleso Observatory gave the values 0.55, 0.27 and 0.17 for U, B and V filters, respectively.

a) CH Cyg

New observations of this symbiotic star were made on 20 nights, from September 1988 to August 1989 (Table 1). Comparison and check star are the same as used Skopal (1989). Observations of the check star (HD 184 960), spectrum F8, V = 5.84 mag) made from 1986 showed its possible long-term variability. Therefore, we do not recommend to use this star as standard star. We shall use the SAO 48 428 (spectrum F8, m_V = 8.0, m_{pg} = 8.6) star, which has been already suggested by Hric and Skopal (1989).

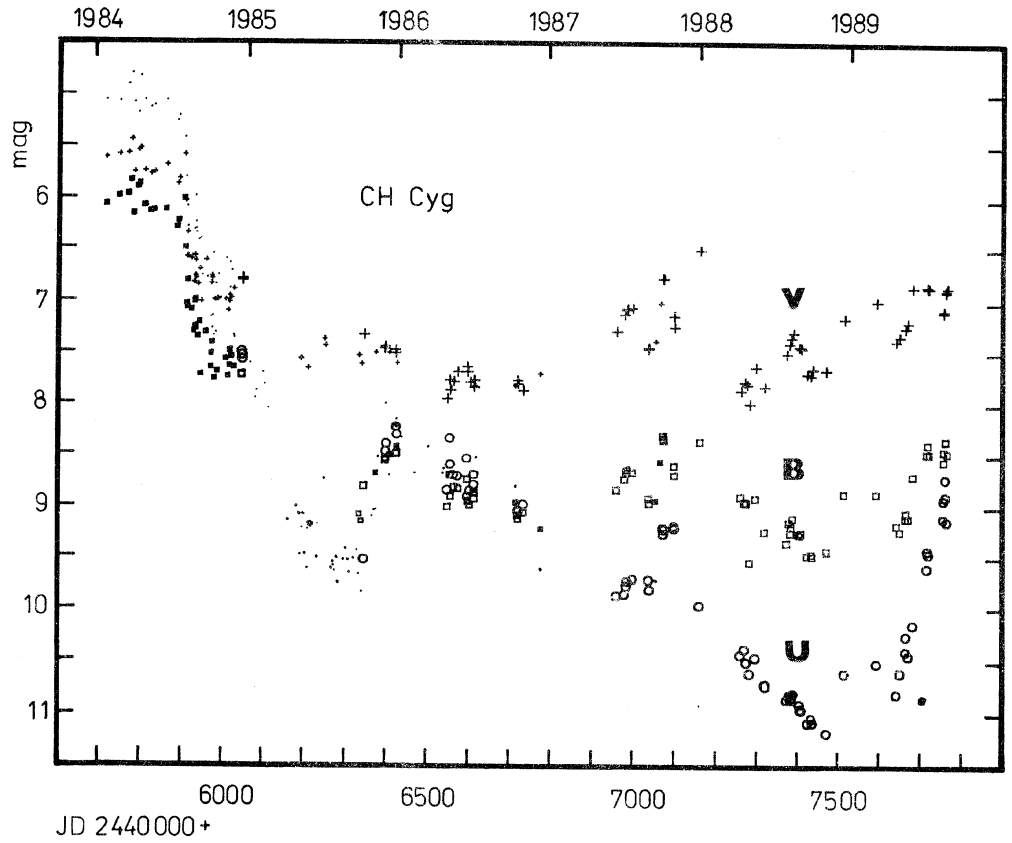

Fig. 2. U, B, V light curve of CH Cyg from the last maximum of its activity to the present new outburst. ., ■, + : U, B, V data adopted from the literature, and o, □, + represent U,B and V observations made at the Skalnaté Pleso Observatory and since JD 2447420 published in this paper.

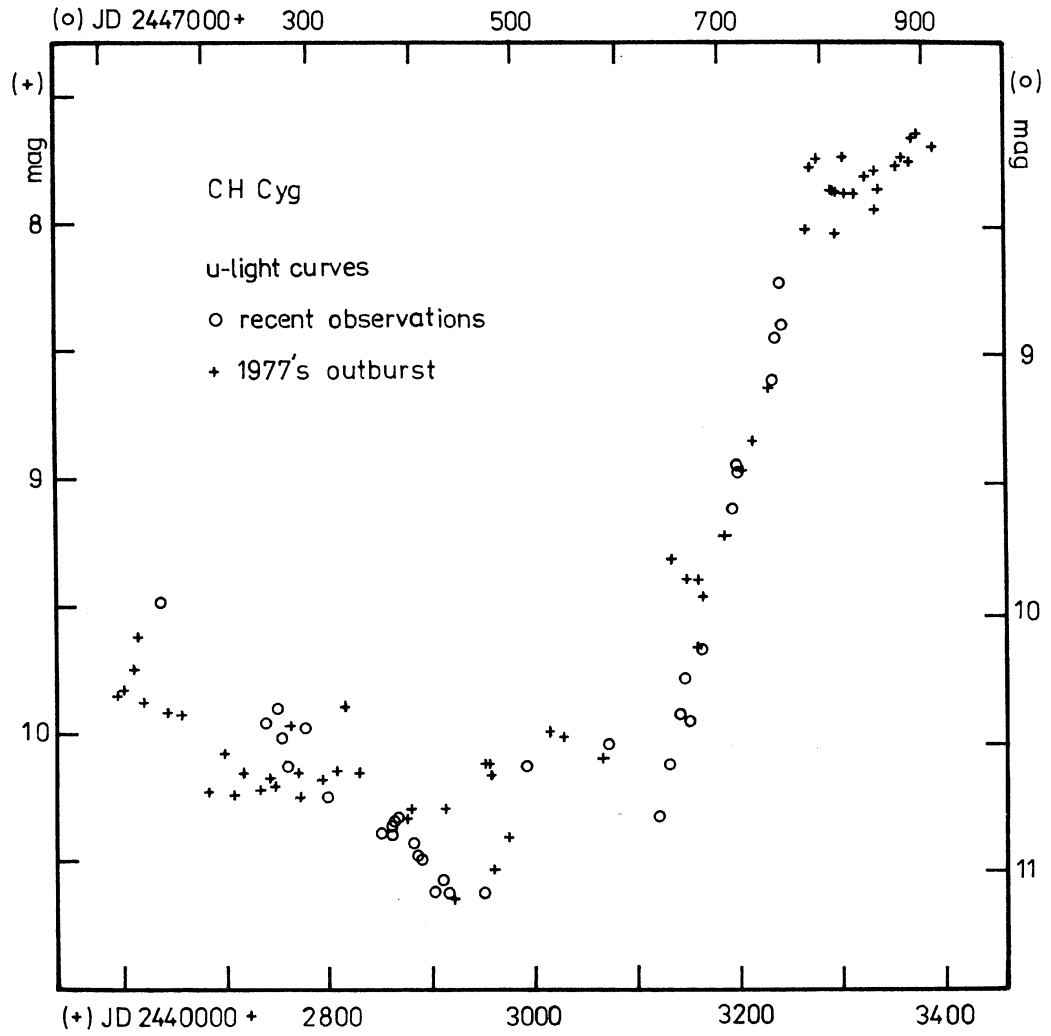

Fig. 3. Comparison of U light curves of the last outburst with the recent increase in the star's brightness in the U-filter. The current data, the upper and r.h.s. scales, are shift back in time by about 4520 days and by aproximately -0.5 mag.

The end of the last activity phase of CH Cyg was indicated photometrically approximately since 1986. In this interval and up to September 1988, a gradual decrease of the star's brightness in the U-filter was observed together with the simultaneous vanishing of its rapid fluctuations in U, B and V (Skopal, 1989). From September to November 1988 the U magnitude still continued to decrease down to 11.1 mag (Fig. 2). In this interval no rapid changes of brightness were observed. A small increase in the brightness of the U colour, about 0.2 - 0.5 mag, occurred between Dec. 17, 1988 and Apr. 25, 1989. It is interesting to note that a similar change also occurred before the last outburst in 1977 (Fig. 3, 1). Subsequently, between

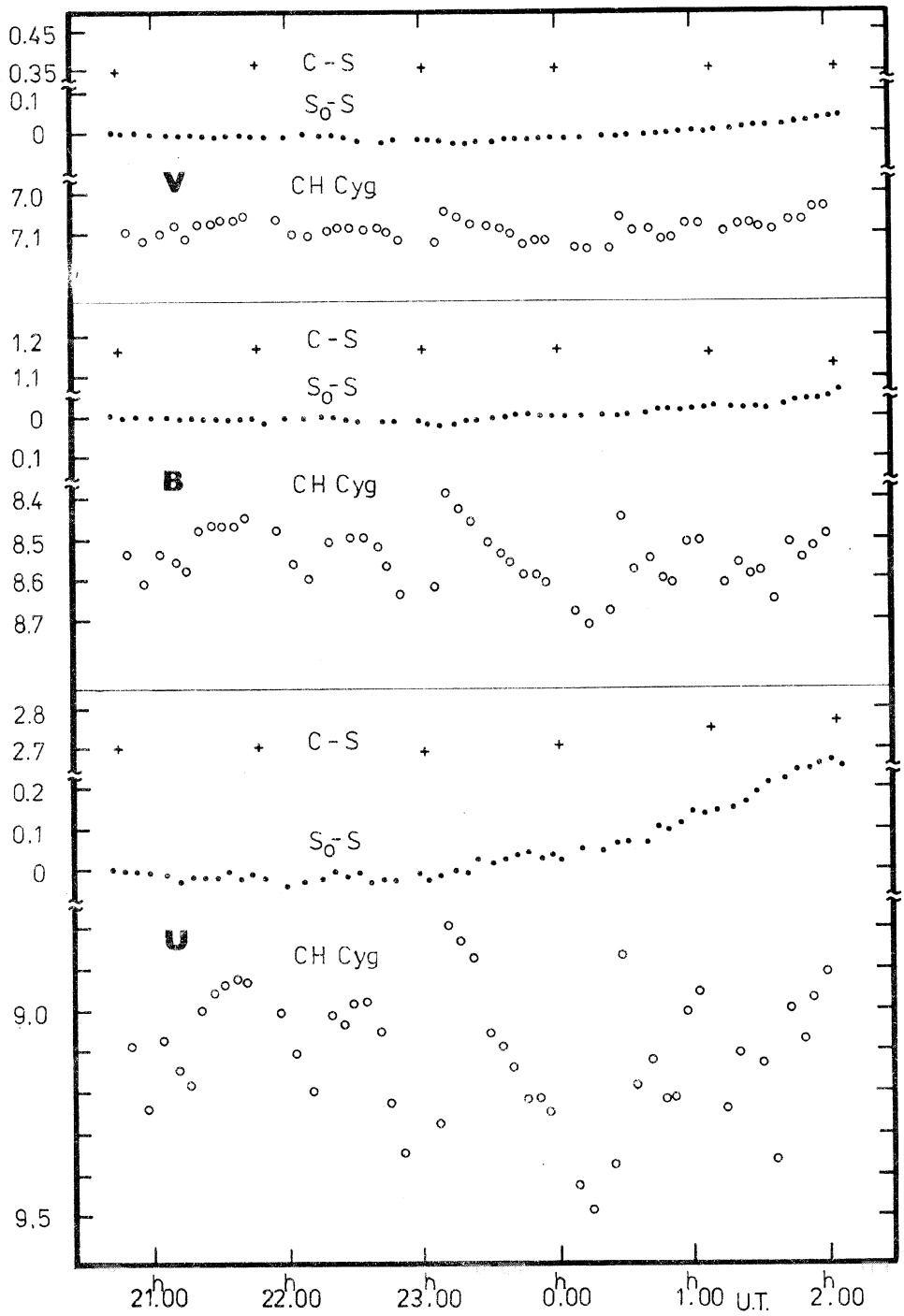

Fig. 4. Differential UBV photometry of CH Cyg in night of August 15./16. 1989. Rapid changes of the brightness in U filter ($\Delta U_{max} \approx 0.7$ mag) are evident. The first measured value of the comparison star is denoted S_0.

TABLE 1

U,B,V OBSERVATIONS OF CH CYGNI IN 1988-1989

J.D.	V	B-V	U-B	N	DATE	U.T.
2447424.285	7.697	1.769	1.610	9	1988 SEP. 19	18 50
433.266	7.704	1.744	1.581	7	1988 SEP. 28	18 23
437.332	7.643	1.825	1.604	4	1988 OCT. 2	19 59
471.206	7.659	1.755	1.756	5	1988 NOV. 5	16 56
513.227	7.153	1.713	1.731	14	1988 DEC. 17	17 27
592.639	6.985	1.879	1.638	5	1989 MAR. 7	03 20
641.541	7.372	1.798	1.623	15	1989 APR. 25	00 59
650.552	7.327	1.902	1.358	6	1989 MAY 4	01 15
663.532	7.241	1.866	1.276	9	1989 MAY 17	00 46
664.530	7.240	1.806	1.189	9	1989 MAY 19	00 42
670.519	7.191	1.914	1.323	6	1989 MAY 24	00 27
681.495	6.845	1.851	1.431	6	1989 JUNE 3	23 52
715.454	6.837	1.635	1.109	14	1989 JULY 7	22 54
716.445	6.850	1.536	1.021	18	1989 JULY 8	22 40
718.404	6.849	1.625	0.967	28	1989 JULY 10	21 42
754.474	7.088	1.458	0.551	49	1989 AUG. 15	23 23
755.427	7.073	1.371	0.474	20	1989 AUG. 16	22 15
759.473	6.877	1.473	0.366	15	1989 AUG. 20	23 21
760.547	6.886	1.452	0.546	12	1989 AUG. 22	01 00
763.506	6.852	1.615	0.659	72	1989 AUG. 25	00 09

Apr. 25, 1989 ($\approx$ 10.8 mag) and the last observations in August 1989 (8.7-8.8 mag) a sudden increase in the brightness in U was observed. In this interval the change amount to about 2 mag and with a view to the values in autumn 1988, ΔU amounted to nearly -2.5 mag (Figs. 1, 2, 3). This rapid change in brightness, $\gtrsim$ -2 mag/months, may already be classified as a new outburst of this symbiotic star. Figure 3 compares the U light curve from the interval of the 1977 outburst with that of the interval of the latest observations shiffed backwards by about 4520 days and by -0.5 mag. The gradient of the rapid change, as well as its absolute value are very similar, which also supports the existence of a new outburst of CH Cyg at this time. The change in the star's brightness has so far been mostly observed in U colour (Fig. 2). The spectral region of the B-filter is less affected by the blue continuum (ΔB $\approx$ -1 mag, Fig. 2) and the V-region is hardly affected at all. The V-magnitude still varies roughly between 6.7 and 7.9 mag and thus ties in with the values observed since 1986 and those observed in the quiescent phase of CH Cyg,1970-1977 (ref. Skopal, 1989: Fig. 1). The changes in the energy distribution in the spectrum characterized by the U-B and B-V colour indices which have recently decreased from $\approx$1.6 and $\approx$1.8 to $\approx$0.4 and $\approx$1.4 (Table 1). An increase of the activity of CH Cyg in July - August 1989 has been also reported by Tomov et al. (1989a, 1989b). They observed the apperance of remarkable emission Balmer lines in the spectrum of CH Cyg and the rapid brightness variations in U filter.

Longer observations of 6 and 4.5 hrs were made on Aug. 15 and 25, respectively. The results are compiled in Tab. 2 and the changes in U, B, V - magnitudes are shown in Fig. 4. The observed changes, ΔU $\approx$ 0.3 - 0.7 mag on a time scale of hours, apparently reflect rapidly varying optical properties of the newly forming,

TABLE 2

U,B,V OBSERVATIONS IN SELECTED NIGHTS

AUGUST 15./16. 1989

2 447 754.+	V	B-V	U-B
0.367	7.092	1.444	0.547
0.372	7.115	1.491	0.631
0.377	7.097	1.447	0.524
0.382	7.079	1.477	0.587
0.385	7.113	1.468	0.598
0.389	7.076	1.407	0.515
0.393	7.075	1.393	0.485
0.396	7.064	1.407	0.463
0.400	7.068	1.397	0.456
0.403	7.056	1.392	0.482
0.413	7.064	1.413	0.523
0.418	7.101	1.462	0.537
0.423	7.106	1.491	0.596
0.429	7.091	1.423	0.493
0.433	7.086	1.433	0.510
0.436	7.085	1.413	0.482
0.440	7.090	1.406	0.479
0.444	7.084	1.434	0.530
0.447	7.097	1.471	0.656
0.451	7.115	1.524	0.707
0.462	7.120	1.496	0.658
0.465	7.044	1.341	0.407
0.469	7.059	1.373	0.398
0.473	7.075	1.387	0.409
0.478	7.080	1.432	0.540
0.482	7.085	1.451	0.550
0.485	7.101	1.458	0.577
0.489	7.129	1.462	0.624
0.493	7.115	1.475	0.620
0.496	7.118	1.489	0.637
0.505	7.135	1.547	0.743
0.509	7.138	1.571	0.776
0.516	7.138	1.537	0.698
0.519	7.058	1.389	0.419
0.523	7.093	1.484	0.598
0.528	7.089	1.461	0.566
0.532	7.114	1.488	0.612
0.535	7.105	1.505	0.598
0.539	7.075	1.434	0.490
0.543	7.076	1.436	0.437
0.551	7.093	1.520	0.621
0.555	7.079	1.479	0.540
0.559	7.073	1.521	0.579
0.562	7.083	1.498	0.542
0.566	7.089	1.563	0.705
0.571	7.063	1.443	0.481
0.575	7.065	1.484	0.513
0.578	7.032	1.483	0.446
0.582	7.032	1.462	0.408

AUGUST 24./25. 1989

2 447 763.+	V	B-V	U-B
0.416	6.814	1.535	0.616
0.417	6.847	1.580	0.629
0.419	6.852	1.601	0.699
0.421	6.850	1.631	0.771
0.425	6.856	1.616	0.713
0.426	6.865	1.637	0.726
0.427	6.862	1.624	0.735
0.429	6.868	1.638	0.761
0.433	6.839	1.595	0.685
0.434	6.831	1.577	0.664
0.436	6.822	1.573	0.619
0.437	6.827	1.565	0.600
0.447	6.853	1.604	0.675
0.448	6.850	1.599	0.675
0.449	6.867	1.603	0.660
0.451	6.862	1.601	0.675
0.455	6.859	1.590	0.647
0.457	6.849	1.605	0.700
0.458	6.848	1.590	0.727
0.459	6.855	1.622	0.722
0.463	6.876	1.580	0.672
0.464	6.854	1.595	0.705
0.466	6.877	1.594	0.709
0.467	6.874	1.661	0.806
0.475	6.849	1.606	0.672
0.476	6.836	1.614	0.714
0.477	6.837	1.631	0.739
0.479	6.837	1.638	0.743
0.485	6.842	1.644	0.688
0.486	6.816	1.615	0.706
0.487	6.827	1.609	0.692
0.489	6.841	1.603	0.663
0.493	6.856	1.613	0.660
0.495	6.824	1.612	0.707
0.496	6.842	1.586	0.639
0.497	6.854	1.599	0.623
0.506	6.868	1.642	0.793
0.507	6.849	1.629	0.743
0.510	6.853	1.656	0.723
0.511	6.822	1.603	0.646
0.515	6.811	1.624	0.739
0.517	6.792	1.569	0.564
0.518	6.808	1.573	0.576
0.519	6.817	1.582	0.591
0.524	6.848	1.574	0.666
0.525	6.831	1.555	0.648
0.527	6.834	1.564	0.567
0.532	6.832	1.571	0.614
0.546	6.849	1.619	0.679
0.548	6.854	1.625	0.686
0.549	6.837	1.601	0.579
0.550	6.844	1.617	0.676
0.555	6.864	1.628	0.654
0.556	6.845	1.642	0.693
0.558	6.864	1.600	0.642
0.559	6.871	1.608	0.638
0.563	6.856	1.626	0.711
0.564	6.871	1.660	0.683
0.565	6.872	1.650	0.743
0.566	6.864	1.634	0.699

TABLE 2 (CONTINUED)

2 447 763.+	V	B-V	U-B
0.570	6.887	1.636	0.716
0.572	6.870	1.655	0.664
0.573	6.873	1.669	0.719
0.574	6.889	1.645	0.671
0.581	6.872	1.622	0.715
0.582	6.872	1.667	0.772
0.584	6.887	1.648	0.724
0.585	6.909	1.673	0.750
0.594	6.854	1.624	0.703
0.595	6.891	1.670	0.768
0.596	6.872	1.691	0.792
0.597	6.877	1.669	0.698

hitherto optically transparent, accretion disk-envelope around the compact component of the system. These rapid changes are comparable with the changes observed at the beginning of 1986 (Tomov et al., 1986; Skopal, 1987). It is convenient to note that U(1986) ≈ U (August 1989)! It appears that the mechanism of outburst generation has the same cause and is recurrent in this extensive system. Spectroscopic observations made in this period, particularly in the UV (L_α) region, could prove to be invaluable.

b) UV Aur

The observations of this star were made on 7 nights between Jan. 5 and Mar. 27, 1989. The changes in brightness are most pronounced in the V-colour and their trend is consistent with the expected 395-day period. It should be noted that changes in the U-colour are negligible relative to the changes in B. The observations so far cover only 21% of the cycle of the 395-day period, so that no further conclusions can be drawn from them. A review of the observations together with the resultant of the UV Aur magnitude for the individual colours are given in Tab. 3 and depicted in Fig. 5.

TABLE 3

U,B,V OBSERVATIONS OF THE SYMBIOTIC STAR UV AUR

J.D.	DU	DB	DV	N	DATE	U.T.
2447532.387	0.377	0.928	0.881	8	1989 JAN. 5	21 17
536.491	0.441	1.193	1.196	11	1989 JAN. 9	23 47
538.490	0.380	0.970	0.953	11	1989 JAN. 10	23 46
561.319	0.394	1.168	1.274	9	1989 FEB. 3	19 39
562.296	0.430	1.129	1.149	15	1989 FEB. 4	19 06
592.413	0.432	1.202	1.171	13	1989 MAR. 6	21 55
613.366	0.473	0.991	0.824	5	1989 MAR. 27	20 47

Table 4 gives the comparison stars for UV Aur as suggested in our campaign program. Since the observations were begun even before this program was compiled, S_2 and S_3 were used as the comparison stars.

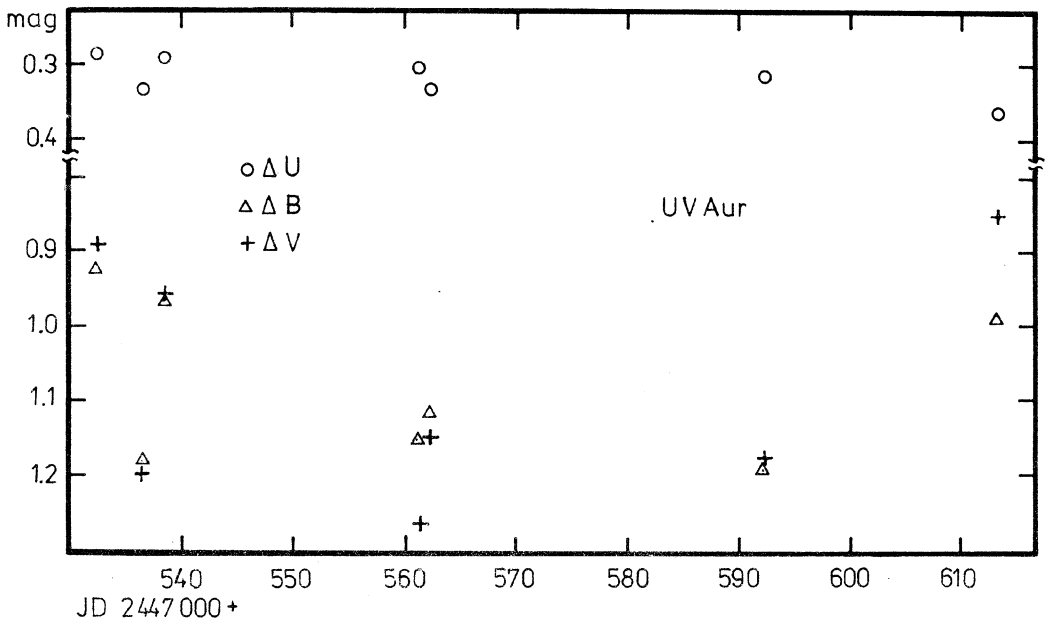

Fig. 5. UBV light curves of UV Aur. The light changes in U, as compared with the changes in B and V, are relatively small.

TABLE 4

COMPARISON STARS FOR UV Aur

comp. star	1950.0	1950.0	V	B-V	U-B	Sp
S_1: HD 242810	05 18 27.0	32 53 01.0	10.70	0.28	-0.23	B9
S_2: SAO 57940	05 18 32.2	32 20 14.4	$m_v = 8.8$,	$m_{pg} = 9.3$		A
S_3: SAO 57937	05 18 19.6	32 15 51.3	$m_v = 8.7$.	$m_{pg} = 9.8$		K0

c) 4 Dra

Table 5 gives a summary of the results of the first 6 months of the observations of 4 Dra in UBV, made between Mar. 12 and Sep. 13, 1989. The star HD 109 551 (6 Dra, V = 4.94, B-V = 1.313 mag, spectrum gK2) has been used as a standard star.

TABLE 5

U,B,V OBSERVATIONS OF 4 DRA

J.D.	DU	DB	DV	N	DATE	U.T.
2447598.497	0.757	0.198	0.029	21	1989 MAR 12	23 56
650.431	0.790	0.171	0.040	15	MAY 3	22 21
656.475	0.865	0.223	0.075	16	MAY 9	23 24
681.441	0.852	0.208	0.038	17	JUN 3	22 35
754.331	0.973	0.357	0.160	16	AUG 15	19 57
755.320	0.933	0.353	0.150	20	AUG 16	19 41
760.576	0.938	0.259	0.051	8	AUG 22	01 49
763.363	0.919	0.196	0.009	24	AUG 24	20 43
779.528	0.936	0.298	0.126	16	SEP 10	00 19
782.595	0.949	0.289	0.108	12	SEP 13	02 17

The limit number of observations does not enable us to draw more accurate conclusions. Fig. 6 indicates that the brightness of 4 Dra decreased in all three colours gradually during the whole interval in question. This decrease is most marked in the U-filter. The overall decrease in all filters is between 0.15 and 0.2 mag.

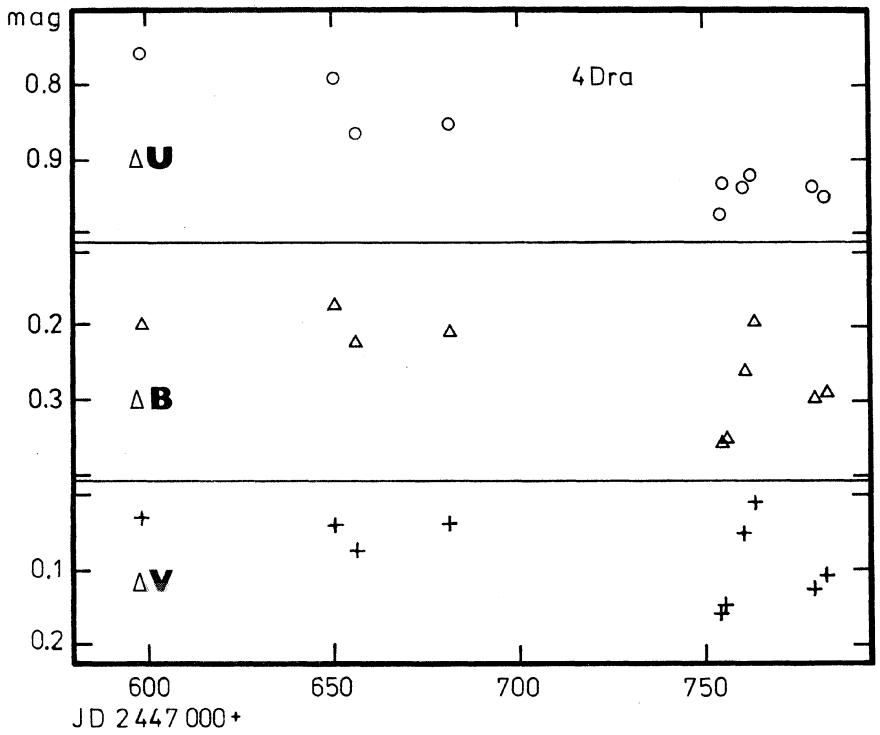

Fig. 6. UBV light curves of 4 Dra between Mar. 12 and Sep. 13, 1989. The small outburst in August and September, apparent in the B and V-colours, less pronounced in U, is remarkable.

The brightening in August and September is remarkable. It is very significant in the B and V-filters, less conspicuous in the U-filter. On the separate nights, there exist indications of rapid variability on a time scale of minutes to tens of minutes, the variabilty being most pronounced in the U-filter. We shall continue in the long-term UBV monitoring of the object, combined with longer observations during individual nights in an effort to detect rapid variability (namely in the U-filter).

Note: The brightness of CH Cyg in U filter suddenly decreased to approximatelly 10.5 mag during September - October 1989. It has kept this value, with the brightness fluctuations $\Delta U \approx 0.1 - 0.3$ mag, until the recent observatons in January 1990.

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